



1015 North 98th Street
Suite 300
Omaha, NE 68114-2334

architecture
landscape architecture
interior design
construction management



Cubby's Renovation - Fremont

450 South Broad Street
Fremont, NE 68025

Project Manual Combined Contract

BCDM Project Number: 5459-00
January 27, 2023



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Suite 300
Omaha, NE 68114-2334

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ARCHITECT:

BCDM Architects
1015 North 98th Street, Suite 300
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Fax: 402-391-8721

OWNER:

Cubby's Inc.
9220 Mormon Bridge Plaza
Omaha, Nebraska 68152
Phone: 402-453-1103

STRUCTURAL ENGINEER:

BCDM Architects
1015 North 98th Street, Suite 300
Omaha, Nebraska 68114-2334
Phone: 402-391-2211
Fax: 402-391-8721

CONSTRUCTION MANAGER:

Lund-Ross Constructors
4601 F Street
Omaha, Nebraska 68117
Phone: 402-342-2810

MECHANICAL AND ELECTRICAL ENGINEER:

Morrissey Engineering
4940 N. 118th Street
Omaha, Nebraska 68164
Phone: 402-491-4144
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**DIVISION 00 – PROCUREMENT AND
CONTRACTING REQUIREMENTS**

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**SECTION 01 10 00
SUMMARY**

PART 1 GENERAL

1.01 WORK UNDER THIS CONTRACT INCLUDES:

- A. All material, labor, tools, expendable equipment, transportation and utility services, and all incidental items necessary to perform and complete, in a workmanlike manner, the Work required for the Combined Construction, including General, Mechanical and Electrical Work, for the Cubby's Fremont Renovation.

1.02 WORK PERFORMED UNDER SEPARATE CONTRACTS. THE OWNER WILL LET SEPARATE CONTRACTS AS FOLLOWS:

- A. This Combined Contract (including General, Mechanical and Electrical Work)
- B. Other items as may be noted on the Drawings or specified herein

1.03 WORK FURNISHED BY OWNER OR OTHERS BUT INSTALLED UNDER THIS CONTRACT INCLUDES THE FOLLOWING:

- A. Paper Holders (PH-1), Hand Dryers (HD-1), Soap Dispensers (SD-1); see Section 10 28 00.
- B. Other items as may be noted in the Drawings or specified herein.

1.04 WORK BY OTHERS (VIA THE OWNER)

- A. Work furnished, installed and/or accomplished by the Owner or Others includes the following:
 - 1. Furnishings and other interior movable equipment items not specified herein.
 - 2. Other items as may be noted on the Drawings or specified herein.

1.05 SEQUENCE AND SCHEDULING OF THE WORK SHALL BE IN ACCORD WITH THE FOLLOWING:

- A. Substantial Completion July 3, 2023
- B. Final Completion July 17, 2023

1.06 CONSTRUCTION SCHEDULES

- A. If Contractor fails to adhere to the Construction Schedule, including accepted revisions, the Contractor shall promptly adopt such other or additional means and methods of construction as will make up the time lost and complete the Work in accordance with the Construction Schedule, at no additional cost to the Owner, except as specifically provided in the Contract.
- B. If the Owner notifies the Contractor of any change in the Contract, or if conditions arise which are likely to cause or are actually causing delays, the Contractor shall notify the Owner and Architect, in writing, within 5 days of such notice or the occurrence of such condition. This notice shall document the effect, if any, of such change or condition upon the Construction Schedule, with the reason therefore.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 25 00
SUBSTITUTION PROCEDURES**

PART 1 GENERAL

1.01 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.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for requests for substitutions by the Contractor that do not require modification of Contract Sum or Contract Time.

1.03 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction proposed by the Contractor after award of the Contract and that do not require modification of Contract Sum or Contract Time are considered to be requests for substitutions.
- B. The following are not considered to be requests for substitutions:
 - 1. Substitutions requested during bidding, and accepted by Addendum prior to award of the Contract.
 - a. Substitutions requested during bidding period must be submitted no later than 14 calendar days prior to date of bid opening.
 - 2. Specified choices of products and options included in the Contract Documents.

1.04 SUBMITTALS

- A. Substitution Request Submittal: Submit the following:
 - 1. Submit 2 copies of each request for substitution for consideration.
 - 2. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.
 - 3. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
 - a. Coordination information, including a list of changes or modifications needed to other parts of the Work that will be necessary to accommodate the proposed substitution.
 - b. A comparison of qualities of the proposed substitution with those of the Work specified.
 - c. Product Data, including Drawings and fabrication and installation procedures.
 - d. Samples, where applicable or requested.
 - 4. Engineer/Architect Action: If necessary, the Engineer/Architect will request additional information or documentation for evaluation. The Engineer/Architect will notify the Contractor of acceptance or rejection of the substitution in the form of a letter from the Engineer/Architect.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

- A. The Architect will receive and consider the Contractor's request for substitution only when all of the following conditions are satisfied:
 - 1. Extensive revisions to the Contract Documents are not required.
 - 2. Proposed changes are in keeping with the general intent of the Contract Documents.
 - 3. The request is timely, fully documented, and properly submitted.
- B. Requests for substitutions must be based on at least one of the following conditions:
 - 1. The request is directly related to an "or-equal" clause in the Contract Documents.
 - 2. The specified product cannot be provided within the Contract Time.
 - 3. The specified product cannot receive necessary approval by a governing authority.
 - 4. The specified product cannot be provided in a manner that is compatible with other materials.

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- C. The Architect/Engineer's acceptance of Shop Drawings, Product Data, or Samples not complying with the Contract Documents does not constitute a valid request for substitution, nor do they constitute approval.
- D. It shall be the responsibility of the Mechanical Contractor to coordinate with the Electrical Contractor on all electrical requirements for the equipment prior to ordering. All requirement changes shall be the responsibility of the Mechanical Contractor/Supplier at no additional cost to the project.

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 29 00
PROGRESS AND PAYMENT**

PART 1 GENERAL

1.01 APPLICATIONS FOR PAYMENT

- A. Applications for Payment shall be submitted to the Architect/Engineer on or before the eighteenth day of each month for work completed and material stored up to the fifteenth day of that month. Applications for Payment shall be submitted in triplicate on AIA Documents G702 and G703, 1992 edition.

1.02 PAYMENT

- A. Upon review and recommendation by the Architect/Engineer, the Owner will, on or before the day following the second Monday of the following month, pay to the Contractor, on account of the Contract, 90 percent of the value of labor and materials incorporated in the Work and 90 percent of materials suitably stored in accord with Subparagraph 9.3.2 of the General Conditions, up to the fifteenth day of the preceding month.

1.03 REDUCTION IN RETAINAGE AFTER WORK IS 50 PERCENT COMPLETE

- A. After 50 percent of the Work is complete, and upon receipt of Applications for Payment accompanied by Consent of Surety to Reduction in or Partial Release of Retainage executed in triplicate on AIA Document G707A, 1994 or later Edition, the Architect/Engineer may, if he finds satisfactory progress is being made, recommend that any of the remaining Progress Payments be paid in full. The full retainage may be reinstated if the manner of completion of the work and its progress do not remain satisfactory to the Architect/Engineer or the Owner, or for other good and sufficient reasons, or if Surety revokes its Consent for Reduction in or Partial Release of Retainage.

1.04 REDUCTION IN RETAINAGE AFTER SUBSTANTIAL COMPLETION

- A. After Substantial Completion, and upon receipt of Applications for Payment accompanied by Consent of Surety to Reduction in or Partial Release of Retainage executed in triplicate on AIA Document G707A, 1994 or later Edition, and upon review and recommendation by the Architect/Engineer, the Owner will pay the Contractor, on account of the Contract, 95 percent of the value of labor and materials incorporated in the Work and 95 percent of the materials suitably stored in accord with Subparagraph 9.3.2 of the General Conditions, up to the fifteenth day of the preceding month.

1.05 FURTHER REDUCTION IN RETAINAGE

- A. The final 3 percent of the Contract Sum will not be paid until the Contractor has submitted to the Architect/Engineer, in triplicate, a written clearance from the Nebraska Commissioner of Labor certifying that all payments then due of contributions to the fund or interest thereon, owing by reason of the performance of the Work under this Contract, have, in fact, been paid by the Contractor and his/her Subcontractors to the Unemployment Compensation Fund of the State of Nebraska.

1.06 FINAL PAYMENT

- A. After Final Completion, and upon receipt of the Final Application of Payment submitted in triplicate on AIA Documents G702 and G703, 1992 Edition, accompanied by Consent of Surety Company to Final Payment and Contractor's Affidavit of Payment of Debts and Claims executed in duplicate on AIA Documents G707 and G706, 1994 or later Editions respectively, Contractor's Affidavit of Release of Liens executed in duplicate on AIA Document G706A latest edition, the Contractor's Release or Waiver of Liens from all subcontractors and suppliers and other items required in Section 01 78 00, and upon the review and recommendation of the Architect/Engineer, the Owner will pay the Contractor the entire balance of the Contract Sum.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS**

PART 1 GENERAL

1.01 SUMMARY

- A. Section 01 29 00 - Progress and Payment
 - 1. Applications for Payment
 - 2. Supplemental Off-Site Storage Agreement
 - 3. Consent of Surety to Reduction in or Partial Release of Retainage
 - 4. Consent of Surety to Final Payment
 - 5. Contractor's Affidavit of Payment of Debts and Claims
 - 6. Certification of Unemployment Compensation Contributions
 - 7. Contractor's Affidavit of Release of Liens
 - 8. Release or Waiver of Liens from Subcontractors and Suppliers
- B. Section 01 40 00 - Quality Requirements
 - 1. Testing Reports
 - 2. Receipts from Testing Payments
- C. Section 01 78 00
 - 1. Inspection Certificates
 - 2. Certification of Unemployment Compensation Contributions
 - 3. Extra Stock
 - 4. Specified Product Warranties as listed in that Section
 - 5. Water System Disinfection Reports
 - 6. Operating and Maintenance Manuals
 - 7. Performance Test Reports
 - 8. Project Record Drawings

1.02 PROGRESS AND VALUE SCHEDULE

- A. Progress and Value Schedule shall be completed in duplicate on forms furnished by the Architect/Engineer at the Preconstruction Conference, and submitted prior to the first Application for Payment and shall reflect in detail all of the Work included under the Combined Contract.
- B. Value Schedule shall be broken out by individual specification section. A preliminary copy of this form shall be submitted to the Architect/Engineer to approve or modify the breakdown of line items before final copies are submitted.

1.03 LIST OF SUBCONTRACTORS AND MATERIAL SUPPLIERS

- A. List of Subcontractors and Material Suppliers shall be entered on the form furnished by the Architect/Engineer, and submitted in duplicate within 10 days after the Notice-to-Proceed or Award of the Project.

1.04 CERTIFICATE OF INSURANCE

- A. ACORD Insurance Certificate Form 25-S shall be submitted by the Contractor in duplicate before work is started on the site.

1.05 PERFORMANCE BOND AND PAYMENT BOND

- A. Performance Bond and Payment Bond each in the amount equal to 100 Percent of the Contract Price, shall be submitted in duplicate to the Architect/Engineer prior to issuance of a Notice-to-Proceed or execution of the Owner-Contractor Agreement (whichever occurs first). Such bonds shall be issued by a surety company acceptable to the Owner and properly licensed in the State of Nebraska. Such bonds shall be issued on AIA Document A312, amended to conform with applicable state statutes.

1.06 AIA DOCUMENTS

- A. AIA Documents which are required for submittals in this or other sections of this Project Manual may be obtained from:

A.I.A. Nebraska
P.O. Box 80045
Lincoln, Nebraska 68501
(402) 472-1456
(800) 332-0265

- B. The Contractor at his/her option, may use electronic copies of the AIA documents by contacting the Client Contractor Billing Program, (1-888-272-4115).

1.07 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- A. Shop Drawings, Product Data and Samples shall be submitted as follows:
1. All shop drawings and product data submittals shall be submitted in electronic (PDF) format using Procore. Procore is a website service designed specifically for transmitting submittals between construction team members.
 2. Shop drawings shall be numbered consecutively within each Division. Each shop drawing transmittal form shall list only items within the Division.
 3. All shop drawings and samples related to color choices and color issues shall be submitted at one time with all samples and colors submitted in triplicate.
 4. The distribution area in the center of the sheet shall be for the use of the Architect/Engineer only.
 5. The Contractor shall review, mark-up and stamp all shop drawings prior to submittal to the Architect. The Architect will use red ink for his markings; the Contractor shall use a color other than red.
 6. Changes from the Contract Documents on a shop drawing shall be listed in a letter of explanation accompanying the shop drawing.
 7. A copy of the following list shall be updated monthly and submitted with the Application for Payment.
 8. All shop drawing dimensions shall be in English units and metric units or English units only. Shop drawings with dimensions in metric units only will be rejected.

1.08 SUCCESSFUL CONTRACTOR/SUPPLIER

- A. The successful contractor/supplier may, at their option, obtain electronic drawing files for architectural drawings (A Series Drawings) for use in preparation of shop drawings. This information is available from BCDM upon written request. A non-refundable one time charge of \$150 per request plus \$20 per drawing file requested (plus shipping and handling if required) will be required at the time of receipt of electronic files. The use of these drawing files is intended solely for the preparation of drawings as required by these Contract Documents. All other uses are strictly prohibited by Copyright law. The user of these electronic drawing files assumes full responsibility for their accuracy and scale.

1.09 SHOP DRAWINGS, PRODUCT DATA AND RELATED SAMPLES

- A. Shop drawings, product data and related samples shall be submitted as noted within each specification section.

1.10 CERTIFICATES

- A. Miscellaneous Certifications shall be submitted in duplicate for all items so noted in individual Specification Sections.
- B. Asbestos Certification. Submit 2 copies of the certification regarding use of asbestos-free products as required by the Supplementary Conditions.
- C. Wood Treatment Certification. Submit 2 copies of a letter certifying that all wood requiring pressure treatment has been treated as specified for water resistance or fire resistance as outlined in Section 06 10 00 .
- D. Silicone Building Sealant Certification. Submit 2 copies of certificates indicating products have been pretested to comply with performance requirements indicted in Section 07 92 00.

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PART 2 PRODUCTS - NOT USED
PART 3 EXECUTION - NOT USED

END OF SECTION



S H O P D R A W I N G T R A N S M I T T A L

PROJECT _____ BCDM# _____ DATE _____ TRANSMITTAL NO. _____

CONTRACTOR _____

ADDRESS _____

FIRST SUBMITTAL

LOCATION _____

RE-SUBMITTAL

THE CONTRACTOR HAS REVIEWED THE ENCLOSED SHOP DRAWINGS AND CERTIFIES THAT ALL MATERIALS ARE IN COMPLIANCE WITH THE CONTRACT DOCUMENTS EXCEPT AS SPECIFICALLY NOTED.

PREV. NO. _____

BY _____ CONTRACT _____

SPEC. SECTION	NO. COPIES	DESCRIPTION	MANUFACTURER	DRAWING OR DATA NO.	ACTION TAKEN

- OWNER
- CONTRACTOR
- ARCHITECT
- OTHER

THE ABOVE DRAWINGS ARE RETURNED WITH ACTION AS DESIGNATED ABOVE IN ACCORDANCE WITH THE FOLLOWING

- LEGEND:**
- A:** NO EXCEPTION TAKEN
 - B:** MAKE CORRECTIONS NOTED
 - C:** REVISE AND RESUBMIT
 - D:** REJECTED
 - E:** SUBMIT SPECIFIED ITEM

REMARKS _____

BY _____ DATE _____

**SECTION 01 31 00
PROJECT MEETINGS**

PART 1 GENERAL

1.01 PRECONSTRUCTION CONFERENCE

- A. The Prime (General) Contractor and the Mechanical and Electrical Subcontractors shall attend a preconstruction conference at a time and location to be determined to discuss and clarify Contract Administration procedures. Representatives of the Owner and the Architect/Engineer will also attend.

1.02 PROGRESS MEETINGS

- A. The Prime (General) Contractor shall convene and conduct progress meetings during normal working hours at the construction site as required by the Architect/Engineer to discuss the progress of construction and properly coordinate respective responsibilities and schedules. The time, date, and location of these meetings shall be set by agreement of those involved. The Mechanical and Electrical Subcontractors shall also attend these meetings. A representative of the Owner and the Architect/Engineer will also attend these meetings when required to coordinate schedules and working relationships with the Contractor.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 40 00
QUALITY REQUIREMENTS**

PART 1 GENERAL

1.01 NOTIFICATION OF TESTING AGENCY

- A. Notification of Testing Agency that materials are ready for sampling, observation and testing shall be made by the Contractor. Such notification shall be made at least one day in advance.

1.02 SAMPLING

- A. Sampling shall be made by the Testing Agency's authorized representatives. The location from which the sample was taken shall be noted on the Test Report.

1.03 REPORTS SHALL BE DISTRIBUTED BY THE TESTING AGENCY AS FOLLOWS:

- A. Architect/Engineer one copy
- B. General Contractor one copy
- C. Owner one copy
- D. Concrete Producer (concrete tests only) one copy

1.04 PAYMENT

- A. Payments shall be made for testing and special inspections by the Contractor who shall forward all receipts for payment to the Architect. The Contractor will be reimbursed from the Testing Allowance specified in Section 01 21 00 - Allowances. Adjustment will be made on the basis of receipts for payment received by the Architect.

1.05 THE CONTRACTOR

- A. The Contractor shall be responsible for maintaining close communication with the Testing Agency, particularly during the overexcavation/filling/recompaction phases for the building addition in order to assure that they are notified as to the schedule when such work is or is not going to take place. If the Contractor persistently fails to notify the Testing Agency when that work is not going to take place due to weather or other reasons, the costs of the unnecessary trips to the site by the Testing Agency shall be paid by the General Contractor from his/her own funds.

1.06 RETESTING

- A. Retesting and re-inspection of inspections due to failure shall be paid by the Contractor.

1.07 PATCHING

- A. Patching, if required by the taking of samples, shall be made by the Contractor.

1.08 TESTS ARE SPECIFIED IN THE FOLLOWING SECTIONS:

- A. 03 30 00 - Cast-in-Place Concrete
- B. 05 40 00 - Cold-Formed Metal Framing
- C. Div. 21 thru 23 Miscellaneous Backfill for Buried Mechanical Items
- D. Div. 26 thru 28 Miscellaneous Backfill for Buried Electrical Items

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS**

PART 1 GENERAL

1.01 WATER

- A. All water required for construction activities will be furnished by the Prime (General) Contractor as may be needed for the entire prosecution of the Work. The cost of the water used will be paid by the Prime (General) Contractor. The Contractor shall be responsible for furnishing all hoses and piping necessary to extend the water services to the construction areas, and shall be responsible for returning existing water sources to their original condition at completion of the project.

1.02 TEMPORARY POWER AND LIGHTING

- A. Temporary power will be provided throughout the construction period by the Prime (General) Contractor for use by all trades, Contractors, and Subcontractors for the following purposes:
 - 1. Operation of miscellaneous power tools and equipment
 - 2. Temporary lighting
 - 3. Power and lighting in temporary construction site office and storage buildings (if any).
 - 4. Testing and checking equipment
 - 5. Welding units
 - 6. Night security lighting
 - 7. Other general construction power needs
- B. All power sources, load centers, distribution boxes, circuit breakers, and other materials, including the methods of installing them, will be as required for safe working conditions and as required by applicable Codes and Ordinances.
- C. Where possible, at areas of the existing building in which construction work will take place, temporary lighting will be provided during the construction period by the Owner via the existing lighting for use by all trades, Contractors and Subcontractors up until such time where existing lighting which is to be removed is no longer operational. The Prime Contractor shall be responsible for adding whatever additional temporary lighting (over and above that provided by the existing building lighting) might be required for proper execution of the work. See list of required footcandle levels below. In areas where existing ceiling and lighting will be removed, the Prime (General) Contractor shall provide temporary lighting as specified below.
- D. At all new building areas, temporary lighting shall be provided during the construction period by the Prime (General) Contractor for use by all trades, Contractors, and Subcontractors for safe and adequate working conditions throughout the building, and shall provide minimum illumination measured in foot candles (FC) at the floor line as follows:

1. General area and walkway lighting	5 FC
2. Mechanical and electrical rooms	20 FC
3. General, electrical and mechanical rough work areas	10 FC
4. Concrete, masonry and finish work areas	20 FC
- E. Cost of electrical energy used during construction at all areas will be paid by the Contractor. The Contractor shall make every effort to conserve the use of electrical energy.
- F. Cost of electrical energy used during construction at all areas will be paid by the Owner. The Contractor shall make every effort to conserve the use of electrical energy and minimize those costs to the Owner.

1.03 SANITARY CONVENIENCES

- A. Sanitary conveniences for use by all persons employed on the Work shall be provided and maintained by the Prime (General) Contractor.
 - 1. New and existing building toilets, sinks, and other plumbing fixtures may not be used by Construction Personnel.

1.04 SECURITY AND WEATHER PROTECTION.

- A. The Prime (General) Contractor shall be responsible for proper security for the building at all times. He/she shall also schedule his/her work and provide temporary facilities and materials as required to assure continuous proper weather protection of all spaces for the duration of the construction process.
- B. This requirement will be strictly enforced in order to minimize the potential for damage to the nearly completed Project and resulting time delays.

1.05 COLD WEATHER PROTECTION

- A. The Prime (General) Contractor shall be responsible for adequately protecting utilities, supplies, and equipment for the Work during cold weather. Items subject to cold weather damage shall be protected by covering, insulating, or storing in a heated space. During cold weather, temporary enclosures shall be erected at exterior openings which are not filled in immediately to minimize heat loss from the existing building.
- B. Temporary protection of new finishes. The Prime (General) Contractor and all Subcontractors shall protect carpet and other new finishes, whether installed under this Contract or by others as required to prevent damage to those materials due to construction activities which occur after those finishes are installed.

1.06 TEMPORARY HEAT

- A. Temporary heat for all building areas shall be furnished by the Prime (General) Contractor until the time when the permanent heating systems for those areas are operational. Up until that time, all temporary heating costs shall be paid for by the Prime (General) Contractor. Electric space heaters will not be acceptable for this preliminary heating source. After the permanent heating systems are operational, they may be used to supply temporary heat after approval to do so has been received from the Architect/Engineer, and the cost of fuel used will be paid by the Prime (General) Contractor.
- B. Wherever the permanent new heating and cooling systems are used to provide temporary heat and cooling, approval to use these systems must first be obtained from the Architect/Engineer. Costs for filter replacement, warranty extension to meet the requirements of the General Conditions, and cleaning at the termination of the heating and cooling periods shall be borne by the Prime (General) Contractor. Warranties for all equipment shall begin at the date of Substantial Completion even though the equipment may have been used for temporary heat and cooling prior to that time. See Section 01 11 00 for additional heating requirements of the existing building.
- C. **NO PROPANE BURNERS OR SIMILAR OPEN FLAME HEATERS WILL BE ALLOWED WITHIN THE BUILDING.**

1.07 MAINTENANCE OF EXITS

- A. During renovations of the existing building, the Prime Contractor shall maintain means of egress, free and unobstructed from the existing exits as required by the City of Fremont Building Inspector, State Fire Marshal, and other responsible authorities.

1.08 BARRICADES, FENCES, AND PROTECTION

- A. The Prime (General) Contractor shall erect temporary barricades, fences and other protective items as necessary to provide for the general safety of the public during the construction of this project. As a minimum, 4-foot high sound snow fencing with posts at 10-foot centers shall be provided. These minimum requirements may be exceeded by the Contractor at his/her option since he/she is responsible for safety at the project site. Where the existing fencing is removed to provide temporary access to the site, it shall be reinstalled or replaced to match existing conditions at the end of the construction day.

1.09 OFFICES AND STORAGE FACILITIES FOR THE CONTRACTORS AND SUBCONTRACTORS

- A. The Prime (General) Contractor shall maintain on the site as necessary for the proper conduct of the Work offices and storage facilities for the Contractor and Subcontractors. After consulting with the Architect/Engineer, these shall be located on the site so that they cause no

interference to Work performed on the site under this Contract or by others or to traffic on adjoining streets. Material and equipment may not be stored on parking and drive areas without permission of the Owner, and such items may not be stored on public streets without permission of the City of Fremont.

- B. Removal of temporary offices and storage facilities. Upon completion of the project, or as directed by the Architect/Engineer, remove the temporary offices and storage facilities, and leave the premises in the condition required by the Contract. All areas affected by the construction shall be finely graded to the profile shown on the Drawings (or to their original profile at areas where the existing contours are shown to be unchanged) in preparation for installation of sod or seed by the Owner. The Contractor shall make every effort to restrict his/her construction activities to the areas shown to receive grade changes and enclosed by the construction fence.

1.10 PROJECT SIGN

- A. Owner's Project Sign (4'x8' - Dual Sided) shall be furnished by the Owner but erected by the Prime Contractor. Exact sign location will be determined prior to start of construction.

1.11 CLEAN UP

- A. The Prime (General) Contractor shall maintain all site areas involved in the Work of this Contract in a clean condition throughout the construction period. The Contractor shall also clean adjoining streets soiled by removal activities as may be required by the governing authorities. In addition, all paving areas shall be cleaned of all dirt, dust, debris and snow at time of Substantial Completion.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 60 00
PRODUCT REQUIREMENTS**

PART 1 GENERAL

1.01 MATERIALS AND EQUIPMENT

- A. Material and equipment shall be of the manufacturer, model, and type specified. Substitute materials and equipment approved prior to bidding, in accord with the Instructions to Bidders, are incorporated into this Project Manual as Addenda.

1.02 MATERIALS AND EQUIPMENT OF ACCEPTABLE MANUFACTURER

- A. An item of material or equipment may be used in place of an item which is specified by manufacturer and model number and type by conforming to all of the following provisions:
 - 1. The item is manufactured by one of the acceptable manufacturers listed in the Project Manual, Drawings, or Addenda.
 - 2. The item of material or equipment meets or exceeds the minimum qualities established by the specified item.
 - 3. The item is used throughout the project so that all items of material or equipment used in place of specified items are of the same make and type.
 - 4. The entire cost of all modifications which result from the use of items in place of specified items shall be borne by the Contractor who uses such items, at no additional cost to other Contractors or to the Owner.
- B. The Architect/Engineer has detailed and specified around a specific manufactured product for certain items. Although additional manufacturers are specified in Contract Documents, it is the Contractor's responsibility to coordinate the requirements of the product selected with all building components.

1.03 REPEATED FEATURES AND MATERIALS

- A. Repeated features and materials must be constructed alike, although detailed or indicated only once. Detail and ornament must continue throughout all moldings, bands, etc. Where items, devices and equipment are specified singular in number, the Specification shall apply to as many items, devices and pieces of equipment as are shown on the Drawings or required to complete the installation. Repeated items of equipment and materials shall be of the same manufacturer, model number and type.

1.04 WHEN BULKY MATERIALS AND EQUIPMENT ARE FURNISHED BY OTHERS

- A. The Prime (General) Contractor shall, upon receipt of notice in ample time, leave proper openings to permit the installation and properly close such openings afterwards.

1.05 WHEN EQUIPMENT IS FURNISHED BY OTHERS

- A. The Contractor shall use the manufacturer's detail drawings to establish roughing in dimensions and location of services. In case of conflict, the equipment detail drawings and dimensions shall be used, except where aesthetic or structural considerations make an adjustment necessary.

1.06 DISCREPANCIES

- A. In the event of discrepancies within the Drawings, within the Project Manual or between the Drawings and Project Manual, the discrepancies shall be brought to the attention of the Architect/Engineer immediately before proceeding with the affected work. The Architect/Engineer will make a written interpretation.
- B. If the Contractor fails to notify the Architect/Engineer of discrepancies and proceeds with the Work where discrepancies occur, such Work shall be considered done at the Contractor's risk. No excuse will thereafter be entertained for failure to carry out Work in a manner satisfactory to the Architect/Engineer.

1.07 STANDARDS

- A. Materials and processes for which standards have been adopted by ASTM, or other industry recognized organizations, shall conform to those standards. Methods shall be those recommended by the manufacturer of the material involved.

1.08 MEASUREMENTS

- A. Before ordering material and doing work, the Contractor shall verify measurements at the building and the site and be responsible for same. Extra compensation will not be allowed for differences between actual dimensions and measurements indicated on the Drawings. The Contractor shall submit differences to the Architect/Engineer.

1.09 CHASES, OPENINGS, INSERTS, ETC

- A. The General Contractor shall build into all new construction necessary chases, slots and openings required for his/her own or other contractor's work as shown on the Drawings or requested by other contractor's for their work. He/she shall cooperate with other contractors in the proper installation of sleeves, inserts, etc., furnished by the contractor or subcontractor concerned unless otherwise shown or specified.

1.10 CUTTING AND PATCHING

- A. Cutting, fitting and patching necessary to fit the several parts of this or other contractor's work together, or cutting, fitting, and patching of existing construction and new work in place shall be the expense of the contractor concerned. Each contractor shall determine and be responsible for proper location and character of all inserts, holes, chases, and other openings in new and existing construction, and give the other interested contractors proper notification with regard to same.
- B. Cutting, fitting, repairing, patching, etc., required whether it be in existing construction, new work in place or executing the initial installation, must be done by craftsmen skilled in their respective trades. Repair cut surfaces to match adjacent surfaces.

1.11 SUBSTITUTIONS

- A. Mill tests, chemical analysis, manufacturer's specifications, and such other information as is available shall be submitted as proof of quality when presenting substitute materials for Owner's approval. If the Contractor proposes the construction method other than that shown or specified, complete drawings and engineering notes shall accompany the request. The Contractor shall reimburse the Architect for architectural and engineering service furnished, time required for checking the proposed change, and drafting time required for preparing as built drawings made necessary by substitutions.

1.12 STABILITY

- A. Members shall be rigid and securely anchored. Members subject to vibration or racking shall be attached with through bolts or cinch bolts. Connections shall be adequate to withstand all strains to which they normally would be subjected.

1.13 TRUENESS

- A. Surfaces and joints of all materials fabricated on or off the site into a single article or composition, or into an assembly of units, shall be uniform, true, plumb, level, properly curved or pitched as required and free from defects and blemishes.

1.14 COORDINATION

- A. The Contractor shall coordinate his/her work with that of the other contractors and shall cooperate with them to the fullest extent. He/she shall order all materials promptly so that they will be available when needed and not delay the installation of items by other contractors.

1.15 THE PRIME (GENERAL) CONTRACTOR

- A. The Prime (General) Contractor shall give ample notice of his/her and other contractor's intended operations including current progress schedules, directing their activities on the job to assure orderly procedures with the interests of the Owner's obligations to the public in mind.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 78 00
CLOSEOUT SUBMITTALS**

PART 1 GENERAL

1.01 CLEANING

- A. When the project is completed, the General Contractor shall clean all site and building areas affected by this work, removing all rubbish and excess materials, no matter by whom it is left. Dust accumulations shall be totally removed from all interior surfaces. See General Conditions and individual Specification Sections for further clean-up requirements.

1.02 SUBMITTALS

- A. The following submittals shall accompany the Contractor's final Application for Payment. Submittals shall be submitted in duplicate unless otherwise specified in the Sections indicated.
 - 1. 01 29 00 Contractor's Affidavit of Payment of Debts and Claims
 - 2. 01 29 00 Certification of Unemployment Compensation Contributions
 - 3. 01 29 00 Contractor's Affidavit of Release of Liens (AIA Document G706A, latest edition)
 - 4. 01 29 00 Individual Releases of Waivers of Liens from Subcontractors and Suppliers
 - 5. 01 29 00 Consent of Surety of Final Payment (AIA Document G707, latest edition)
 - 6. 07 19 00 Water Repellent Warranty
 - 7. 07 24 00 Exterior Insulation and Finish System Warranty
 - 8. 07 24 19 Direct-Applied Exterior Finish System (DEFS) Warranty
 - 9. 07 42 13 Metal Wall Panel Warranty
 - 10. 07 62 00 Sheet Metal Flashing and Trim Warranty
 - 11. 07 92 00 Silicone Joint Sealer Warranty
 - 12. 08 36 13 Sectional Overhead Door Warranty
 - 13. 08 43 13 Aluminum Frame and Door Warranty
 - 14. 08 71 00 Finish Hardware Warranty
 - 15. 08 80 00 Glazing Warranty
 - 16. 09 51 00 Acoustical Ceiling Tile System Warranty
 - 17. Divisions 21 thru 28 Various Mechanical and Electrical Warranties as noted

1.03 INSPECTION CERTIFICATES

- A. Inspection certificates issued by regulatory agencies shall be submitted to the Architect/Engineer before final payment.

1.04 TESTING REPORTS

- A. Testing reports shall be submitted to the Architect/Engineer before final payment, and shall include the following:
 - 1. Performance Tests
 - 2. Water System Disinfection Reports
 - 3. Air Balancing Reports

1.05 COORDINATE

- A. Coordinate with requirements of Commissioning as outlined in various sections throughout the project manual.

1.06 RECEIPTS FOR TESTING COSTS

- A. Receipt for testing costs as specified in Section 01 40 00, Quality Control Services, shall be submitted to the Architect/Engineer before final payment.

1.07 PROJECT RECORD DRAWINGS

- A. Project Record Drawings shall be delivered to the Architect/Engineer before final payment in accordance with the General Conditions of the Contract. Record drawings shall be a copy of the Contract Drawings, properly marked to reflect changes made during construction, and with

undamaged edges.

- B. These drawings shall be the Contractor's separate field set on which he/she has accurately marked changes that were made during construction.

1.08 OPERATION AND MAINTENANCE MANUALS AND REPAIR KITS

- A. Operation and Maintenance Manuals and Repair kits shall be submitted to the Architect/Engineer in duplicate before final payment or earlier when specified. Data to be included is as follows:
 - 1. Water Repellent Maintenance Data
 - 2. Hardware Maintenance Data
 - 3. Acoustic Ceiling Tile Maintenance Data
 - 4. Mechanical and Electrical Operating and Maintenance Data, Parts Lists, Lubrication Schedules, Diagrams and Accessory Schedules
- B. Operation and Maintenance Manuals shall be bound in plastic or vinyl-covered 3-ring binders (Submit one copy). The binders shall be large enough to accommodate all materials and shall be marked with tabs to identify the contents. In addition to the hard copies Operation and Maintenance Manuals shall also be submitted in PDF form by approved external storage media or digital file transfer.

1.09 INSTRUCTIONS FOR THE OWNER

- A. On completion of the project, the Contractor shall demonstrate the proper operation and maintenance procedures for all mechanical, electrical and operating general construction items prior to final acceptance by the Owner. Such demonstration sessions shall be video-recorded by the Contractor at his/her expense. One copy of each video-recording shall be in DVD format, and turned over to the Owner.

1.10 EXTRA STOCK

- A. Extra Stock shall be delivered to the Owner before final payment, and shall include the following:
 - 1. Paint
 - 2. Carpet
 - 3. Tile
 - 4. Resilient Flooring and Vinyl Base
 - 5. Mechanical/Electrical Items as may be noted in Divisions 22 thru 28 and on the Drawings

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 91 13
COMMISSIONING REQUIREMENTS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including general and supplementary conditions, general mechanical provisions, and applicable mechanical and electrical specification sections, apply to work of this section.

1.02 DEFINITIONS

- A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- B. CxA: Commissioning Authority.
- C. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.03 COMMISSIONING AUTHORITY

- A. The Owner may contract directly with the Commissioning Authority (CxA) for this project. The CxA has overall responsibility for planning and coordinating the commissioning process.

1.04 CONTRACTOR RESPONSIBILITY

- A. This section of the specifications defines the Contractor's responsibilities with respect to the commissioning process. Each Contractor and subcontractor shall review this section and shall include in their bids for carrying out the work described, as it applies to each division and section of these specifications, individually and collectively.

1.05 DESCRIPTION OF WORK

- A. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner's operational needs. The CxA shall provide the Owner with an unbiased, objective view of the system's installation, operation, and performance. The commissioning process does not take away or reduce the responsibility of the installing contractors to provide a finished product, installed and fully functional in accordance with the Contract Documents.
- B. Commissioning is intended to enhance the quality of system startup and aid in the orderly completion and transfer of systems for beneficial use by the Owner. The CxA shall be the leader of the commissioning team, planning and coordinating all commissioning activities in conjunction with the design professionals, construction manager, subcontractors, manufacturers, and equipment suppliers.
- C. The General Contractor, Mechanical Contractor, Electrical Contractor, Temperature Control Contractor, and all subcontractors shall be responsible for cooperating and coordinating their work with the CxA. They shall also be responsible for carrying out all the physical activities required for installation of components and systems, and operating them during the commissioning process as required in this section.
- D. Commissioning, including functional tests, O&M documentation review, and training is to occur after startup and initial checkout and be completed before Substantial Completion.

1.06 SCOPE OF COMMISSIONING

- A. The following shall be commissioned:
 - 1. HVAC Systems, including:
 - a. New gas fired / DX cooling Rooftop Units (3 total).
 - b. New gas fired water heater and recirculation system (1 total).
 - c. New Grease exhaust hood (2 total).
 - d. New Make-up Air unit (1 total).
 - 2. Other equipment and systems explicitly identified elsewhere in the Contract Documents as requiring commissioning.

1.07 SUBMITTALS

- A. Manufacturers Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.
- B. Startup plans and reports, including blank Startup and Prefunctional Checklists for approval by CxA.
- C. Submit O&M manuals related to items that are commissioned to CxA for review; make changes recommended by CxA.
- D. Completed Prefunctional Checklists.

1.08 STARTUP, PREFUNCTIONAL CHECKLISTS, AND INITIAL CHECKOUT

- A. General: Prefunctional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional performance testing for a given system shall be successfully completed prior to formal functional performance testing of equipment can begin.
- B. Startup and Initial Checkout Plan: The primary role of the CxA in this process is to ensure there is written documentation that each of the manufacturer-recommended procedures has been completed.
 - 1. Contractor responsible for the purchase of the equipment develops the full startup plan by utilizing the manufacturer's detailed startup and checkout procedures from the O&M Manual and the normally-used field checkout sheets. The plan shall include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.
 - 2. The full startup plan shall consist of something as simple as:
 - a. The manufacturer's prefunctional checklists.
 - b. The manufacturer's standard written startup procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
 - 3. Contractor shall submit the full startup plan to the General Contractor for review and scheduling.
 - 4. The CxA reviews the procedures and the format for documenting them, noting any procedures that need to be added. Checklists shall be submitted to CxA for approval not less than 8 weeks prior to startup.
- C. Execution of Prefunctional Checklists and Startup: Contractor shall be responsible for filling out Prefunctional Checklists after completion of installation and before startup; witnessing by the CxA is not required unless otherwise specified.
 - 1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete with deficiencies.
 - 2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; resubmission of the checklist is required upon completion of remaining items.
 - 3. Individual checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
 - 4. If any checklist line item is not relevant, record reasons on the form.
 - 5. Regardless of these reporting requirements, Contractor shall be responsible for correct startup and operation.
 - 6. The Subs and vendors shall execute startup and provide the General Contractor with a signed and dated copy of the completed start-up report within two days of completion. The General Contractor shall submit copies to the CxA for review.

- D. Deficiencies: Correct deficiencies and re-inspect or retest, as applicable, at no extra cost to the Owner.
 - 1. If difficulty in correction would delay progress, report deficiency to the CxA immediately.

1.09 FUNCTIONAL PERFORMANCE TESTS

- A. General: The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. In general, each system will be operated through all modes of operation as described in the Contract Documents (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each step in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. will also be tested.
- B. A Functional Performance Test is required for each piece of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.
- C. Development of Test Procedures: The CxA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Prior to execution, the CxA will provide a copy of the test procedures to the Contractor(s) who shall review the tests for feasibility, safety, equipment and warranty protection. The CxA will submit the tests to the A/E for review.
- D. Coordination and Scheduling: The Subs shall provide sufficient notice to the CxA regarding their completion schedule for the prefunctional checklists and startup of all equipment and systems. The CxA will schedule functional tests through the GC and affected Subs. The CxA shall direct, witness and document the functional testing of all equipment and systems. The Contractor(s) shall execute the tests.
- E. In general, functional testing is conducted after prefunctional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CxA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems.
- F. Contractor shall be responsible for correction of deficiencies and retesting at no extra cost to the Owner; if a deficiency is not corrected and retested immediately, the CxA shall document the deficiency and the Contractor's stated intentions regarding correction.
 - 1. Deficiencies are any condition in the installation or function of a component, piece of equipment, or system that is not in compliance with the Contract Documents or does not perform properly.
 - 2. When the deficiency has been corrected, the Contractor shall notify the CxA. The CxA shall reschedule the test and the Contractor shall retest.
 - 3. Contractor shall bear the cost of Owner and CxA personnel time witnessing retesting.
 - 4. Contractor shall bear the cost of Owner and CxA personnel time witnessing retesting if the test failed due to failure to execute the relevant Prefunctional Checklist correctly. If the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and any subsequent retests.
- G. Deferred Functional Performance Testing: Some tests may need to be performed later, after Substantial Completion, due to partial occupancy, equipment, seasonal requirements, design, or other site conditions. Performance of these tests remains the Contractor's responsibility regardless of timing.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

- A. Division 23 and 26 contractors shall provide all testing equipment required to fulfill the testing requirements outlined in this Section.

- B. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
 - 1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 deg F and resolution of plus/minus 0.1 deg F.
 - 2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
 - 3. Calibration: According to the manufacturer's recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.
- C. Equipment-Specific Tools: When special testing equipment, tools, and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to the Owner; such equipment, tools, and instruments are to become the property of the Owner.

PART 3 - EXECUTION

3.01 COMMISSIONING RESPONSIBILITIES - NON-CONTRACTOR TEAM MEMBERS

- A. Introduction:
 - 1. A multi-disciplinary team carries out commissioning. The commissioning responsibilities of some non-contractor team members during the construction and acceptance phases of the project are provided here for information and to provide some context for the overall process.
- B. Commissioning Authority Responsibilities:
 - 1. Plan, organize, and implement the commissioning process as specified herein.
 - 2. Provide commissioning plan.
 - 3. Revise the commissioning plan as required during construction.
 - 4. Chair commissioning meetings and prepare and distribute minutes to all commissioning team members, whether or not they attend the meeting.
 - 5. Coordinate the commissioning work and, with the GC, ensure that commissioning activities are being scheduled into the master schedule.
 - 6. Perform site visits, as necessary, to observe component and system installations.
 - 7. Monitor system verification checks and ensure the results are documented as the checks are done.
 - 8. Approve air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.
 - 9. Coordinate, witness, and approve functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
 - 10. Witness all functional performance tests and document the results.
 - 11. Prepare and maintain the Commissioning Issues Log to track system deficiencies.
 - 12. Provide a final commissioning report.
- C. Design Team Responsibilities (A/E):
 - 1. A/E will review the Commissioning Plan and will participate, as appropriate, in on-site commissioning meetings.
 - 2. During the acceptance phase of the commissioning process, the Mechanical/Electrical Engineer may be on site to review commissioning documentation, to witness functional performance tests, and to analyze the installation and its performance.
 - 3. Participate in the resolution of system deficiencies identified during commissioning, according to the contract documents.
 - 4. Review and approve the O&M manuals.

3.02 COMMISSIONING RESPONSIBILITIES - GENERAL CONTRACTOR

- A. The General Contractor has responsibility to ensure the overall completion of the work. In this regard, he shall:
 - 1. Participate as required in the HVAC commissioning process.
 - 2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.

3. Integrate and coordinate commissioning process activities with the construction schedule.
 4. Ensure the Mechanical Contractor performs all assigned HVAC commissioning responsibilities as specified in Article Commissioning Responsibilities Mechanical Contractor.
 5. Ensure the testing, adjusting, and balancing agency performs HVAC commissioning responsibilities as specified in Article Commissioning Responsibilities TAB Agency, if TAB is contracted through the General Contractor.
 6. Ensure the Electrical Contractor performs all assigned HVAC commissioning responsibilities as specified in Article Commissioning Responsibilities Electrical Contractor.
 7. Ensure the cooperation and participation in the HVAC commissioning process of all other subcontractors as applicable.
- B. The General Contractor shall assign a representative to the commissioning team and submit the person's name to the CxA within one month of the award of the contract. The representative shall have the authority to make decisions on behalf of the General Contractor as they relate to the organization and scheduling of HVAC commissioning. The representative shall facilitate communications among all Contractors and suppliers and other commissioning team members and shall foster the necessary cooperative action. One specific responsibility shall be to attend commissioning meetings and ensure action items arising from them are attended to as required to allow the commissioning process to proceed on schedule.
- C. In the event that any scheduled equipment or system startups or functional performance tests are terminated because the CxA or Mechanical Engineer discover deficient or incomplete work, or due to non-attendance of required Contractor or supplier personnel the Contractor or subcontractor responsible for the termination shall also be responsible for paying reasonable costs of time and travel expenses for any or all of the following representatives who were physically present for the purpose of witnessing the start or function performance tests: the CxA, the Mechanical Engineer, the Electrical Engineer, and the Owner. The Owner may provide a statement to the General Contractor identifying the specific activity that was terminated, the scheduled date, and a list of those in attendance, along with their reasonable time and travel expense costs.

3.03 COMMISSIONING RESPONSIBILITIES - MECHANICAL CONTRACTOR

- A. The Mechanical Contractor, and all mechanical subcontractors and suppliers, shall cooperate with the CxA and other commissioning team members to facilitate the successful completion of the commissioning process.
- B. The Contractor shall assign a representative to the commissioning team and submit the person's name to the CxA within one month of the award of the contract. The representative shall have the authority to make decisions on behalf of the Mechanical Contractor as they relate to the organization and scheduling of HVAC commissioning. The representative shall ensure communications between Mechanical Contractors and suppliers and all other commissioning team members and shall foster the necessary cooperative action. One specific responsibility shall be to attend commissioning meetings and ensure action items arising from them are attended to as required to allow the commissioning process to proceed on schedule.
- C. The Mechanical Contractor, and all mechanical subcontractors and suppliers, shall cooperate with the CxA in carrying out the HVAC commissioning process. In this context, the Mechanical Contractor shall:
1. Each contractor and subcontractor shall include in their quotes the cost of participating in the commissioning process as specified herein.
 2. Ensure the Temperature Controls Contractor performs HVAC commissioning responsibilities as listed in Article Commissioning Responsibilities Controls Contractor.
 3. Ensure the testing, adjusting, and balancing agency performs HVAC commissioning responsibilities as specified in Article Commissioning Responsibilities TAB Agency, if TAB is contracted through the Mechanical Contractor.
 4. Ensure participation of major equipment manufacturers in appropriate startup, testing, and training activities.
 5. Attend commissioning meetings scheduled by the CxA.

6. Provide a complete set of as-built drawings and O&M Manuals to the CxA.
7. Prepare preliminary schedule for mechanical system orientation and inspections, O&M Manual submission, training sessions, pipe and duct system testing, flushing and cleaning, equipment start TAB, and task completion for use by the CxA. Update schedule as appropriate throughout the construction period.
8. Notify the CxA a minimum of two weeks in advance of scheduled equipment and system startups, so the CxA may witness system verifications and equipment and system startups.
9. Provide sufficient personnel to assist the CxA as required during system verification and functional performance testing.
10. Prior to startup, inspect, check, and confirm the correct and complete installation of all equipment and systems for which system verification checklists are included in the Commissioning Plan. Document the results of all inspections and checks on the checklists and sign them. If deficient or incomplete work is discovered, ensure corrective action is taken and recheck until the results are satisfactory and the system is ready for safe startup.
11. Notify the CxA a minimum of two weeks in advance of the time for start of the TAB work. Attend the initial TAB meeting for review of the TAB procedures.
12. Provide equipment and systems startup resources as specified and required. If, during an attempted equipment or system startup, deficient or incomplete work is discovered that would preclude safe operation, the startup shall be aborted until corrective action has been taken. Ensure such action is taken and verified before rescheduling a new startup. Those responsible for deficient or incomplete work shall be responsible for costs in accordance with this Section.
13. Carry out performance checks to ensure that all equipment and systems are fully functional and ready for the CxA to witness formal functional performance tests.
14. Operate equipment and systems for functional performance tests in accordance with the Commissioning Plan and as directed by the CxA. If improper functionality, incomplete work, or other deficiencies affecting system performance are discovered, the functional performance tests will be stopped by the CxA. Those responsible for deficient or incomplete work shall be responsible for costs in accordance with this Section. Ensure that all corrections necessary for full and complete system operation as specified are complete then, with the Temperature Controls Contractor and other applicable subcontractors, carry out functional performance checks to confirm correct operation before applying to the CxA to reschedule the functional performance tests for the system in question.

3.04 COMMISSIONING RESPONSIBILITIES - TAB AGENCY

- A. With respect to commissioning, the TAB agency shall:
 1. Include costs for HVAC commissioning requirements in the quoted price.
 2. Attend commissioning meetings scheduled by the CxA prior to, and during, onsite TAB work being done.
 3. Submit proposed TAB procedures to the CxA and Mechanical Engineer for review and acceptance.
 4. A copy of the TAB report shall be submitted to the CxA prior to the start of system functional performance testing. The report shall contain the results in a clear format. The report should follow the latest and most rigorous reporting recommendations by AABC, NEBB or ASHRAE Standard 111.
 5. Provide skilled TAB technician to assist during system verification and functional performance testing as required by the CxA.

3.05 COMMISSIONING RESPONSIBILITIES - CONTROLS CONTRACTOR

- A. With respect to commissioning, the Controls Contractor shall:
 1. Include cost for commissioning requirements in the quoted price.
 2. Attend commissioning meetings scheduled by the CxA.
 3. Provide a complete set of as-built drawings and O&M Manuals to the CxA.
 4. Provide the following submittals to the CxA eight (8) weeks prior to equipment prefunctional startup for review:

- a. Control shop drawings including equipment data sheets.
 - b. Narrative description of all control sequences for each piece of equipment controlled. These shall be provided to the CxA in electronic format upon request.
 - c. Proposed list of alarm points including alarm notification levels.
 - d. Project specific operator workstation graphics screen shots.
5. Inspect, check, and confirm the proper installation and performance of controls/BAS hardware and software provided by others.
 6. Integrate installation and programming scheduling with construction and commissioning schedules.
 7. Inspect, check, and confirm the correct installation and operation of input and output field points and devices through documented and signed off point-to-point checkouts.
 8. Provide support and coordination with TAB Contractor on all interfaces between controls and TAB scopes of work. Provide, at no additional cost to the TAB and CxA, all devices, such as portable operator's terminals and all software for the TAB agency to use in completing TAB procedures.
 9. In conjunction with the Mechanical Contractor, demonstrate system performance to the CxA including all modes of system operation (e.g. occupied, unoccupied, emergency) during the functional performance tests. If improper functionality, incomplete work, or other deficiencies affecting system performance are discovered, the functional performance tests will be stopped by the CxA. Those responsible for deficient or incomplete work will be responsible for costs in accordance with this Section.
 10. Provide skilled control system technician to assist during system verification and functional performance testing.

3.06 COMMISSIONING RESPONSIBILITIES - ELECTRICAL CONTRACTOR

- A. With respect to commissioning, the Electrical Contractor shall:
 1. Include cost for HVAC and electrical systems commissioning requirements in the quoted price.
 2. Review design with respect to providing power to the HVAC equipment.
 - a. Verify that proper hardware specifications exist for functional performance and sequence of operation required by specification.
 - b. Verify that proper safeties and interlocks are included in the design of electrical connections for HVAC equipment.
 3. Attend commissioning meetings scheduled by the CxA.
 4. Provide a complete set of as-built drawings and O&M Manuals to the CxA.
 5. Schedule work so that required electrical installations are completed and systems verification checks and functional performance tests can be carried out on schedule.
 6. Attend commissioning meetings scheduled by the CxA.
 7. Ensure participation of major equipment manufacturers in appropriate startup, testing, and training activities.
 8. Inspect, check, and confirm in writing the proper installation and performance of all electrical services provided.
 9. Provide skilled electrical system technicians to assist during system verification and functional performance testing as required by the CxA.

3.07 TEST PROCEDURES GENERAL

- A. Provide skilled technicians to execute starting of equipment and to execute the Functional Performance Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments, and problem solving.
- B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pretest condition.
- C. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Pro

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vide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

- D. The CxA may direct that set points be altered when simulating conditions is not practical.

END OF SECTION

DIVISION 02 – EXISTING CONDITIONS

**SECTION 02 41 00
DEMOLITION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of built site elements.
- B. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 10 00 - Summary: Description of items to be salvaged or removed for re-use by Contractor.
- C. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- D. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- E. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

1.03 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations 2022, with Errata (2021).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Site Plan: Indicate:
 - 1. Areas for temporary construction and field offices.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.05 QUALITY ASSURANCE

- A. Pre-Demolition Conference:
 - 1. Once the ceilings have been removed, prior to any demolition related to any walls and/or structural items, the General Contractor shall hold a Pre-Demolition Conference with the General Contractor, Demolition Sub-Contractor, Architect, Structural Engineer and Owner to review limits of demolition and the Contractor's proposed means and methods to perform the work.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Not Used.

PART 3 EXECUTION

3.01 DEMOLITION

- A. Refer to Drawings for scope of demolition.
- B. Remove other items indicated, for salvage, relocation, and recycling.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. The Contractor shall thoroughly review the site, the building, and the Bidding Documents before submittal of bids in order to determine the scope of the demolition involved.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.

2. Comply with applicable requirements of NFPA 241.
 3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 4. Provide, erect, and maintain temporary barriers and security devices.
 5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 7. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
 8. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
 9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Do not begin removal until built elements to be salvaged or relocated have been removed.
- E. Do not begin removal until vegetation to be relocated has been removed and vegetation to remain has been protected from damage.
- F. Protect existing structures and other elements to remain in place and not removed.
1. Provide bracing and shoring.
 2. Prevent movement or settlement of adjacent structures.
 3. Stop work immediately if adjacent structures appear to be in danger.
- G. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- H. Hazardous Materials:
1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.
 2. If the Contractor discovers material which he/she suspects may contain asbestos, he/she shall immediately notify the Owner and cease work in close proximity to the suspected asbestos containing material. The Owner will then arrange for the testing and removal of the asbestos material. If time delays are encountered because of required asbestos removal work, the schedule shall be adjusted accordingly by Change Order.
- I. Remove building materials regardless of how they are constructed. Components shall be removed as follows:
1. Demolish masonry walls in small sections.
 2. Remove structural steel, cast iron, and heavy timbers by individual pieces and lower carefully.
 3. Completely remove floor slabs, pavement and walks regardless of depth below the surface. Under new paving and walk areas, abandoned utilities shall be removed to a depth of at least 3-feet below finished grade.
 4. Remove materials where shown or required.
 5. Remove area of walks, drives, curbs, rubbish, junk, and miscellaneous items.
 6. Where paving, slabs and curbs are removed next to paving, slabs and curbs scheduled to remain, the paving, slabs and curbs shall be saw-cut to provide a straight edge.
 7. Locate demolition equipment throughout the structure and remove materials so as to not impose excessive loads to supporting walls, floors and framing.
- J. The Contractor shall be responsible for providing all necessary temporary shoring and supports as required during removal of existing walls, floors, and other structural items and until final structural replacement items are in place. He/she shall be responsible for damage to existing facilities which are scheduled to remain caused by his/her demolition operations. The

Architect/Engineer will not be responsible for problems/accidents which occur because of the Contractor's failure to thoroughly inspect the structure and review the drawings of the existing building before removing such items. A copy of the Owner's drawings of the existing building will be made available for review at the Owner's office prior to receipt of bids and during construction of the project. These drawings may be helpful to the Contractor in determining the sequence or methods of removal for certain items. The Contractor shall be responsible for verifying the accuracy of such existing drawings before making decisions regarding demolition based upon them.

3.03 EXISTING UTILITIES

- A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone. Identify and mark, in same manner as other utilities to remain, utilities to be reconnected.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
 - 1. Verify construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Separate areas in which demolition is being conducted from areas that remain occupied.
 - 1. Provide, erect, and maintain temporary 1-hour fire-rated partitions to separate areas of the building under construction from areas occupied by the Owner. Coordinate the locations of these walls with the local Authority having Jurisdiction to meet egress requirements.
- C. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.
- D. Remove existing work as indicated and required to accomplish new work.
 - 1. Remove items indicated on drawings.
 - 2. The following items shall be carefully removed by the Contractor and delivered to the Owner at a location designated by the Owner:
 - a. Other items as may be noted on the Drawings.
 - 3. Items to be removed and reinstalled by the Contractor shall be as follows:
 - a. Existing Knox Box.
 - b. Existing Exterior Fire Extinguisher.
 - c. Certain coolers/food service equipment as noted on the Drawings.
 - d. Other items so noted on the Drawings.
- E. Protect existing work to remain.
 - 1. Prevent movement of structure. Provide shoring and bracing as required.
 - 2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.

4. Patch to match new work.

3.05 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Materials shall not be stored on the site for sale, nor shall the Contractor conduct any sale on the site. The Owner reserves the right to remove any materials scheduled for demolition prior to the scheduled time of removal and to retain such materials as their property.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

DIVISION 03 – CONCRETE

**SECTION 03 30 00
CAST-IN-PLACE CONCRETE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete formwork.
- B. Floors and slabs on grade.
- C. Concrete reinforcement.
- D. Joint devices associated with concrete work.
- E. Miscellaneous concrete elements, including equipment pads, equipment pits, light pole bases, flagpole bases, thrust blocks, and manholes.

1.02 RELATED REQUIREMENTS

- A. Section 03 35 11 - Concrete Floor Finishes: Densifiers, hardeners, applied coatings, and polishing.

1.03 REFERENCE STANDARDS

- A. ACI 117 - Specification for Tolerances for Concrete Construction and Materials 2010 (Reapproved 2015).
- B. ACI 211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide 2022.
- C. ACI 301 - Specifications for Concrete Construction 2020.
- D. ACI 302.1R - Guide to Concrete Floor and Slab Construction 2015.
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete 2000 (Reapproved 2009).
- F. ACI 306R - Guide to Cold Weather Concreting 2016.
- G. ACI 308R - Guide to External Curing of Concrete 2016.
- H. ACI 318 - Building Code Requirements for Structural Concrete 2019 (Reapproved 2022).
- I. ACI 347R - Guide to Formwork for Concrete 2014 (Reapproved 2021).
- J. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.
- K. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2022.
- L. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars 2022.
- M. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2018.
- N. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens 2021.
- O. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2022a.
- P. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete 2020.
- Q. ASTM C150/C150M - Standard Specification for Portland Cement 2022.
- R. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method 2016.
- S. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete 2010a (Reapproved 2016).
- T. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete 2017a.
- U. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete 2019, with Editorial Revision (2022).

- V. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete 2022.
- W. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing 2017.
- X. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) 2018.
- Y. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars 2021.
- Z. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers 2020.
- AA. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs 2017.
- BB. COE CRD-C 572 - Handbook for Concrete and Cement Corps of Engineers Specifications for Polyvinylchloride Waterstop 1974.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Mix Design: Submit proposed concrete mix design.
 - 1. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
- C. Samples: Submit samples of underslab vapor retarder to be used.
- D. Test Reports: Submit report for each test or series of tests specified.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.

2.02 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1. Type: Deformed billet-steel bars.
 - 2. Finish: Unfinished, unless otherwise indicated.
 - 3. Finish: Epoxy coated in accordance with ASTM A775/A775Mat stoops.
- B. Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain type.
 - 1. Mesh Size and Wire Gage: As indicated on drawings.
- C. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 - 3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
- B. Fine and Coarse Aggregates: ASTM C 33.
- C. Fly Ash: ASTM C618, Class C or F.

- D. Water: Clean and not detrimental to concrete.

2.04 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. Water Reducing Admixture: ASTM C494/C494M Type A.

2.05 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder: Multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, complying with ASTM E1745, Class A; Permeance of less than 0.01 perms after mandatory conditioning tests per ASTM E1745 (7.1.1-7.1.5) stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.
 2. Products:
 - a. Stego Industries, LLC: www.stegoindustries.com.
 - b. W.R. Meadows, Inc.; PERMINATOR Class A - 15 mils: www.wrmeadows.com/#sle.
 - c. Interplast Group; Barrier-Bac VB-350.
 - d. Insulation Solutions; Viper Vapercheck II Vapor Barrier 15-mil (Class A) .
 - e. Griffolyn 15 by Reef Industries
 - f. Fortifiber Building Systems Group; Noistop 15.

2.06 BONDING AND JOINTING PRODUCTS

- A. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
1. Material: Closed-cell, non-absorbent, compressible polyethylene or polymer foam in sheet form.
 2. Products:
 - a. W.R. Meadows, Inc; Deck-O-Foam Joint Filler with pre-scored top strip: www.wrmeadows.com/#sle.
 - b. Sonneborn Dugussa Building Systems; Sonoflex F Polyethylene Foam Joint Filler.
- B. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with minimum 1 inch diameter holes for conduit or rebars to pass through at 6 inches on center; ribbed steel stakes for setting.

2.07 CONCRETE MIX DESIGN

- A. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- C. Normal Weight Concrete:
1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
 2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
 3. Water-Cement Ratio: Maximum .45 percent by weight.
 4. Total Air Content: Max 3 percent, determined in accordance with ASTM C173/C173M.
 5. Maximum Slump: 4 inches.

2.08 MIXING

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

- B. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
 - 1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as shown on the drawings. Do not use sand.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.
- B. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- C. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.
- D. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- D. Ensure reinforcement, inserts, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- E. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

- A. Locate joints as indicated on drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
 - 1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.
- D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. An independent testing agency, as specified in Section 01 40 00, will inspect finished slabs for conformance to specified tolerances.
- B. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
 - 1. Exposed to View and Foot Traffic: F(F) of 35; F(L) of 25, on-grade only.
 - 2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15, on-grade only.
 - 3. Under Carpeting: F(F) of 25; F(L) of 20, on-grade only.

4. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25, on-grade only.
- C. Measure F(F) and F(L) in accordance with ASTM E1155, within 48 hours after slab installation; report both composite overall values and local values for each measured section.
- D. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.
- E. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

- A. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
 1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.
 2. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
 - a. Chemical Hardener: See Section 03 35 11.

3.08 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 1. Normal concrete: Not less than 7 days.
- C. Surfaces Not in Contact with Forms:
 1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
 2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water-fog spray or saturated burlap.
 - a. Spraying: Spray water over floor slab areas and maintain wet.
 - b. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.
 3. Final Curing: Begin after initial curing but before surface is dry.
 - a. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.09 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
- E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.10 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.11 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

**SECTION 03 32 20
CONCRETE FLOOR UNDERLAYMENT**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Self-leveling concrete underlayment as indicated on the Drawings – See Sheet A1-1 for locations.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.03 REFERENCES

- A. ACI 302.1R - Guide to Concrete Floor and Slab Construction.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with concrete floor placement and concrete floor curing.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's published data on each product, including information on compatibility of different products and limitations.
- C. Furnish data, laboratory test reports and materials certificates as specified in the Section 03 31 00, "Concrete Work."

1.06 QUALITY ASSURANCE

- A. Installer's Qualifications shall be by an applicator authorized by the manufacturer using manufacturer's approved mixing and pumping equipment for the installation of the specified product.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be delivered in their original, unopened packages and protected from exposure to the elements. Damaged or deteriorated materials shall be removed from the premises.

1.08 FIELD CONDITIONS

- A. Before, during and after installation of gypsum cementitious underlayment, building interior shall be enclosed and maintained at a temperature above 50 degrees F (10 degrees C).

PART 2 PRODUCTS

2.01 MATERIALS

- A. Self-Leveling Floor Underlayment:
 - 1. Basis-of-Design: Maxxon Corp., Level-Right Self-Leveling Floor Underlayment: www.maxxon.com.
- B. Sand Aggregate: Washed masonry or plaster sand, 1/8-inch or less particle size.
- C. Water: Potable and free of impurities.
- D. Subfloor Primer: As required by the manufacturer.

2.02 MIX DESIGNS

- A. General: Mix proportions and methods shall be in strict accordance with product manufacturer's recommendations.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Apply materials in accordance with manufacturer's instructions.
- B. General: Subfloor shall be structurally sound. Clean subfloor to remove all mud, oil, grease and other contaminating material prior to the installation of the underlayment.

- C. Leak Prevention: Fill all cracks and voids with quick setting patching or caulking material where leakage of underlayment could occur.
- D. Primer: Prime subfloor using the floor primer. Priming instructions may vary according to type of substrate. Apply multiple coats where required by the manufacturer.
- E. Application of Self-Leveling Concrete Underlayment shall not begin until the building is enclosed, including windows, doors and other fenestration. Install after drywall installation.
- F. Place Self-Leveling Concrete Underlayment over concrete from a maximum of 3-inches thick to featheredge as required in conjunction with grinding of the existing concrete floor to create a level surface with no more than 1/4" variation in height over a 10'-0" run. Spread and screed underlayment to a smooth surface. Except at required joints, place underlayment as continuously as possible until application is complete so that no product slurry is placed against underlayment that has obtained its initial set.
 - 1. Comply with the Floor Flatness and Levelness Values as specified in 03 30 00 - Cast-in-Place Concrete:
 - a. Under Carpeting: F(F) of 25; F(L) of 20.
 - b. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25.
- G. Drying: Provide continuous ventilation and adequate heat. Provide mechanical ventilation if required by the manufacturer. To test for dryness, tape a 24-inch by 24-inch section of plastic to the surface of the underlayment. After 48 to 72 hours, if no condensation occurs, the underlayment shall be considered moisture free.

3.02 QUALITY CONTROL

- A. Slump Test: At least one set of 3 molded cube samples shall be taken from each day's pour during the underlayment application. Cubes shall be tested recommended by the manufacturer's recommendation in accord with ASTM C109/C109M. Test results shall be available to Architect upon request from applicator.
- B. Protection: During construction, place temporary protection over the underlayment where subject to heavy wheeled or concentrated loads.

END OF SECTION

DIVISION 04 – MASONRY

**SECTION 04 43 13
STONE MASONRY VENEER**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Adhered cut stone veneer at exterior walls.
- B. Setting mortar and pointing mortar.

1.02 REFERENCE STANDARDS

- A. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar 2019.
- B. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens 2021.
- C. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile 2021.
- D. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.
- E. ASTM C192/C192M - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory 2019.
- F. ASTM C270 - Standard Specification for Mortar for Unit Masonry 2019a, with Editorial Revision.
- G. ASTM C482 - Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste 2020.
- H. ASTM C1242 - Standard Guide for Selection, Design, and Installation of Dimension Stone Attachment Systems 2022a.
- I. ASTM C1670/C1670M - Standard Specification for Adhered Manufactured Stone Masonry Veneer Units 2021b.
- J. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry 2019a.
- K. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2022.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on stone units, mortar, and reinforcement.
- C. Samples: Submit two stone samples illustrating color range, texture, and markings.
- D. Samples: Submit mortar color samples.

1.05 QUALITY ASSURANCE

- A. Stone Fabricator Qualifications: Company specializing in fabricating cut stone with minimum ten years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect stone from discoloration during storage on site.

PART 2 PRODUCTS

2.01 STONE

- A. Stone Veneer:
 - 1. Profile: Cliffstone. Include matching corner pieces.

2. Color: Boardwalk.
3. Basis of Design:
 - a. Eldorado Stone, LLC; as provided by Watkins Concrete Block Company: www.eldoradostone.com.
- B. Veneer Unit properties: Precast veneer units consisting of portland cement, lightweight aggregates, and mineral oxide pigments.
 1. Compressive Strength: ASTM C192/C192M and ASTM C39/C39M, 5 sample average: greater than 1,800 psi (12.4MPa).
 2. Shear Bond: ASTM C482: 50 psi (345kPa), minimum.
 3. Freeze-Thaw Test: ASTM C67/C67M: Less than 3 percent weight loss and no disintegration.
 4. Thermal Resistance: ASTM C177: 0.473 at 1.387 inches thick
 5. Weight per square foot: 2012 IBC and 2012 IRC, ASTM C1670/C1670M, 15 pounds, saturated.

2.02 MORTAR MIXES

- A. Mortar:
 1. Cement: Portland cement complying with ASTM C 1329.
 2. Lime: ASTM C 207.
 3. Sand: ASTM C 144, natural or manufactured sand.
 4. Color Pigment: ASTM C 979, mineral oxide pigments.
 5. Water: Potable.
 6. Pre-Packaged Latex-Portland Cement Mortar: ANSI A118.4.
- B. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 1. Type: Type S.
 2. Color: Mineral pigments added as required to produce approved color sample.
- C. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that support work and site conditions are ready to receive work of this section.
- B. Verify that substrates to receive mortar scratch coat or setting bed comply with stone veneer manufacturer's instructions.

3.02 PREPARATION - ADHERED VENEER

- A. Dampen masonry surfaces to reduce excessive suction.
- B. Prepare substrate in accordance with manufacturer's installation instructions for the type of substrate being covered.

3.03 INSTALLATION - ADHERED VENEER

- A. Install thin stone veneer with a cementitious mortar setting bed to a backing surface, in accordance with stone fabricator's instructions and applicable sections of the ICC (IBC), TMS 402/602 and ASTM C1242 that apply to adhered masonry veneer.

3.04 CLEANING

- A. Remove excess mortar as work progresses, and upon completion of work.
- B. Clean soiled surfaces with cleaning solution.
- C. Use non-metallic tools in cleaning operations.

END OF SECTION

DIVISION 05 – METALS

**SECTION 05 12 00
STRUCTURAL STEEL FRAMING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural steel framing members.
- B. Base plates, .
- C. Grouting under base plates.

1.02 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual 2017.
- B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges 2022.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2022.
- E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2021.
- G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2021a.
- H. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts 2021a.
- I. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric) 2021a.
- J. ASTM A992/A992M - Standard Specification for Structural Steel Shapes 2022.
- K. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2022.
- L. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions 2019.
- M. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength 2020.
- N. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2020.
- O. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2022).
- P. SSPC-SP 3 - Power Tool Cleaning 2018.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
 - 2. Connections not detailed.
 - 3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Fabricator's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."
- B. Fabricator: Company specializing in performing the work of this section with minimum 5 years of documented experience.
- C. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.
- D. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.
- E. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Steel Angles and Plates: ASTM A36/A36M.
- B. Steel W Shapes and Tees: ASTM A992/A992M.
- C. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.
- D. Pipe: ASTM A53/A53M, Grade B, Finish black.
- E. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A and galvanized in compliance with ASTM A153/A153M Class C.
- F. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436/F436M washers.
- G. Unheaded Anchor Rods: ASTM F1554, Grade 36, plain, with matching ASTM A563 or ASTM A563M nuts and ASTM F436/F436M Type 1 washers.
- H. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
 - 2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.
- I. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. Shop fabricate to greatest extent possible.
- B. Fabricate connections for bolt, nut, and washer connectors.

2.03 FINISH

- A. Prepare structural component surfaces in accordance with SSPC-SP 3.
- B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

- A. Erect structural steel in compliance with AISC 303.
- B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

- C. Field weld components indicated on shop drawings.
- D. Do not field cut or alter structural members without approval of Architect.
- E. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
- F. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

END OF SECTION

**SECTION 05 40 00
COLD-FORMED METAL FRAMING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Formed steel stud exterior wall and interior wall framing.

1.02 REFERENCE STANDARDS

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members 2016, with Supplement (2020).
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- D. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members 2018, with Editorial Revision.
- E. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories 2020.
- F. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic) 2019.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.
- C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.
- D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
 - 1. Describe method for securing studs to tracks and for bolted framing connections.
 - 2. Design data:
 - a. Shop drawings signed and sealed by a professional structural engineer.
- E. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention .

1.04 QUALITY ASSURANCE

- A. Designer Qualifications: Design framing system under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Framing:
 - 1. ClarkDietrich: www.clarkdietrich.com/#sle.
 - 2. Marino: www.marinoware.com/#sle.
- B. Framing Connectors and Accessories:
 - 1. Same manufacturer as metal framing.

2.02 FRAMING SYSTEM

- A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.
- B. Design Requirements: Provide completed framing system having the following characteristics:
 - 1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100.
 - 2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
 - 3. Design Loads: In accordance with applicable codes.
 - 4. Live load deflection meeting the following, unless otherwise indicated:
 - a. Exterior Walls: Maximum horizontal deflection under wind load of 1/240 of span.
 - b. Design non-axial loadbearing framing to accommodate not less than 1/2 in vertical deflection.
 - 5. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
 - 6. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

2.03 FRAMING MATERIALS

- A. Studs and Track: ASTM C955; studs formed to channel, C- or Sigma-shaped with punched web; U-shaped track in matching nominal width and compatible height.
 - 1. Gauge and Depth: As required to meet specified performance levels.
 - 2. Galvanized in accordance with ASTM A653/A653M, G90/Z275 coating.
- B. Framing Connectors: Factory-made, formed steel sheet.
 - 1. Material: ASTM A653/A653M SS Grade 33 and 40 (minimum), with G90/Z275 hot dipped galvanized coating for base metal thickness less than 10 gauge, 0.1345 inch, and factory punched holes and slots.
 - 2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI S100.
 - 3. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

2.04 FASTENERS

- A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.
- B. Anchorage Devices: Powder actuated.

2.05 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.
- B. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION OF STUDS

- A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.

3.03 INSTALLATION OF WALL SHEATHING

- A. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.

END OF SECTION

**SECTION 05 50 00
METAL FABRICATIONS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel and aluminum items.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.
- C. Section 09 90 00 - Painting: Paint finish.

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2020.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2022.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.
- F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing 2021.
- G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- H. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes 2019a.
- I. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2021a.
- J. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
- K. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2022.
- L. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 2004.
- M. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic) 2019.
- N. SSPC-SP 2 - Hand Tool Cleaning 2018.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1.05 QUALITY ASSURANCE

- A. Field Measurement: Take field measurements prior to preparation of shop drawings and fabrication, where possible.
- B. Shop Fabrications: Fabricate, fit, and assemble miscellaneous metal items in the shop. Work that cannot be permanently shop-assembled shall be completely assembled, marked, and disassembled before shipment to ensure proper assembly in the field.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. General: For metal work which will be exposed to view, use only materials which are smooth and free of all surface blemishes.
- B. Steel Sections: ASTM A36/A36M.
- C. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- D. Plates: ASTM A283/A283M.
- E. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- F. Slotted Channel Framing: ASTM A653/A653M, Grade 33.
- G. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
- H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.
- C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210/B210M, 6063 alloy, T6 temper.
- D. Bolts, Nuts, and Washers: Stainless steel.

2.03 MATERIALS - GROUT

- A. Grout materials for setting posts in sleeves shall be Bonsal Anchor Cement manufactured by W.R. Bonsal Company or approved equal.

2.04 MATERIALS - FASTENERS

- A. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.
- B. Provide bolts and fastening devices as required to set miscellaneous and ornamental metal items in place.

2.05 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds at exterior locations.
 - 1. Miscellaneous metal items exposed on the interior shall be intermittently welded, ground smooth, and filled with sanded body putty; or at the Contractor's option, they may be continuously welded and ground smooth.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to a 1/32-inch radius. Form bent metal corners to smallest radius possible without causing grain separation of otherwise impairing work with exposed faces flat, smooth and free of deformation and distortion.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- G. Cut, reinforce, drill and tap miscellaneous metal work as required to receive hardware and similar items.

- H. Weather Exposure: Fabricate joints which will be exposed to the weather in a manner to exclude water and/or provide weep holes where water may accumulate through condensation or other means.

2.06 FABRICATED ITEMS

- A. Bollards: Stainless steel pipe, rounded cap, as detailed.
- B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking and masonry; prime paint finish.
- C. Steel Angles: Provided for metal deck support at all roof openings greater than 12-inches by 12-inches in size. Angles shall extend to adjacent joists and shall be installed on all 4 sides except where openings are immediately adjacent to joists. Angles shall be 3-inch by 3-inch by 1/4-inch unless noted otherwise on the Drawings.
- D. Lintels: As detailed; prime paint finish.
 - 1. Lintels shall have a minimum 8-inch bearing unless otherwise noted.
 - 2. All surfaces of exterior lintels shall be prepared and hot-dipped galvanized after fabrication.
- E. Aluminum break metal enclosures – see A3 series Drawings. Note that these enclosures shall have no exposed seams.

2.07 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.
 - 2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: Two coats.
- E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements.
- F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.08 FINISHES - ALUMINUM

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.09 FINISHES - STAINLESS STEEL

- A. Stainless Steel Finish: No. 4 Bright Polished finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Obtain approval prior to site cutting or making adjustments not scheduled.

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- D. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

END OF SECTION

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

**SECTION 06 10 00
ROUGH CARPENTRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preservative treated wood materials.
- B. Fire retardant treated wood materials.
- C. Communications and electrical room mounting boards.
- D. Concealed wood blocking, nailers, and supports.
- E. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

- A. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

- A. ASME B18.2.1 - Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series) 2012 (Reaffirmed 2021).
- B. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2021.
- C. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts 2021a.
- D. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2023.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- F. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples 2021.
- G. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs 2017.
- H. ASTM F594 - Standard Specification for Stainless Steel Nuts 2009 (Reapproved 2020).
- I. AWPA U1 - Use Category System: User Specification for Treated Wood 2022.
- J. PS 1 - Structural Plywood 2019.
- K. PS 2 - Performance Standard for Wood Structural Panels 2018.
- L. PS 20 - American Softwood Lumber Standard 2021.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide technical data on each type of process and factory-fabricated product.
- C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.
- D. Research/Evaluation Reports: For the following, showing compliance with the building code in effect for the Project:
 - 1. Power-driven fasteners.
 - 2. Powder-actuated fasteners.
 - 3. Expansion anchors
 - 4. Metal framing anchors.

1.05 QUALITY ASSURANCE

- A. New Products: Only new lumber shall be utilized throughout the project.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
 - 3. Where nominal sizes are indicated, provide actual sizes required by PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 4. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.
 - 5. Treated wood will not be allowed, except at sill plate conditions.

2.02 DIMENSION LUMBER

- A. General: Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Top Plates and Headers Framing (2 by 6 through 4 by 16):
 - 1. Machine stress-rated (MSR) as follows:
 - a. Fb-single; minimum extreme fiber stress in bending: 1350 psi.
 - b. E (minimum modulus of elasticity): 1,400,000 psi.
 - 2. Species: Douglas Fir-Larch.
- E. Other Framing Not Listed Above: Any species and grade with a modulus of elasticity of at least 1,400,000 psi and an extreme fiber stress in bending of at least 875 psi for 2-inch thick nominal thickness for single-member use.
- F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. For items of dimension lumber size, provide Construction, Stud or No. 2 grade SPF lumber with 19 percent maximum moisture content.
 - 2. For concealed boards, provide lumber with 19 percent maximum moisture content and the following species and grades:
 - a. Spruce-pine-fir (south) or Spruce-pine-fir, Construction or No. 2 Common grade; NELMA, NLGA, WCLIB, or WWPA.

2.03 EXPOSED BOARDS

- A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.
- B. Moisture Content: S-dry (19 percent maximum).
- C. Surfacing: S4S.
- D. Grade: No. 1, 1 Common, or Select.

2.04 CONSTRUCTION PANELS

- A. Wall Sheathing: PS 2 type.

1. Bond Classification: Exterior.
 2. Grade: Structural I Sheathing.
 3. Span Rating: 24.
 4. Performance Category: 5/16 PERF CAT.
 5. Edge Profile: Square edge.
- B. Wall Sheathing: See Section 09 21 16.
- C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- D. Other Applications:
1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
 2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
 3. Other Locations: PS 1, C-D Plugged or better.

2.05 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
1. Where rough carpentry is exposed to weather, in ground contact, or in an area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153.
- B. Nails, Brads, and Staples: ASTM F1667 .
- C. Power-Driven Fasteners: CABO NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1 .
- F. Bolts: Steel bolts complying with ASTM A307 , Grade A, Property Class 4.6; with ASTM A563 Hex nuts and, where indicated, flat washers.
- G. Headed Anchor Bolts at Sill Plates: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594 , Alloy Group 1 or 2.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six (6) times the load imposed when installed in unit masonry assemblies and equal to four (4) times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
1. Material: Carbon-steel components, zinc plated to comply with ASTM B633 , Class FeZn 5.
 2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.06 METAL FRAMING ANCHORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Alpine Engineered Products, Inc.
 2. Cleveland Steel Specialty Co.
 3. Simpson Strong-Tie Co., Inc.
 4. USP Structural Connectors.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by the manufacturer that meet or exceed those indicated. The manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60 coating designation.

2.07 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
 - 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWWA standards.
- B. Fire Retardant Treatment:
 - 1. Interior Type A: AWWA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat rough carpentry items as indicated .
 - c. Do not use treated wood in applications exposed to weather or where the wood may become wet.
 - 2. Preservative Pressure Treatment of Lumber Above Grade: AWWA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber in contact with roofing.
 - c. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted Fit rough carpentry to other construction; scribe and cope as needed for accurate fit.
- B. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. CABO NER-272 for power-driven fasteners.
 - 2. Published requirements of metal framing anchor manufacturer.
 - 3. Table 2304.9.1, "Fastening Schedule", in the 2006 International Building Code.
 - 4. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view of will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; pre-drill as required.
 - 5. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- C. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

- D. At sill plate conditions, provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less the 1-ID-inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.
- E. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- F. Provide the following specific nonstructural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Wall-mounted door stops.
 - 6. Projection screens.
 - 7. Wall and ceiling mounted projectors.
 - 8. Wall paneling and trim.
 - 9. Cubical curtain tracks.
 - 10. Fire extinguisher cabinets.

3.04 INSTALLATION OF CONSTRUCTION PANELS

- A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
- B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3. Install adjacent boards without gaps.

3.05 SITE APPLIED WOOD TREATMENT

- A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.
- B. Allow preservative to dry prior to erecting members.

END OF SECTION

**SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Window Sills.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 09 99 90 - Color Schedule.

1.03 REFERENCE STANDARDS

- A. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications 2022.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- C. AWI (QCP) - Quality Certification Program Current Edition.
- D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
- E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards 2021, with Errata.
- F. ISFA 2-01 - Classification and Standards for Solid Surfacing Material 2013.
- G. NEMA LD 3 - High-Pressure Decorative Laminates 2005.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
- C. Samples: Submit the following samples to the Architect/Engineer in accord with 01 30 00 - Administrative Requirements.
 - 1. Solid Surfacing: Set of two pieces of each color specified; 2-inches by 2-inches.

1.05 QUALITY ASSURANCE

- A. Quality Certification:
 - 1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
 - 2. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) requirements for grade or grades specified.
 - 3. Provide designated labels on shop drawings as required by certification program.
 - 4. Provide designated labels on installed products as required by certification program.
 - 5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
 - 6. Replace, repair, or rework all work for which certification is refused.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.
- B. Do not deliver casework until painting, wet work, and similar operations, which could damage or deteriorate woodwork, have been completed in installation areas.
- C. Scheduling: Fabricator shall advise Contractor of temperature and humidity requirements for finish carpentry installation areas. Do not install interior finish carpentry until required temperature and relative humidity conditions have been stabilized and will be maintained in installation areas.
- D. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.07 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 LUMBER - GENERAL

- A. Factory-mark each piece of lumber and plywood with grading agency identification information; except omit marking from surfaces to receive transparent finish.
- B. Softwood Moisture Content: Softwood shall be seasoned lumber having a moisture content from time of manufacture until time of installation not greater than the values required by the applicable grading rules of the appropriate grading and inspecting agency.
- C. Hardwood Moisture Content: Hardwood shall be kiln dried lumber having a moisture content from time of manufacture until time of installation within the ranges required in the Architectural Woodwork Institute "Quality Standards".
- D. Wood Moisture Content: Provide kiln-dried lumber with an average moisture content range of 6-percent to 11-percent for interior work. Lumber at time of installation shall not exceed 5-percent to 10-percent for interior wood (except pressure treated wood).

2.02 WOOD-BASED COMPONENTS

- A. Concealed miscellaneous solid wood for blocking, furring, nailers and similar applications as required shall be Standard or Better, any species, unless designated otherwise on the Drawings.
- B. Hardboard: shall be tempered.
 - 1. Thickness: 1/4-inch thick unless noted otherwise.
 - 2. Manufacturers:
 - a. Boise Cascade; www.bc.com.
 - b. Georgia-Pacific; www.gp.com.
 - c. Masonite Corporation; www.masonite.com.
- C. Particle Board:
 - 1. Density: 45-48 pounds per cubic foot.
 - 2. Thickness: 3/4-inch, unless otherwise shown or specified.
 - 3. Manufacturers:
 - a. Georgia-Pacific; www.gp.com.
 - b. Weyerhaeuser Company; www.weyerhaeuser.com
 - 4. Medium Density Fiberboard (MDF):
 - a. ANSI A208.2 Composed primarily of cellulosic fibers and a bonding system cured under heat and pressure.

2.03 SOLID SURFACE WINDOWSILLS

- A. Solid Surfacing Window Sills: Solid surfacing sheet or plastic resin casting over continuous substrate.
 - 1. Flat Sheet Thickness: 1/2 inch, minimum.
 - 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Bellavati
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
 - b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - c. Color: As shown in Color Schedule 09 99 90.
 - 3. Exposed Edge Treatment: edge profile as indicated on drawings.
 - 4. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.

5. Fabricate in accordance with AWI/AWMAC/WI (AWS), Section 11 - Countertops, Premium Grade.
6. Fabricate in accordance with manufacturer's standard requirements.

2.04 ACCESSORIES

- A. Adhesive: Type recommended by AWI/AWMAC to suit application.
- B. Sealant, for sealing between wall surfaces and splashes or countertops, shall be one of the following:
 1. Dow Corning Corp.; 999, clear.
 2. General Electric Co.; SCC-1201, clear.
- C. Sealer for hardboard and drawer bodies shall be clear satin varnish (2 coats) manufactured by any of the approved manufacturers listed in Section 09 99 90 - Color Schedule.
- D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- E. Nails: Select material, type, size, and finish required for each use.

Stock up to 1/2-inch thick	4d finishing or casing nails
Stock 1/2- to 3/4-inch thick	6d finishing or casing nails
Stock 3/4- to 1-inch thick	8d finishing or casing nails
Stock 1- to 1-1/4-inch thick	16d finishing or casing nails

2.05 FABRICATION

- A. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- B. Concealed and semi-exposed framing shall be of soft wood.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Use fixture attachments in concealed locations for wall mounted components.

3.03 ADJUSTING

- A. Test installed work for rigidity and ability to support loads.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

**SECTION 07 19 00
WATER REPELLENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water repellents applied to exterior stone surfaces.

1.02 RELATED REQUIREMENTS

- A. Section 04 43 13 - Stone Masonry Veneer.

1.03 REFERENCE STANDARDS

- A. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete 2021.
- B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings 2005 (Reapproved 2018).
- C. ASTM D5095 - Standard Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes and Silane-Siloxane Blends Used in Masonry Water Repellent Treatments 1991 (Reapproved 2022).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience
- B. Single Source Responsibility: Both water-repellent coating and graffiti-resistant coating to be by the same manufacturer. Where both coatings are applied to the same surface, apply within the time limit specified by the coating manufacturer.
 - 1. When both water repellent and graffiti-resistant coatings are applied to the same surface, be sure only manufacturers that provide both types of coatings are specified and that their products are compatible with each other.

1.06 MOCK-UPS

- A. Apply water repellent according to the rates and methods recommended by the manufacturer to half of the approved brick and cast stone unit mock-ups. Water repellent work shall not proceed until the sample applications have been approved by the Owner and Architect.

1.07 FIELD CONDITIONS

- A. Protect liquid materials from freezing.
- B. Do not apply water repellent when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.
- C. Follow the manufacturer's printed instructions relative to other application limitations and specific requirements of temperature and wall dryness before masonry surface application begins.
- D. Sequencing: Application of water repellent shall not proceed until all caulking, painting and sealing has been applied.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Water Repellent: Submit 2 copies of a warranty, signed by the manufacturer, describing an agreement to furnish new water repellent material at no cost to the Owner for wall areas which become non-water-repellent due to a deterioration of the original application within a period of 5

years following the completion of the water repellent work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acrylic Water Repellents:
 - 1. BASF Construction Chemicals; MasterProtect Series:
www.buildingsystems.basf.com/#sle.
- B. Silane, Siloxane, Silane-Siloxane Blend, and Siliconate Water Repellents:
 - 1. PROSOCO, Inc; Sure Klean Weather Seal Blok-Guard & Graffiti Control:
www.prosoco.com/#sle.

2.02 MATERIALS

- A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
 - 1. Applications: Vertical surfaces and non-traffic horizontal surfaces.
 - 2. Number of Coats: Two.
 - 3. VOC Content: Less than 20 g/L, when tested in accordance with ASTM D3960 or ASTM D5095.
 - 4. Water-based siloxane, silane, or blend that reacts chemically with concrete and masonry.
 - a. Manufacturers:
 - 1) PROSOCO, Inc; Sure Klean Weather Blok-Guard & Graffiti Control II:
www.prosoco.com/#sle.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify joint sealants are installed and cured.
- C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.02 PREPARATION

- A. Protection of Adjacent Work:
 - 1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
 - 2. Protect adjacent surfaces not intended to receive water repellent.
- B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.
- C. Do not start work until masonry mortar substrate is cured a minimum of 60 days.
- D. Remove loose particles and foreign matter.
- E. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.
- F. Scrub and rinse surfaces with water and let dry.
- G. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.

3.03 APPLICATION

- A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.
- B. Apply at rate recommended by manufacturer, continuously over entire surface.
- C. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

END OF SECTION

**SECTION 07 21 00
THERMAL INSULATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation at underside of roof.
- B. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.
- C. Insulation system at roof.

1.02 RELATED REQUIREMENTS

- A. Section 07 21 19 - Foamed-In-Place Insulation.
- B. Section 07 27 00 - Air Barriers: Separate air barrier materials.

1.03 REFERENCE STANDARDS

- A. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
- B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board 2022a.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a.
- E. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C 2022.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect insulation from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with the manufacturer's recommendations for handling, storage, and protection during installation.
- B. Do not expose plastic insulation to sunlight, except to the extent necessary for the period of installation and concealment.
- C. Protect plastic insulation against ignition at all times. Do not deliver plastic insulating materials to project site ahead of time. Complete installation and concealment of plastic materials as rapidly as possible in each area of work.

1.06 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 FOAM BOARD INSULATION MATERIALS

- A. Rigid Cellular Polyisocyanurate (ISO) Thermal Insulation Board with Facers Both Sides and Water-Resistive Barrier: Complying with ASTM C1289.
 - 1. Classifications:
 - a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
 - 1) Class 1 - Faced with glass fiber reinforced cellulosic facers on both major surfaces of the core foam.

- 2) Compressive Strength: Classes 1-2-3, Grade 3 - 25 psi (172 kPa), minimum.
- 3) Thermal Resistance, R-value: At 1-1/2 inch thick; Class 1, Grades 1-2-3 - 8.4 (1.48), minimum, at 75 degrees F.
2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
4. Board Thickness: 1.5 inch.
5. Water Vapor Permeance: 1.2 perm, maximum, at 1 inch thickness, and when tested in accordance with ASTM E96/E96M, desiccant method.
6. Products:
 - a. Atlas Roofing Corporation; EnergyShield CGF PRO: www.atlasroofing.com/#sle.

2.02 MINERAL FIBER BLANKET INSULATION MATERIALS

- A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 4. Formaldehyde Content: Zero.
 5. Thermal Resistance: R-value of R-11. At 6-inch stud walls, use unfaced R-19 batts.
 6. Facing: Aluminum foil, flame spread 25 rated; one side.
 7. Products:
 - a. CertainTeed Corporation: www.certainteed.com/#sle.
 - b. Johns Manville: www.jm.com/#sle.
 - c. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORIES

- A. Continuous Air Barrier and Vapor Retarder: At all exterior walls where Batt Insulation is provided, that area shall be encapsulated by a vapor barrier. Install per manufacturer's recommended standards.
 1. Product: MemBrain by Certainteed Corporation.
- B. Tape: Polyethylene self-adhering type, mesh reinforced, 2 inch wide.
- C. Insulation Fasteners: Appropriate for purpose intended.
- D. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.
- E. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BATT INSTALLATION

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall and soffit spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. Push down and in vertical spaces to assure avoidance of future settling.
- F. Maintain all required minimum clearances between insulation and fans, lights, or other heat producing equipment items.

- G. Install with factory-applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.
- H. Staple or nail facing flanges in place at maximum 6 inches on center.
- I. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
- J. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.
- K. Coordinate work of this section with construction of air barrier seal, see Section 07 27 00.

3.03 INSTALLATION - ROOF INSULATION

- A. Install insulation systems at roof locations in accordance with insulation system manufacturer installation requirements. Provide full envelope coverage with insulation systems. All joints in vinyl facing shall be sealed/taped per manufacturer requirements.

3.04 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

**SECTION 07 24 00
EXTERIOR INSULATION AND FINISH SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Composite wall cladding of rigid insulation and reinforced finish coating "Class PB" (noted as EIFS on the Drawings).
- B. Drainage and water-resistive barriers behind insulation board.

1.02 RELATED REQUIREMENTS

- A. Section 07 24 19 - Direct-Applied Exterior Finish System (DEFS): Soffit finish system.
- B. Section 07 62 00 - Sheet Metal Flashing and Trim: Perimeter flashings.
- C. Section 07 92 00 - Joint Sealants: Sealing joints between EIFS and adjacent construction and penetrations through EIFS.
- D. Section 09 21 16 - Gypsum Board Assemblies.
- E. Section 09 99 90 - Color Schedule

1.03 REFERENCE STANDARDS

- A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus 2019.
- B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.
- C. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation 2022.
- D. ASTM C1397 - Standard Practice for Application of Class PB Exterior Insulation and Finish Systems (EIFS) and EIFS with Drainage 2013 (Reapproved 2019).
- E. ASTM D968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive 2022.
- F. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity 2015 (Reapproved 2020).
- G. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2021.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- I. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference 2000 (Reapproved 2016).
- J. ASTM E2273 - Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies 2018.
- K. ASTM E2485/E2485M - Standard Test Method for Freeze/Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water Resistive Barrier Coatings 2013 (Reapproved 2018).
- L. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials 2013 (Reapproved 2021).
- M. ASTM G155 - Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials 2021.
- N. NFPA 268 - Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source 2022.
- O. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components 2023.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

- B. Product Data: Provide data on system materials, product characteristics, performance criteria, and system limitations.
- C. Shop Drawings: Indicate wall and soffit joint patterns, joint details, and molding profiles.
- D. Verification Samples: Submit actual samples of selected coating on specified substrate, minimum 12 inches square, illustrating project colors and textures.
- E. Manufacturer's Installation Instructions: Indicate preparation required, installation techniques, and jointing requirements.

1.05 QUALITY ASSURANCE

- A. Maintain copy of specified installation standard and manufacturer's installation instructions at project site during installation.
- B. EIFS Manufacturer Qualifications: Provide EIFS products other than insulation from the same manufacturer with qualifications as follows:
 - 1. Engage a firm experienced in manufacturing systems similar to those indicated for this project and with a record of successful in-service performance.
 - 2. Member in good standing of EIMA (EIFS Industry Members Association).
 - 3. System recognized for intended use by the national codes and by the local code agency with jurisdiction over the project.
 - 4. System listed by nationally recognized test agency.
 - 5. System listed in GA (Gypsum Association) Fire-Resistance Manual.
- C. Insulation Manufacturer Qualifications: Approved by manufacturer of EIFS and approved and labeled under third party quality program as required by applicable building code.
- D. Installer Qualifications: Engage an experienced installer who is certified in writing by system manufacturer as qualified to install manufacturer's system.
 - 1. Installer foreman engaged in installation of EIFS/DEFS for this project shall have been trained and certified by EIFS/DEFS manufacturer with the past 12 months.

1.06 MOCK-UPS

- A. Apply finish coat to portion of wall adjacent to the existing building and schedule time for Architect and Owner to review finish and color prior to applying to the entire wall. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to project site in manufacturer's original, unopened containers with labels intact. Inspect materials and notify manufacturer of any discrepancies.
- B. Storage: Store materials as directed by manufacturer's written instructions.
 - 1. Protect adhesives and finish materials from freezing, temperatures below 40 degrees F and temperatures in excess of 90 degrees F.

1.08 FIELD CONDITIONS

- A. Do not prepare materials or apply EIFS under conditions other than those described in the manufacturer's written instructions.
- B. Do not prepare materials or apply EIFS during inclement weather unless areas of installation are protected. Protect installed EIFS areas from inclement weather until dry.
- C. Do not install coatings or sealants when ambient temperature is below 40 degrees F.
- D. Protect other work from the application of the system. Replace or restore other work which has been soiled or otherwise damaged by the application of the system.
- E. Coordinate installation of EIFS/DEFS with related work specified in other sections to ensure that wall assemblies, including sheathing, flashing, trim, joint sealers, windows, and doors are protected against damage from the effects of weather, age, corrosion, moisture, and other causes. Do not allow water to penetrate behind EIFS/DEFS.
- F. Provide sufficient manpower and material to ensure continuous installation of the EIFS/DEFS, free of cold joints, scaffold lines, and texture variation.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Provide manufacturer's standard material warranty, covering a period of not less than 15.
- C. Submit 2 copies of system manufacturer's limited warranty for materials to the Architect/Engineer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Sto Corp.; StoTherm ci Classic.
- B. Exterior Insulation and Finish Systems Manufacturers:
 - 1. Parex USA, Inc: www.parex.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 EXTERIOR INSULATION AND FINISH SYSTEM

- A. Fire Characteristics:
 - 1. Flammability: Pass, when tested in accordance with NFPA 285.
 - 2. Ignitibility: No sustained flaming when tested in accordance with NFPA 268.
- B. Water Penetration Resistance: No water penetration beyond the plane of the base coat/insulation board interface after 15 minutes, when tested in accordance with ASTM E331 at 6.24 psf differential pressure with tracer dye in the water spray; include in tested sample at least two vertical joints and one horizontal joint of same type to be used in construction; disassemble sample if necessary to determine extent of water penetration.
- C. Drainage Efficiency: Average minimum efficiency of 90 percent, when tested in accordance with ASTM E2273 for 75 minutes.
- D. Salt Spray Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating after 300 hours exposure in accordance with ASTM B117, using at least three samples matching intended assembly, at least 4 by 6 inches in size.
- E. Freeze-Thaw Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 10 cycles, when tested in accordance with ASTM E2485/E2485M.
- F. Weathering Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 2000 hours of accelerated weathering conducted in accordance with ASTM G153 Cycle 1 or ASTM G155 Cycles 1, 5, or 9.
- G. Water Degradation Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating after 14 days exposure, when tested in accordance with ASTM D2247.
- H. Mildew Resistance: No growth supported on finish coating during 28 day exposure period, when tested in accordance with ASTM D3273.
- I. Abrasion Resistance Of Finish: No cracking, checking or loss of film integrity when tested in accordance with ASTM D968 with 113.5 gallons of sand.

2.03 MATERIALS

- A. Finish Coating Top Coat: Water-based, air curing, acrylic finish with integral color and texture.
 - 1. Texture: Sto Corp; Product - Stolit Acrylic Textured Finish.
 - 2. Color: P-6 - as indicated in Section 09 99 90 - Color Schedule.
- B. Reinforcing Mesh: Balanced, open weave glass fiber fabric, treated for compatibility and improved bond with coating, weight, strength, and number of layers as required to meet required system impact rating.
- C. Expanded Polystyrene (EPS) Board Insulation: Complies with ASTM C578.
 - 1. Board Size: 24 by 48 inches.

2. Board Size Tolerance: Plus/minus 1/16 inch from square and dimension.
 3. Board Thickness: As indicated on drawings. See A0-0 for new construction walls.
 - a. Patching of existing EIFS and insulation board required where indicated on the drawings. Match existing insulation thickness at these locations.
 4. Type and Thermal Resistance, R-value (RSI-value): Type VIII, 3.8 (0.67) per 1 inch thickness at 75 degrees F mean temperature using ASTM C177 test method.
 5. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, when tested in accordance with ASTM E84.
- D. Water-Resistive Barrier Coating: Fluid-applied air and water barrier membrane; applied to sheathing; furnished or approved by EIFS manufacturer.
- E. Fluid-Applied Flashing: Flexible water based polymer material suitable for use with reinforcing mesh and, if used with water-resistive barrier sheet, certified compatible with sheet material.

2.04 ACCESSORIES

- A. Trim: EIFS manufacturer's standard PVC or galvanized steel trim accessories, as required for a complete project and including starter track and drainage accessories.
- B. Sealant Materials: Compatible with EIFS materials and as recommended by EIFS manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate is sound and free of oil, dirt, other surface contaminants, efflorescence, loose materials, or protrusions that could interfere with EIFS installation and is of a type and construction that is acceptable to EIFS manufacturer. Do not begin work until substrate and adjacent materials are complete and thoroughly dry.
- B. Verify that substrate surface is flat, with no deviation greater than 1/4 in when tested with a 10 ft straightedge.

3.02 INSTALLATION - GENERAL

- A. Install in accordance with EIFS manufacturer's instructions and ASTM C1397.
1. Where different requirements appear in either document, comply with the most stringent.
 2. Neither of these documents supercedes provisions of Contract Documents that defines contractual relationships between parties or scope of this work.

3.03 INSTALLATION - WATER-RESISTIVE BARRIER

- A. Apply barrier coating as recommended by coating manufacturer; prime substrate as required before application.
- B. Seal substrate transitions and intersections with other materials to form continuous water-resistive barrier on exterior of sheathing, using method recommended by manufacturer.
- C. At door and window rough openings and other wall penetrations, seal water-resistive barrier and flexible flashings to rough opening before installation of metal flashings, sills, or frames, using method recommended by manufacturer.
- D. Lap flexible flashing or flashing tape at least 2 inches on each side of joint or transition.

3.04 INSTALLATION - INSULATION

- A. Install in accordance with manufacturer's instructions.
- B. Prior to installation of boards, install starter track and other trim level and plumb and securely fastened. Install only in full lengths, to minimize moisture intrusion; cut horizontal trim tight to vertical trim.
- C. Install back wrap reinforcing mesh at all openings and terminations that are not to be protected with trim.
- D. On wall surfaces, install boards horizontally.
- E. Place boards in a method to maximize tight joints. Stagger vertical joints and interlock at corners. Butt edges and ends tight to adjacent board and to protrusions. Achieve a continuous

flush insulation surface, with no gaps in excess of 1/16 inch.

- F. Fill gaps greater than 1/16 inch with strips or shims cut from the same insulation material.
- G. Rasp irregularities off surface of installed insulation board.
- H. Adhesive Attachment: Use method recommended by EIFS manufacturer.

3.05 INSTALLATION - CLASS PB FINISH

- A. Base Coat: Apply in thickness as necessary to fully embed reinforcing mesh, wrinkle free, including back-wrap at terminations of EIFS. Install reinforcing fabric as recommended by EIFS manufacturer.
 - 1. Lap reinforcing mesh edges and ends a minimum of 2-1/2 inches.
 - 2. Allow base coat to dry a minimum of 24 hours before next coating application.
- B. Apply finish coat after base coat has dried not less than 24 hours, embed finish aggregate, and finish to a uniform texture and color.
- C. Seal control and expansion joints within the field of exterior finish and insulation system, using procedures recommended by sealant and finish system manufacturers.

3.06 PROTECTION

- A. Protect completed work from damage and soiling by subsequent work.

END OF SECTION

**SECTION 07 24 19
DIRECT-APPLIED EXTERIOR FINISH SYSTEM (DEFS)**

PART 1 GENERAL

SECTION INCLUDES

- A. Provide textured finish system for exterior gypsum or cement board soffit and ceiling surfaces (noted as DEFS on the Drawings).

1.02 RELATED REQUIREMENTS

- A. Section 07 62 00 - Sheet Metal Flashing and Trim: Perimeter flashings.
- B. Section 07 92 00 - Joint Sealants: Sealing joints between DEFS and adjacent construction and penetrations through DEFS.
- C. Section 09 21 16 - Gypsum Board Assemblies.
- D. Section 09 99 90 - Color Schedule

1.03 REFERENCE STANDARDS

- A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus 2019.
- B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing 2017.
- C. ASTM C1397 - Standard Practice for Application of Class PB Exterior Insulation and Finish Systems (EIFS) and EIFS with Drainage 2013 (Reapproved 2019).
- D. ASTM D968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive 2022.
- E. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity 2015 (Reapproved 2020).
- F. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2021.
- G. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference 2000 (Reapproved 2016).
- H. ASTM E2273 - Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies 2018.
- I. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials 2013 (Reapproved 2021).
- J. ASTM G155 - Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials 2021.
- K. NFPA 268 - Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source 2022.
- L. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components 2023.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on system materials, product characteristics, performance criteria, and system limitations.
- C. Shop Drawings: Indicate soffit joint patterns and joint details.
- D. Verification Samples: Submit actual samples of selected coating on specified substrate, minimum 12 inches square, illustrating project colors and textures.
- E. Manufacturer's Installation Instructions: Indicate preparation required, installation techniques, and jointing requirements.

1.05 QUALITY ASSURANCE

- A. Maintain copy of specified installation standard and manufacturer's installation instructions at project site during installation.
- B. DEFS Manufacturer Qualifications: Provide DEFS products other than insulation from the same manufacturer with qualifications as follows:
 - 1. Engage a firm experienced in manufacturing systems similar to those indicated for this project and with a record of successful in-service performance.
 - 2. Member in good standing of EIMA (EIFS Industry Members Association).
 - 3. System recognized for intended use by the national codes and by the local code agency with jurisdiction over the project.
 - 4. System listed by nationally recognized test agency.
 - 5. System listed in GA (Gypsum Association) Fire-Resistance Manual.
- C. Installer Qualifications: Company specializing in the type of work specified and with at least five years of documented experience.

1.06 MOCK-UP

- A. Apply finish coat to portion of soffit adjacent to the existing building and schedule time for Architect and Owner to review finish and color prior to applying to the entire wall. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to project site in manufacturer's original, unopened containers with labels intact. Inspect materials and notify manufacturer of any discrepancies.
- B. Storage: Store materials as directed by manufacturer's written instructions.
 - 1. Protect adhesives and finish materials from freezing, temperatures below 40 degrees F and temperatures in excess of 90 degrees F.
 - 2. Protect Portland cement based materials from moisture and humidity. Store under cover off the ground in a dry location.
 - 3. Protect insulation materials from exposure to sunlight.

1.08 FIELD CONDITIONS

- A. Do not prepare materials or apply DEFS under conditions other than those described in the manufacturer's written instructions.
- B. Do not prepare materials or apply DEFS during inclement weather unless areas of installation are protected. Protect installed DEFS areas from inclement weather until dry.
- C. Do not install coatings or sealants when ambient temperature is below 40 degrees F.
- D. Protect other work from the application of the system. Replace or restore other work which has been soiled or otherwise damaged by the application of the system.
- E. Coordinate installation of DEFS with related work specified in other sections to ensure that wall assemblies, including sheathing, flashing, trim, joint sealers, windows, and doors are protected against damage from the effects of weather, age, corrosion, moisture, and other causes. Do not allow water to penetrate behind DEFS.
- F. Provide sufficient manpower and material to ensure continuous installation of the DEFS, free of cold joints, scaffold lines, and texture variation.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's standard material warranty, covering a period of not less than 15 years.
- C. Submit 2 copies of system manufacturer's limited warranty for materials to the Architect/Engineer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Sto Corp.; StoQuik Gold Finish System for Soffits and Ceilings.
- B. Other Acceptable Manufacturers:
 - 1. Parex USA, Inc: www.parex.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DIRECT APPLIED FINISH SYSTEM

- A. Fire Characteristics:
 - 1. Flammability: Pass, when tested in accordance with NFPA 285.
 - 2. Ignitibility: No sustained flaming when tested in accordance with NFPA 268.
- B. Water Penetration Resistance: No water penetration beyond the plane of the base coat/insulation board interface after 15 minutes, when tested in accordance with ASTM E331 at 6.24 psf differential pressure with tracer dye in the water spray; include in tested sample at least two vertical joints and one horizontal joint of same type to be used in construction; disassemble sample if necessary to determine extent of water penetration.
- C. Drainage Efficiency: Average minimum efficiency of 90 percent, when tested in accordance with ASTM E2273 for 75 minutes.
- D. Salt Spray Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating after 300 hours exposure in accordance with ASTM B117, using at least three samples matching intended assembly, at least 4 by 6 inches in size.
- E. Freeze-Thaw Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 10 cycles, when tested in accordance with ASTM E2485/E2485M.
- F. Weathering Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 2000 hours of accelerated weathering conducted in accordance with ASTM G153 Cycle 1 or ASTM G155 Cycles 1, 5, or 9.
- G. Water Degradation Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating after 14 days exposure, when tested in accordance with ASTM D2247.
- H. Mildew Resistance: No growth supported on finish coating during 28 day exposure period, when tested in accordance with ASTM D3273.
- I. Abrasion Resistance Of Finish: No cracking, checking or loss of film integrity when tested in accordance with ASTM D968 with 113.5 gallons of sand.

2.03 MATERIALS

- A. Finish Coating Top Coat: Water-based, air curing, acrylic finish with integral color and texture.
 - 1. Texture: Sto Corp; Polymer-Enhanced Acrylic Stolit 1.0 Fine; www.stocorp.com/#sle.
 - 2. Color: As indicated in Section 09 99 90 - Color Schedule.
- B. Base Coat: Fiber-reinforced, acrylic-based product compatible with insulation board and reinforcing mesh.
- C. Reinforcing Mesh: Balanced, open weave glass fiber fabric, treated for compatibility and improved bond with coating, weight, strength, and number of layers as required to meet required system impact rating.
- D. Gypsum Soffit Board: Glass Mat faced gypsum sheathing in compliance with ASTM C1177/C1177M.
 - 1. See Section 09 21 16 - Gypsum Board Assemblies.
- E. Water-Resistive Barrier Coating: Fluid-applied air and water barrier membrane; applied to sheathing; furnished or approved by DEFS manufacturer.

DIRECT-APPLIED EXTERIOR FINISH SYSTEM
(DEFS)

- F. Fluid-Applied Flashing: Flexible water based polymer material suitable for use with reinforcing mesh and, if used with water-resistive barrier sheet, certified compatible with sheet material.

2.04 ACCESSORY MATERIALS

- A. Sealant Materials: Compatible with DEFS materials and as recommended by DEFS manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate is sound and free of oil, dirt, other surface contaminants, efflorescence, loose materials, or protrusions that could interfere with EIFS installation and is of a type and construction that is acceptable to EIFS manufacturer. Do not begin work until substrate and adjacent materials are complete and thoroughly dry.
- B. Verify that substrate surface is flat, with no deviation greater than 1/4 in when tested with a 10 ft straightedge.

3.02 INSTALLATION - GENERAL

- A. Install in accordance with DEFS manufacturer's instructions and ASTM C1397.
 - 1. Where different requirements appear in either document, comply with the most stringent.
 - 2. Neither of these documents supercedes provisions of Contract Documents that defines contractual relationships between parties or scope of this work.

3.03 INSTALLATION - WATER-RESISTIVE BARRIER

- A. Apply barrier coating as recommended by coating manufacturer; prime substrate as required before application.
- B. Seal substrate transitions and intersections with other materials to form continuous water-resistive barrier on exterior of sheathing, using method recommended by manufacturer.
- C. Lap flexible flashing or flashing tape at least 2 inches on each side of joint or transition.

3.04 INSTALLATION - CLASS PB FINISH

- A. Base Coat: Apply in thickness as necessary to fully embed reinforcing mesh, wrinkle free, including back-wrap at terminations of DEFS. Install reinforcing fabric as recommended by DEFS manufacturer.
 - 1. Lap reinforcing mesh edges and ends a minimum of 2-1/2 inches.
 - 2. Allow base coat to dry a minimum of 24 hours before next coating application.
- B. Apply finish coat after base coat has dried not less than 24 hours, embed finish aggregate, and finish to a uniform texture and color.
- C. Seal control and expansion joints within the field of exterior finish and insulation system, using procedures recommended by sealant and finish system manufacturers.

3.05 PROTECTION

- A. Protect completed work from damage and soiling by subsequent work.

END OF SECTION

**SECTION 07 27 00
AIR BARRIERS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air barriers.

1.02 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry: Water resistant barrier under exterior cladding.
- B. Section 06 10 00 - Rough Carpentry: Air barrier under exterior cladding.

1.03 REFERENCE STANDARDS

- A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection 2021.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a.
- D. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials 2021a.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on material characteristics, performance criteria, limitations, and description for protection, surface preparation, and application.
- C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.
- D. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- E. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification; keep copies of each contractor accreditation and installer certification on site during and after installation, and present on-site documentation upon request.
- F. Testing agency qualification statement.

1.05 QUALITY ASSURANCE

- A. Contractor requirements:
 - 1. Knowledgeable in the proper use and handling of specified products.
 - 2. Employ skilled installers who are experienced and knowledgeable in air and water-resistive barrier application, and familiar with the requirements of the specified work.
 - 3. Provide the proper equipment, manpower and supervision on the job site to install the system in compliance with the manufacturer's published instructions.
- B. Project Meeting: Convene a pre-application meeting before the start of installation of fluid-applied membrane air barrier. Require attendance of parties directly affecting work of this section, including the Contractor, Architect, and product representative. Review Mock-Up procedures.

1.06 MOCK-UPS

- A. Prior to overall installation, apply air and water-resistive barrier system to mock-up wall, verify details for overall installation. Demonstrate tie-ins with adjoining construction and other termination conditions.
 - 1. Install air and water-resistive barrier mock-ups in field on assemblies constructed of unit masonry. Use the manufacturer's written application instructions.

2. Mock-ups must remain available for inspection, testing and approval throughout the project.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in their original sealed containers bearing manufacturer's name and identification of product.
- B. Protect coatings (pail products) from freezing temperatures and temperatures in excess of 90 degrees F (32 degrees C). Store away from direct sunlight.

1.08 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)

- A. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.
 1. Air Barrier Coating:
 - a. Material: Acrylic.
 - b. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
 - c. Water Vapor Permeance: 25 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method, at 73.4 degrees F.
 - d. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A when tested in accordance with ASTM E84.
 - e. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
 - f. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
 - g. Basis-of-Design Manufacturer:
 - 1) PROSOCO, Inc; R-GUARD Spray Wrap MVP: www.prosoco.com/r-guard/#sle.
 - h. Other Acceptable Manufacturers:
 - 1) Dow Chemical Company; DOWSIL DefendAir 200C: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - 2) Sto Corp; Sto Gold Coat: www.stocorp.com/#sle.
 - 3) W.R. Meadows, Inc; Air-Shield TMP: www.wrmeadows.com/#sle.
 - 4) Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.
- B. System consists of self-adhesive glass fiber tape; a ready-mixed acrylic compound fill; and a ready-mixed flexible, acrylic coating to be applied to GWB or CMU backup.
 1. R-Guard GypPrime
 - a. Form: Milky blue liquid, mild odor
 - b. Specific Gravity: 1.01
 - c. pH: 8.5
 - d. Wt/Gal: 8.41 lbs
 - e. Total Solids: ASTM D2369 - 18 percent
 - f. VOC Content: Less than 100g/L
 - g. Flash Point: More than 212 degrees F (More than 93 degrees c)
 - h. Freeze Point: 32 degrees F (0 degrees C)
 2. R-Guard Joint and Seam Filler
 - a. Form: Pale Red, Gun grade sealant
 - b. Specific Gravity: 1.4 to 1.5
 - c. pH: Not Applicable
 - d. Wt/Gal: 11.8 lbs
 - e. Total Solids: 99 percent

- f. VOC Content: Max 100 g/L
- g. Flash Point: No data
- h. Freeze Point: No data
- 3. R-Guard Liquid-Applied Flashing Membrane - Fast Flash
 - a. Form: Brick Red, Gun grade sealant
 - b. Specific Gravity: 1.45 to 1.60
 - c. pH: Not Applicable
 - d. Wt/Gal: 12.5 lbs
 - e. Total Solids: 99 percent
 - f. VOC Content: 30 g/L
 - g. Flash Point: No data
 - h. Freeze Point: No data
- 4. R-Guard Fill
 - a. Form: Dark red viscous liquid, mild odor
 - b. Specific Gravity: More than 1.0
 - c. pH: 7.5 - 10.5
 - d. Wt/Gal: 11.9 lbs
 - e. Total Solids: ASTM D2369 - 83 percent
 - f. VOC Content: Less than 100 g/L
 - g. Flash Point: More than 200 degrees F (More than 93 degrees C)
 - h. Freeze Point: 32 degrees F (0 degrees C)
- 5. R-Guard Spray Wrap MVP
 - a. Form: Batter like, semi-gel liquid pink color
 - b. Specific Gravity: More than 1.4
 - c. pH: 8.5 - 9.5
 - d. Wt/Gal: 11.69 lbs
 - e. Total Solids: ASTM D2369 - 63-68 percent
 - f. VOC Content: Less than 18 g/L
 - g. Flash Point: not applicable
 - h. Freeze Point: 32 degrees F (0 degrees C)

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready for work of this section.
- B. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.
- C. Do not proceed with this work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Protect people, vehicles, property, plants and all surfaces not designated to receive treatment from the product, splash and wind drift.
- B. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- C. Ensure that sheathing is properly installed with ends, corners and edges properly fastened with mechanical fasteners set flush with sheathing and spotted with joint and seam filler and fastened back into solid backing.
- D. Joints should be struck flush with the surface of the CMU.
- E. Fill small voids and cracks up to 1/8-inch with fill specified above. For voids and cracks greater than 1/8-inch and up to 1/4-inch, use paintable acrylic latex caulk tooled flush.
- F. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's installation instructions.
- B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.
- D. Fluid-Applied Coatings or Membranes:
 - 1. Prepare substrate in accordance with manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.
 - 2. Where exterior masonry veneer is being installed, install masonry anchors before installing air barrier over masonry; provide airtight seal around anchors.
 - 3. Use flashing to seal to adjacent construction and to bridge joints in coating substrate.
- E. Openings and Penetrations in Exterior Air Barriers:
 - 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto air barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
 - 2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
 - 3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
 - 4. At head of openings, install flashing under air barrier extending at least 2 inches beyond face of jambs; seal air barrier to flashing.
 - 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
 - 6. Service and Other Penetrations: Form flashing around penetrating item and seal to air barrier surface.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Coordination of ABAA Tests and Inspections:
 - 1. Provide testing and inspection required by ABAA QAP.
 - 2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
 - 3. Cooperate with ABAA testing agency.
 - 4. Allow access to air barrier work areas and staging.
 - 5. Do not cover air barrier work until tested, inspected, and accepted.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

**SECTION 07 42 13
METAL WALL PANELS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Manufactured metal panels for walls and soffits, with related flashings and accessory components.
- B. Exterior metal wall panels for patching.

1.02 RELATED REQUIREMENTS

- A. Section 05 40 00 - Cold-Formed Metal Framing: Wall panel substrate.
- B. Section 07 27 00 - Air Barriers: Air barrier under wall panels.
- C. Section 07 92 00 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.03 REFERENCE STANDARDS

- A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document) 2015.
- B. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process 2022.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
 - 1. Physical characteristics of components shown on shop drawings.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation instructions and recommendations.
- C. Shop Drawings: Indicate dimensions, layout, joints, construction details, and methods of anchorage.
- D. Samples: Submit two samples of wall panel and soffit panel, 12 inches by 12 inches in size illustrating finish color, sheen, and texture.
- E. Manufacturer's qualification statement.
- F. Installer's qualification statement.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in installing products specified in this section with minimum three years of documented experience.
- C. Pre-Installation Conference: Schedule and convene a pre-installation conference just prior to commencement of field operations, and establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda of the conference shall include review of the substrate for being true and plumb.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.
- C. Prevent contact with materials that may cause discoloration or staining of products.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

- B. Warranty Term: Provide 2-year commencing on the date of Substantial Completion for defects in workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design:
 - 1. MetalTech-USA; Reveal Panels: www.metaltech-usa.com.

2.02 METAL WALL AND SOFFIT PANELS

- A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
 - 1. Provide exterior panels and subgirt framing assembly.
 - 2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
 - 3. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
 - 4. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
 - 5. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
- B. Exterior Wall Panels:
 - 1. Orientation: Horizontal.
 - 2. Material: Precoated steel sheet, 24 gauge minimum thickness.
 - 3. Profile Height: 1 inch.
 - 4. Panel Width: 12 inches.
 - 5. Reveal Width: 1/2 inch.
 - 6. Color:
 - a. Panel Type-1: Pre-Weathered Galvalume; see Drawings where indicated.
 - b. Panel Type-2: Regal Red; see Drawings where indicated.
- C. Exterior Wall Panels for Patching:
 - 1. Orientation, Profile, Width, and Height: To match existing panels.
 - 2. Location: As indicated on the Drawings.
 - 3. Color: Paint to match existing.
- D. Soffit Panels:
 - 1. Profile: Style as indicated, with venting provided.
 - 2. Color: As indicated on drawings.
- E. Subgirt Framing Assembly:
 - 1. Profile as indicated; to attach panel system to building.
- F. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.
- G. Trim, Closure Pieces, Caps, and Flashings: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

2.03 MATERIALS

- A. Precoated Steel Sheet: Aluminum-zinc alloy-coated steel sheet, ASTM A792/A792M, Commercial Steel (CS) or Forming Steel (FS), with AZ-50/AZ-55 coating; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.04 FINISHES

- A. Custom Fluoropolymer Coating System: Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness (DFT) of 0.9 mil; color and gloss as scheduled.

1. Products:
 - a. Arkema, Inc; Kynar 500: www.arkema.com/#sle.
 - b. PPG; Duranar: www.ppgmetalcoatings.com/#sle.
 - c. Sherwin-Williams Company; Fluropon: www.coil.sherwin.com/#sle.

2.05 ACCESSORIES

- A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient.
- B. Concealed Sealants: Non-curing butyl sealant or tape sealant, see Section 07 92 00
- C. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
- D. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, stainless steel. Exposed fasteners same finish as panel system.
 1. Heads/integral washers a minimum of 7/16-inch diameter, stainless steel minimum 3/4-inch length.
- E. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that weather barrier has been installed over substrate completely and correctly.
- B. Verify compatibility of different surfaces.

3.02 PREPARATION

- A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane, and spaced at intervals indicated.

3.03 INSTALLATION

- A. Install panels on walls and soffits in accordance with manufacturer's instructions.
- B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint; allow to dry prior to wall panel installation.
- C. Fasten panels to structural supports; aligned, level, and plumb.
- D. Ensure that all flashing and trim is installed before erecting panels, sealed with tape or sealant to stop direct weather penetration per manufacturers installation instructions.
- E. Obtain panel symmetry whenever possible relative to openings (e.g. doors and windows) using shop fabricated with custom mitered corners.
- F. Provide expansion and control joints where indicated.

3.04 CLEANING

- A. Remove site cuttings from finish surfaces.
- B. Remove protective material from wall panel surfaces.
- C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.
- D. Upon completion of installation, thoroughly clean prefinished aluminum surfaces in accordance with AAMA 609 & 610.

END OF SECTION

**SECTION 07 46 43
COMPOSITION SIDING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior composition siding.

1.02 RELATED REQUIREMENTS

- A. Section 07 21 00 - Thermal Insulation: Continuous Insulation Support System.
- B. Section 09 21 16 - Gypsum Board Assemblies: Sheathing.

1.03 REFERENCE STANDARDS

- A. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2022.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
 - 1. Manufacturer's requirements for related materials to be installed by others.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods, including nail patterns.
- C. Samples: For each finish product specified, provide two complete sets of color samples representing manufacturer's full range of available colors and patterns, including the following:
 - 1. Siding: Two of each type; full panel width by 6 inches long.
- D. Executed warranty.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum two years of experience.

1.06 MOCK-UPS

- A. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship and appearance are approved by Architect.
 - 3. Subject to approval by Architect, mock-up may be retained as part of finish work.
- B. Pre-Installation Meetings: Conduct pre-installation meetings to verify project requirements, substrate conditions, construction documents, details and manufacturer's warranty requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original packaging and clearly identified.
- B. Store materials under dry and waterproof cover, well ventilated, and elevated above grade on a flat surface.
- C. Protect materials from harmful environmental elements, construction dust, and other potentially detrimental conditions.

1.08 FIELD CONDITIONS

- A. Do not install siding when air temperature or relative humidity are outside manufacturer's limits.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer's Warranty: Provide manufacturer's standard warranty of ten years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design:
 - 1. Vertigo 5010 Wood Hybrid Cladding as manufactured by Geolam: www.geolaminc.com.
 - 2. Substitutions: Not permitted.

2.02 COMPOSITION SIDING

- A. Hybrid Aluminum/WPC Cladding: Coextruded boards of aluminum and wood composite.
 - 1. Physical Properties:
 - a. Aluminum Type-A60636 Per JISH4100
 - b. Surface Finish AA10 Per JIS H8601
 - c. Tensile Strength-150 N/mm² or better
 - d. Load Bearing Capacity-110N/mm² or better
 - e. Bonding Layer-Olefin Resin
 - f. Surface Layer-Regenerated wood flour resin containing PP based Non-halogenated flame retardant
 - g. Accelerated Weathering Test-DIN ISO 16474-2 Passed
 - h. Accelerated Weathering Test-JIS A 1415 5000 hours. 2.1 DE
 - i. Salt Spray Test-DIN EN ISO 9227 NSS
 - j. Sulfur Dioxide Corrosion Testing DIN EN ISO 3221
 - k. Color Stability Test-JIS K5400
 - l. Aging Test-JIS K1571-2010
 - m. Core in Anodized Aluminum Alloy: A60635S-T5.
 - 2. Application: Horizontal board orientation, as indicated on drawings.
 - 3. Surface Texture: Smooth.
 - 4. Length: 12 feet, nominal.
 - 5. Width: 7-1/4 inches, nominal.
 - 6. Thickness: 1/2 inch, nominal.
 - 7. Color: Rosewood.

2.03 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Comply with local building code in accordance with authorities having jurisdiction (AHJ) for wind load resistance requirements of project location.
- B. Fire Resistance:
 - 1. Flame Spread Index (FSI): 25 or less, in accordance with ASTM E84.
 - 2. Smoke Developed Index (SDI): 450 or less, in accordance with ASTM E84.

2.04 ACCESSORIES

- A. Fasteners, Stainless Steel: Type 304 or 316 stainless steel #9 composite decking screws complying with ASTM C1002; length as required to penetrate wall sheathing at least 1/4 inch as recommended by the manufacturer.
- B. Clips and Anchors: Provide as indicated in accordance with siding manufacturer; conceal unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.
- B. Do not begin until unacceptable conditions have been corrected.

- C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Protect surrounding areas and adjacent surfaces during execution of this work.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
 - 1. Use trim details as indicated on drawings.
 - 2. Touch-up field cut edges before installing.
 - 3. Predrill screw holes if necessary to prevent breakage.
- B. Securely attach siding boards to furring, using fastener size, number, spacing, and minimum dimensions from board edges and ends in accordance with manufacturer's recommendations.
 - 1. Cut and route siding boards using carbide-tipped blades to prevent frayed edge cuts.
 - 2. Predrill holes located less than 1-1/2 inches from ends of boards, 1 inch from board edges, and in siding boards 3 inches wide or less.
 - 3. Install fasteners perpendicular to siding substrates and flush with surface of board.
- C. Horizontal Board Orientation:
 - 1. Begin siding installation at lowest established level.
 - 2. Center butt joints over vertical furring, and as siding courses are added, stagger butt joints in a consistent stair-step manner.
 - 3. Install lengths of siding to span at least three furring members.
 - 4. Provide width of siding open joint at boards abutting ends in accordance with manufacturer's instructions, as spacing dimensions are temperature dependent.
 - 5. Provide width of open joints and locations as indicated, and in accordance with manufacturer's instructions.
- D. Allow space for thermal movement between both ends of siding boards that butt against each other and trim.
- E. Do not install siding less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.

3.04 PROTECTION

- A. Protect installed products until Date of Substantial Completion.
- B. Repair damage to adjacent substrates and surfaces.
- C. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

**SECTION 07 62 00
SHEET METAL FLASHING AND TRIM**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, counterflashings, gutters, and downspouts.
- B. Sealants for joints within sheet metal fabrications.
- C. Precast concrete splash pads.

1.02 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2020.
- B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2021a.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
- F. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free 2007 (Reapproved 2018).
- G. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene at project site before starting work of this section.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.
- B. Edge Securement. Metal edge flashing at low slope membrane roof areas shall be secured to comply with Section 1504.5 of the 2018 International Building Code.
- C. Roofing Subcontractor shall be a firm with a minimum of 5 years experience in work related to the type of roofing system shown and specified. All sheet metal, roofing, roof insulation, and associated work shall be subcontracted to a single firm, with undivided responsibility for the specified performance of component parts (even though some components may be sub-subcontracted to others).
- D. Installer's Field Supervision: The Roofing Subcontractor must maintain a full-time, experienced supervisor/foreman on the jobsite during times that roofing work and associated roofing work (as described above) is in progress.
- E. Coordination: Roof deck, sheet metal, roof insulation, roofing materials, and methods of installations shall be coordinated to develop assemblies approved by the roofing, insulation, and flashing material manufacturers.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

1.07 WARRANTY

- A. All flashing materials and installation shall be warranted to be leakproof and free of defects by the flashing subcontractor for a period of 2 years following the date of Substantial Completion. All prefinished sheet metal shall be warranted covering fade, chalking and film integrity for a non-prorated period of 20 years following the date of Substantial Completion. These warranties shall also be signed by the Prime Contractor and shall be submitted in duplicate.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal.
- B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal, shop pre-coated with PVDF coating.
 - 1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
 - 2. Color: As selected by Architect from manufacturer's full colors.
- C. Aluminum: ASTM B209 (ASTM B209M); 22 gauge, 0.0253 inch thick; mill finish.
 - 1. Clear Anodized Finish: AAMA 611, AA-M12C22A41, Class I, clear anodic coating not less than 0.7 mil, 0.0007 inch thick.
- D. Pre-Finished Aluminum: ASTM B209/B209M, 3005 alloy, H12 or H14 temper; 22 gauge, 0.0253 inch thick; plain finish shop pre-coated with PVDF coating.
 - 1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; pretreated metal with two-coat system including primer and color coat with at least 70 percent PVDF coating.

2.02 FABRICATION - GENERAL

- A. General: Shop fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance and with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels as indicated. Provide uniform neat seams with minimum exposure of sealant.
- B. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant in compliance with industry standards.
- C. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- D. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- E. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- F. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with mastic sealant (concealed within joints).

2.03 FABRICATION

- A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements.
- B. Protection: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- C. Fabrication of Perimeter Roof Edge Flashing:
 - 1. Form exposed roof edge flashing from 24 gauge prefinished sheet metal to the profiles shown on the Drawings in maximum 10-foot lengths. The height of the exposed face shall be as shown on the Drawings. Form 8-inch wide coverplates for joints to the same profile

as the flashing and for installation over the roof edge flashing similar to Figure 2-5A of the SMACNA Manual.

2. Form concealed continuous cleats from 22 gauge galvanized sheet metal to match the profile shown on the Drawings.
- D. Form counter flashing and receivers for lower roof intersections with upper walls from 28-gauge prefinished sheet metal similar to the profile shown in the SMACNA Manual, Figure 4-4A Alternate with vertical back dam, except crimp the vertical counterflashing to approximately at 3/4-inch bend to produce a spring clip action against the membrane roofing as shown on the Drawings. Form receivers and counterflashing in maximum 10-foot lengths. Where the upper walls are EIFS or metal panel in lieu of brick, form the receiver to tuck up behind the air/moisture barrier at least 3-inches, or as otherwise required by the manufacturer.
 1. Receivers and counterflashing for the base curbs of the skylight shall be similarly formed, with the receivers modified to fit under the skylight and extend onto the top of the curb.
- E. Form sealer pocket pans for roof penetrations, which are of other sectional shapes than round, from 24-gauge galvanized sheet metal as shown in the SMACNA Manual, Figure 4-17E, and as otherwise indicated on the Drawings and required by the roofing manufacturer.
- F. Form miscellaneous drawings from 24-gauge prefinished sheet metal as shown on the Drawings, and install with clips, cleats, or other fastenings as required.

2.04 ACCESSORIES

- A. Nails: Shall be not less than No. 12 gauge, with large flat heads, diamond points, barbed shafts, and of sufficient length to penetrate substrate at least 7/8-inch. Nails shall have lead or neoprene washers where heads are exposed to the weather. Nails shall be hot-dipped galvanized steel with ring shanks.
- B. Screws: Shall be No. 12 stainless steel, galvanized, bronze or brass round head wood or sheet metal screws of sufficient length to penetrate substrate 7/8-inch. Provide lead, bronze, or nylon expansion sleeves where screws are used to secure sheet metal to masonry or concrete. Neoprene or lead washers shall be provided where screws are exposed to the weather.
- C. Primer Type: Zinc chromate.
- D. Concealed Sealants: Non-curing butyl sealant.
- E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- F. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.
- G. Isolation Materials: Coatings and tapes, for isolation of dissimilar materials, shall meet the recommendations of the sheet metal manufacturer. Aluminum surfaces and dissimilar surfaces to be placed in contact with each other shall each be coated with paints as specified in Aluminum Construction Manual published by The Aluminum Association, latest edition.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.
- C. Install underlayment where shown on the Drawings to substrate according to manufacturer's recommendations.

3.03 INSTALLATION

- A. Install work with lines and corners true and accurate in alignment. Install faces flat and free of buckles, excessive waves, and avoidable tool marks, considering the temper and reflectivity of the metal. Provide uniform neat seams with minimum exposure of solder, welds, and sealant. Fold back sheet metal to form a hem on the concealed side of exposed edges. Joints at corners shall be sealed and designed to accommodate movement.
- B. SMACNA and Manufacturer's Details: Install work to meet the recommendations shown in the SMACNA Manual and the recommendations of the sheet metal manufacturer, except when otherwise shown or specified. In the event of a conflict between recommendations of SMACNA and the sheet metal manufacturer, the latter shall govern.
- C. Conceal fasteners and expansion provisions wherever possible in exposed work, and locate to minimize the possibility of leakage. Cover and seal work for a watertight installation. Provide cleat-type anchorages for metal flashing and trim wherever practical, arranged to relieve stresses resulting from building movement and thermal expansion.
- D. Apply plastic cement compound between metal flashings and felt flashings.
- E. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- F. Seal metal joints watertight.
- G. Provide flanges, minimum 4-inches wide, for stripping in roofing.
- H. Provide for thermal expansion for items which exceed 10-feet in length
- I. Expansion joints shall be watertight, and shall be located as follows:
 - 1. Flashing and Trim. At 2-feet from corners and intersections and at 10-foot centers elsewhere.
- J. Overlaps shall be as follows:

Vertical surfaces and slopes steeper than 6 in 12	Minimum 3-inches
Slopes 6 in 12 or less	Minimum 6-inches
- K. Form drive-cleat sealed seams unless otherwise shown or specified.
- L. Installation of Receivers and Counterflashing: Fasten receivers to wood blocking or set into reglet lapping joints 4-inches minimum. Nail receivers to wood at 8-inch centers. Snap counterflashing into receiver and bend receiver down to form a straight line drip and compress the bottom edge of counterflashing back tightly against the roofing membrane. Slope counterflashing down near roof edges.
- M. Install sealer pocket pans with pourable sealer and as otherwise required by the roofing system materials suppliers.
- N. Install other miscellaneous sheet metal items as shown on the Drawings and as specified herein and in the SMACNA Manual to provide a neat, weathertight installation.
- O. Slope gutters 1/4 inch per 10 feet, minimum.
- P. Connect downspouts to storm sewer system, and grout connection watertight.

3.04 CLEANING AND PROTECTION

- A. Touch-up exposed surfaces which are visible or which might cause corrosion of metal or deterioration of finish with touch-up paint approved by the sheet metal manufacturer. Only minor scratches and fastening heads shall be touched-up. Other damaged material shall be replaced.
- B. Protection: Installer shall advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure that work will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

**SECTION 07 71 00
ROOF SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof Penetration Systems.

1.02 REFERENCE STANDARDS

- A. NRCA (RM) - The NRCA Roofing Manual 2022.

PART 2 PRODUCTS

2.01 COMPONENTS

- A. Roof Penetration Sealing Systems: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
 - 1. Application: Roof vent and pipe flashing for flat roofs, shingled roofs, and corrugated metal roofs.
 - 2. Products:
 - a. Dynamic Fastener; Dyna-Flash: www.dynamicfastener.com.
 - b. W.W. Grainger Inc.: www.grainger.com.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

- A. Sealant for Joints in Linear Components: As recommended by component manufacturer.
- B. Adhesive for Anchoring to Roofing: Compatible with roofing material.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

END OF SECTION

**SECTION 07 92 00
JOINT SEALANTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 09 21 16 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

1.03 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer 2015 (Reapproved 2022).
- B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants 2018 (Reapproved 2022).
- C. ASTM C834 - Standard Specification for Latex Sealants 2017.
- D. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications 2022.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
- F. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems 2016.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
- H. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants 2022.
- I. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants 2018.
- J. SCAQMD 1168 - Adhesive and Sealant Applications 1989, with Amendment (2022).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 4. Substrates the product should not be used on.
 - 5. Certification by manufacturer indicating that product complies with specification requirements.
- C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection. Samples shall be strips of actual caulking. Paper samples shall not be acceptable.
- D. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
- E. Executed warranty.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

- B. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
 - 1. Adhesion Testing: In accordance with ASTM C794.
 - 2. Compatibility Testing: In accordance with ASTM C1087.
 - 3. Allow sufficient time for testing to avoid delaying the work.
 - 4. Deliver sufficient samples to manufacturer for testing.
 - 5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
 - 6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide listed manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.
 - 1. Urethane Sealants: Five years
 - 2. Silicone Sealants: Twenty years.
- C. Extended Correction Period: Correct defective work within 5-year period commencing on Date of Substantial Completion.

1.07 JOB CONDITIONS

- A. Weather and Temperature: Sealants shall be installed on dry days preferably with temperatures between 40F and 55F, but in no case shall sealants be installed when temperatures are below 40F or above 90F.
- B. Protection: Special care shall be exercised to prevent damage to adjacent work during installation of sealants.
- C. Sequencing:
 - 1. Install sealant adjacent to painted and stained surfaces before adjacent surfaces receive their final coat of paint or stain.
 - 2. Install sealants after brickwork and concrete is washed down and before water repellent treatment is applied.
 - 3. Caulking shall not begin until all samples have been approved and until a meeting has been held at the construction site between the Architect/Engineer and the caulking subcontractor to discuss miscellaneous caulking requirements and workmanship.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

- A. Scope:
 - 1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to:
 - a. Wall expansion and control joints.
 - b. Joints between door, window, and other frames and adjacent construction.
 - c. Joints between different exposed materials.
 - d. Openings below ledge angles in masonry.
 - e. Other joints indicated below.
 - 2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
 - a. Joints between door, window, and other frames and adjacent construction.
 - b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
 - 1) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated.

- c. Other joints indicated below.
3. Do not seal the following types of joints:
 - a. Intentional weep holes in masonry.
 - b. Joints indicated to be treated with manufactured expansion joint cover, or some other type of sealing device.
 - c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
 - d. Joints where installation of sealant is specified in another section.
 - e. Joints between suspended panel ceilings/grid and walls.
- B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
 1. Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.
 2. Joints within and at perimeter of Exterior Insulation Finish System.
- C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
 1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
 2. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
 3. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.
 4. Interior Expansion Joints at Exterior Walls.
- D. Interior Wet Areas: restrooms, kitchens, and food service areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.
- E. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

2.02 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

2.03 NONSAG JOINT SEALANTS

- A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
 1. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
 2. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 3. Products:
 - a. Dow; DOWSIL 790 Silicone Building Sealant: www.dow.com/#sle.
 - b. Dow; DOWSIL 791 Silicone Weatherproofing Sealant: www.dow.com/#sle.
 - c. Pecora Corporation: www.pecora.com/#sle.
 - d. Tremco Commercial Sealants & Waterproofing; Spectrem 1: www.tremcosealants.com/#sle.
 - e. Tremco Commercial Sealants & Waterproofing; Spectrem 3: www.tremcosealants.com/#sle.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
 1. Color: White.
 2. Products:
 - a. Dow; Dowsil 786 Silicone Sealant: www.dow.com.
 - b. General Electric; Sanitary SCS1700 Sealant: www.siliconeforbuilding.com.
 - c. Tremco Commercial Sealants & Waterproofing; Tremsil 200: www.tremcosealants.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 50 percent, minimum.
 2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
 3. Products:
 - a. Pecora Corporation; Dynatrol II: www.pecora.com/#sle.
 - b. Sika Corporation; Sikaflex-2c NS: www.usa-sika.com/#sle.
 - c. Tremco Commercial Sealants & Waterproofing; Vulkem 116: www.tremcosealants.com/#sle.
 - d. Tremco Commercial Sealants & Waterproofing; Dymeric 511: www.tremcosealants.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface .
1. Movement Capability: Plus and minus 35 percent, minimum.
 2. Products:
 - a. Pecora Corporation; NR-200 Urexpan: www.pecora.com.
 - b. Sika Corporation; Sikaflex-2c NS: www.usa.sika.com/#sle.
 - c. Tremco Commercial Sealants & Waterproofing; THC-900: www.tremcosealants.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use. Acoustical Sealant for use at penetrations through walls and at the tops of walls.
1. Color: To be selected by Architect from manufacturer's standard range.
 2. Products:
 - a. Hilti, Inc; CP 506 Smoke and Acoustical Sealant: www.us.hilti.com/#sle.
 - b. Master Builders Solutions; MasterSeal NP 520: www.master-builders-solutions.com/en-us/#sle.
 - c. Pecora Corporation; AC-20: www.pecora.com/#sle.
 - d. Tremco Commercial Sealants & Waterproofing; Tremstop Smoke and Sound: www.tremcosealants.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 SELF-LEVELING JOINT SEALANTS

- A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
1. Movement Capability: Plus and minus 25 percent, minimum.
 2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
 3. Products:
 - a. Sika Corporation; Sikaflex-2c SL: www.usa.sika.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Self-Leveling Polyurethane Sealant for Horizontal Expansion Joints: ASTM C920, Grade P, Uses T, M and O; multi-component; explicitly approved by manufacturer for horizontal expansion joints.
1. Movement Capability: Plus and minus 25 percent, minimum.
 2. Hardness Range: 30 to 35, Shore A, when tested in accordance with ASTM C661.
 3. Products:
 - a. Tremco Commercial Sealants & Waterproofing; THC-901: www.tremcosealants.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Self-Leveling Polysulfide Sealant: ASTM C920, Grade P, Uses M and A; multicomponent; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
1. Movement Capability: Plus and minus 25 percent.
 2. Hardness Range: 30 to 55, Shore A, when tested in accordance with ASTM C661.

3. Products:
 - a. W.R. Meadows, Inc; Deck-O-Seal (pourable): www.wrmeadows.com/#sle.
 - b. W.R. Meadows, Inc; Deck-O-Seal 125: www.wrmeadows.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
 1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
 2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
 3. Open Cell: 40 to 50 percent larger in diameter than joint width.
 4. Where used with hot-applied sealant, provide heat-resistant type which will not be deteriorated by sealant application temperature as indicated.
 5. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
 6. Products:
 - a. Master Builders Solutions: www.master-builders-solutions.com/en-us/#sle.
 - b. Nomaco, Inc: www.nomaco.com/#sle.
 - c. W.R. Meadows: www.wrmeadows.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Overlay Extrusion for Glazing System Joint Protection: Rubber profiled extrusions placed over joints in glazing system and provided with watertight seal.
 1. Profile: As required to match existing metal glazing cap requirements.
- C. Preformed Extruded Silicone Joint Seal: Pre-cured low-modulus silicone extrusion, in sizes to fit applications indicated on drawings, combined with a neutral-curing liquid silicone sealant for bonding joint seal to substrates.
 1. Thickness: 0.78 inch, with ridges along outside bottom edges for bonding area.
 2. Products:
 - a. Tremco Commercial Sealants & Waterproofing; Spectrem Simple Seal: www.tremcosealants.com/#sle.
- D. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- E. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- F. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- G. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

- A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Install acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- E. Install bond breaker backing tape where backer rod cannot be used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

DIVISION 08 – OPENINGS

**SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Thermally insulated hollow metal doors with frames.

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware.
- B. Section 09 90 00 - Painting: Field painting.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2022.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2020.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable 2021a.
- G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.
- H. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete 2020.
- I. ASTM C476 - Standard Specification for Grout for Masonry 2022.
- J. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames 2016.
- K. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
- L. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames 2002.
- M. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames 2011.
- N. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames 2017.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- D. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Supplier of Hollow Metal Doors and Frames shall be responsible for all coordination and preparation of hardware and wood and hollow metal doors and frames as they relate to each other.
- B. Hardware Templates: Templates shall be furnished to the fabricator by the hardware manufacturer. The fabricator shall drill and tap all holes, and make all cutouts and

reinforcement in frames and doors to receive hardware in a neat and proper manner.

- C. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Inspect hollow metal work upon delivery for damage or manufacturing defects. Minor damages and defects may be repaired provided items are equal in all respects to new work and acceptable to the Architect. Rejected work shall be replaced with new items.
- C. Delivery and Storage: Doors shall be shipped individually packed. Frames shall be shipped with angle spreaders at door opening bottoms. Doors and frames shall be stored on the building site, in an upright position, under cover, on wood sills or floors, in a manner that will prevent rust or damage. Ventilate canvas or plastic covers to avoid humidity build-up.
- D. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 3. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
 - 4. Steelcraft, an Allegion brand: www.allegion.com/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
 - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 3. Door Edge Profile: Manufacturers standard for application indicated.
 - 4. Typical Door Face Sheets: Flush.
 - 5. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

- A. Interior Doors, Non-Fire Rated:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A 1 000 000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gauge, 0.053 inch, minimum.
 - 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 - 3. Door Thickness: 1-3/4 inches, nominal.

4. Door Finish: Factory primed and field finished.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Frame Finish: Factory primed and field finished.
- C. Exterior Door Frames: Full profile/continuously welded type.
 1. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
 2. Weatherstripping: Separate, see Section 08 71 00.
- D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
- E. Transom Bars: Fixed, of profile same as jamb and head.
- F. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- G. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.

2.05 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

- A. Removable Stops: Formed sheet steel, mitered or butted corners; prepared for countersink style tamper proof screws.
- B. Astragals for Double Doors: Specified in Section 08 7100.
- C. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
- D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

2.07 FABRICATION

- A. Fabricate metal doors and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Grind and fill all visible projection welds as required to make welded areas smooth, flush and invisible on exposed faces. No visible grind marks from fabrication will be allowed. The level of surface grinding prior to prime painting shall be as sufficient so that all grinding is invisible on exposed faces regardless of the sheen of the painted finish. The Owner reserves the right to reject any surface where visible grinding marks are found after final finish regardless of whether surface preparation was done according to manufacturer's standard practices or SDI standards.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Coordinate frame anchor placement with wall construction.
- C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

- D. Install door hardware as specified in Section 08 71 00.
- E. Coordinate installation of electrical connections to electrical hardware items.
- F. Touch up damaged factory finishes.

3.03 TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION

**SECTION 08 31 00
ACCESS DOORS AND PANELS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall- and ceiling-mounted access units.
- B. Floor-mounted access door and frame units, interior.

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware: Mortise cylinder and core hardware.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate exact position of each access door and/or panel unit.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store access doors and frames in protective cartons to protect from damage.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

- A. Wall-Mounted Units:
 - 1. Location: As indicated on drawings.
 - 2. Panel Material: Steel.
 - 3. Size: 24 by 24 inches.
 - 4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
- B. Ceiling-Mounted Units:
 - 1. Location: As indicated on drawings and as required for Mechanical/Electrical access. If ceiling-mounted units are not indicated on the Drawings, coordinated locations with Architect.
 - 2. Panel Material: Steel.
 - 3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
- C. Interior Floor-Mounted Access Units:
 - 1. Location: As indicated on drawings.

2.02 WALL- AND CEILING-MOUNTED ACCESS UNITS

- A. Manufacturers:
 - 1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com/#sle.
 - a. Multipurpose Access Panel: Activar/JL Industries TM.
 - 2. ACUDOR Products Inc: www.acudor.com/#sle.
 - 3. Karp Associates, Inc; KDW Series: www.karpinc.com/#sle.
 - 4. Milcor, Inc; DW: www.milcorinc.com/#sle.
 - 5. Nystrom, Inc; NW Series: www.nystrom.com/#sle.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
 - 1. Style: Exposed frame with door surface flush with frame surface.
 - 2. Door Style: Single thickness with rolled or turned in edges.
 - 3. Frames: 16-gauge, 0.0598-inch minimum thickness.
 - 4. Single Steel Sheet Door Panels: 16-gauge, 0.0625-inch minimum thickness.
 - 5. Steel Finish: Primed.
 - 6. Primed and Factory Finish: Polyester powder coat; color as selected by Architect from manufacturer's standard colors.

7. Size: As indicated above.
 - a. Provide a minimum clear access door opening dimension of 12-inches x 12-inches on ductwork, when possible.
 - b. Verify size specified is adequate for area/equipment to be accessed.
8. Hardware:
 - a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
 - b. Coordinate cylinders and key with door hardware supplier to match remainder of the building. See Section 087100.

2.03 FLOOR-MOUNTED ACCESS UNITS

- A. Floor-Mounted Access Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
 1. Size: Verify existing opening for size required.
 2. Hardware: Steel, hot-dipped galvanized.
 - a. Hinges: Removable pin.
 - b. Lock: Cylinder lock with latch, two keys for each unit.
- B. Interior Floor-Mounted Access Units: Steel, minimum 1/4 inch thick.
 1. Design Load: Design to support live load of 300 psf with deflection not to exceed 1/180 of span.
 2. Operation: Manual opening, and manual closing.
 3. Cover Pattern: Diamond tread plate.
 4. Lift Handle: Removable.
 5. Finish: Rust inhibiting primer.
 6. Manufacturers:
 - a. BILCO Company; Type Q - Angle Frame, steel: www.bilco.com/#sle.
 - b. Nystrom, Inc: www.nystrom.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.
- D. Coordinate location of ceiling access panel with overhead coiling grill requirements.

3.04 ADJUST AND CLEAN

- A. Adjust hardware and panels after installation for proper operation.
- B. Remove and replace panels and frames which are warped, bowed or otherwise damaged.

END OF SECTION

**SECTION 08 36 13
SECTIONAL DOORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Overhead sectional doors, manually operated.
- B. Operating hardware and supports.

1.02 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- B. DASMA 102 - American National Standard Specifications for Sectional Doors 2018.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
- C. Product Data: Show component construction, anchorage method, and hardware.
- D. Operation Data: Include normal operation, troubleshooting, and adjusting.

1.04 QUALITY ASSURANCE

- A. Provide each sectional overhead door as a complete unit produced by one manufacturer, including frames, sections, brackets, guides, tracks, counterbalance mechanisms, hardware, operators and installation accessories, to suit openings and head room allowable.
- B. Inserts and Anchorages: Furnish inserts and anchoring devices which must be built into masonry for installation of units. Provide setting drawings, templates, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.
- C. Wind Loading: Design and reinforce sectional overhead doors to withstand a 20 lb. per sq. ft. wind loading pressure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sectional Doors:
 - 1. Overhead Door Co.; Series 595: www.overheaddoor.com.
 - 2. Raynor Garage Doors; Model TC 200: www.raynor.com.
 - 3. Wayne-Dalton, a Division of Overhead Door Corporation; Thermospan Model 200-20: www.wayne-dalton.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 STEEL DOORS

- A. Steel Doors: Flush steel, insulated; standard lift operating style with track and hardware; complying with DASMA 102, Commercial application.
 - 1. Door Nominal Thickness: 2 inches thick.
 - 2. Exterior Finish: Factory finished with standard factory finish; color as selected from manufacturers standard line.
 - 3. Interior Finish: Factory finished with standard factory finish; color as selected from manufacturers standard line.
 - 4. Manual Operation: Chain hoist.
- B. Door Panels: Steel construction; outer steel sheet of 20 gage, 0.0359 inch minimum thickness, flush profile; inner steel sheet of 24 gage, 0.0239 inch minimum thickness, flat profile; core reinforcement sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; expanded polystyrene (EPS) insulation.

2.03 COMPONENTS

- A. Track: Provide manufacturer's standard galvanized steel track system sized for door size and weight, and designed for clearance shown. Provide complete track assembly including brackets, bracing and reinforcing.
- B. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.
- C. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.
 - 1. For Manual Operation: Requiring maximum exertion of 25 lbs force to open.
- D. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.
- E. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.
- F. Head Weatherstripping: EPDM rubber seal, one piece full length.
- G. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.
- H. Lock: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.
- I. Lock Cylinders: Master keyed to building keying system. Use Schlage S123 keyway.

2.04 MATERIALS

- A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G60/Z180 coating, plain surface.
- B. Insulation: Expanded polystyrene (EPS), bonded to facing.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

3.02 PREPARATION

- A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

3.03 INSTALLATION

- A. Install door unit assembly in accordance with manufacturer's instructions.
- B. Anchor assembly to wall construction and building framing without distortion or stress.
- C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
- D. Fit and align door assembly including hardware.
- E. Install perimeter trim.

3.04 TOLERANCES

- A. Maximum Variation from Plumb: 1/16 inch.
- B. Maximum Variation from Level: 1/16 inch.
- C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.
- D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING

- A. Adjust door assembly for smooth operation and full contact with weatherstripping.

3.06 CLEANING

- A. Clean doors and frames.
- B. Remove temporary labels and visible markings.

3.07 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.
- B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION

**SECTION 08 38 00
TRAFFIC DOORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Double-acting self-closing swinging traffic doors.
- B. Door accessories.
- C. Door frames.

1.02 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's technical information for each type of door specified, including details about materials, components, profiles, gaskets, and finishes; include:
 - 1. Preparation and installation instructions and methods.
 - 2. Storage and handling requirements and recommendations.
 - 3. Operation and maintenance data.
- C. Shop Drawings: Show installation details of doors and frames, including elevations and attachment.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver product in manufacturer's original unopened packages with label legible and intact.
- B. Store doors at project site on edge or in upright position, under cover and elevated above grade, following manufacturer's instructions.

1.04 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer's standard two-year warranty that products are free of defects in material and workmanship, guaranteeing to replace (exclusive of freight and labor) parts proven defective within two years after date of shipment to purchaser.

PART 2 PRODUCTS

2.01 RIGID TRAFFIC DOORS

- A. Wood Core Double-Acting Traffic Doors : Wood core laminated with finish faces both sides, edges sealed or trimmed.
 - 1. Core: Moisture resistant composite wood core; 3/4 inches thick.
 - 2. Finish: Same finish both sides.
 - 3. Faces: Stainless steel, Type 304, with No. 4 brushed satin finish; 20 gauge minimum base metal thickness.
 - 4. Edge Trim: Type 304 stainless steel wrap-around channel trim applied over finish faces.
 - 5. Manufacturers:
 - a. Eliason Corporation; Model EHH-3: www.eliasoncorp.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Door Assemblies: Provide double-acting, self-closing pairs of doors and frame ; factory fabricated and finished, complete with hinges and specified accessories.
 - 1. Door Swing: Minimum of 90 degrees each direction.
 - 2. Hinges: V-cam gravity hinges at top and pivots at bottom; mounted on bottom of header and on top of floor; maximum rise 1-1/2 inches; vertical and horizontal adjustment in the field .
 - 3. Hinge Guards: Manufacturer's standard material and configuration, to protect lower hinges from damage.
 - 4. Exposed Metal Parts: Either stainless steel, extruded aluminum, or powder coated.
 - 5. View Windows: Provide view window in each door panel unless otherwise indicated, centered in door width, and 48 inches, maximum, from finish floor to bottom of viewing area.

6. Dimensional Tolerances: Plus or minus 1/4 inch in width and height of each panel.
- C. View Windows: Factory installed glazing in molded or extruded black thermoplastic or rubber gasket; use single glazing unless otherwise indicated.
 1. Rectangular-Shaped Window Size: Manufacturer's standard - 9 inches by 14 inches.
 - a.
 2. Single Glazing: Acrylic glazing sheet, 1/4 inch thick, clear.

2.02 ACCESSORIES

- A. Frames: Provide doors pre-hung in frames by door manufacturer; Type 304 stainless steel welded frame.
- B. Provide fasteners and other hardware as recommended by manufacturer for complete installation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that jambs and frames are square and plumb.
- B. Verify that opening is ready to receive work and opening dimensions and clearances are as indicated on drawings.
- C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.
- D. Commencement of work by installer is acceptance of opening conditions.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.

3.03 INSTALLATION

- A. Install doors with clearances, anchors, hardware, and accessories according to the manufacturer's instructions and as specified.
- B. Install doors plumb, level, and properly aligned.
- C. Minimum jamb construction of double studded 2 by 4 wood construction or equivalent.
- D. Reinforce hollow metal jambs at hardware locations.

3.04 ADJUSTING

- A. Clean and lubricate operating parts.
- B. Adjust doors to open and close smoothly and freely without binding and for proper fit of seals.

3.05 CLEANING

- A. Clean surfaces using methods as recommended by manufacturer.

END OF SECTION

**SECTION 08 42 29
AUTOMATIC ENTRANCES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sliding type packaged power-operated door assemblies.
- B. Controllers, actuators and safety devices.

1.02 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- B. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2019.
- C. BHMA A156.10 - Power Operated Pedestrian Doors 2017.
- D. ITS (DIR) - Directory of Listed Products Current Edition.
- E. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL (DIR) - Online Certifications Directory Current Edition.
- G. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate layout and dimensions; head, jamb, and sill conditions; elevations; components, anchorage, recesses, materials, and finishes, electrical characteristics and connection requirements.
- C. Product Data: Include system components, sizes, features, and finishes.
- D. Executed warranty.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Wrenches and other tools required for maintenance of equipment.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience and approved by manufacturer.
 - 1. Certified by AAADM.
- C. Source Limitations: Obtain automatic entrance door assemblies through one source from a single manufacturer.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Emergency-Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrances serving as a required means of egress.

1.05 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 1-year manufacturer warranty for defects in material and workmanship from date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design - Sliding Automatic Entrance Door Assemblies:
 - 1. Stanley Access Technologies; Dura-Glide 2000 Sliding: www.stanleyaccess.com/#sle.
- B. Other Manufacturers - Sliding Automatic Entrance Door Assemblies:
 - 1. ASSA ABLOY Entrance Solutions: www.besam-usa.com/#sle.
 - 2. Horton Automatics, a division of Overhead Door Corporation: www.hortondoors.com/#sle.

2.02 POWER OPERATED DOORS

- A. Power Operated Doors: Provide products that comply with NFPA 101 and requirements of authorities having jurisdiction; provide equipment selected for actual door weight and for light pedestrian traffic, unless otherwise indicated.
 - 1. Sliding and Folding Door Operators: In the event of power failure, provide for manual open, close, and break-away operation of door leaves.
 - 2. Packaged Door Assemblies: Provide components by single manufacturer, factory-assembled, including doors, frames, operators, actuators, and safeties.
 - a. Finish exposed equipment components to match door and frame finish.
 - 3. Air Leakage: Maximum of 1.0 cfm/sf of wall area, when tested in accordance with ASTM E283/E283M at 1.57 psf pressure differential across assembly.
 - 4. Exterior and Vestibule Doors: Provide equipment suitable for operating temperature range of minus 20 to plus 140 degrees F ambient.
- B. Sliding and Folding Doors with Full Power Operators: Comply with BHMA A156.10; safeties required; provide break-away operation unless otherwise indicated; in the event of break-away operation, interrupt power operation.
 - 1. Comply with UL 325; acceptable evidence of compliance includes UL (DIR) listing or test report by testing agency acceptable to authorities having jurisdiction.
 - 2. Force Required to Swing Break-Away Panel: 50 pound-force, maximum, measured at 1 inch from the latch edge of the door at any point in the closing cycle.

2.03 AUTOMATIC ENTRANCE DOOR ASSEMBLIES

- A. Comply with ADA Standards for egress requirements.
- B. Framing and Transom Members: Provide manufacturer's standard extruded aluminum framing, reinforced as required to support imposed loads.
 - 1. Nominal Sizes:
 - a. Single Slide and Bi-Parting Sliding Doors: 1-3/4 inch wide by 4-1/2 inch deep.
 - 2. Transoms: Provide flush glazed transom with framing that is integral with automatic entrance framing system.
- C. Door and Sidelight Construction: Heavy duty interlocked extruded aluminum tubular stile and rail sections, through-rod bolted construction with steel corner support at hinge stile of carrier-suspended swinging panels to reduce sag in sliding or breakout mode.
 - 1. Door Thickness: 1-3/4 inch, nominal.
 - 2. Stile Design:
 - a. Medium stile, 3-1/2 inch, nominal width.
 - 3. Top Rail Height: 4 inch, nominal.
 - 4. Bottom Rail Height: 10 inch, nominal.
 - 5. Glazing Stops: Manufacturer's standard snap-on extruded aluminum square stops with preformed resilient glazing gaskets.
 - 6. Glazing Stop Width: Manufacturers standard.
 - 7. Glazing Thickness: 1/4 inch at interior locations and 1/2 inch at exterior locations.
- D. Sliding Automatic Door: Bi-parting double leaf track-mounted, electric operation, extruded aluminum glazed door, with frame, and operator concealed overhead.
 - 1. Operation: Power open, power close operation.
 - 2. Door and Frame Finish: Same as adjacent framing system.

2.04 DOOR OPERATORS

- A. General: Provide door operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, operation under normal traffic load for type of occupancy indicated.
- B. Electromechanical Operators: Two (2) self-contained overhead units, 1/4 horsepower minimum, permanent-magnet DC motors with gear reduction drives, microprocessor controller; and encoder.
 - 1. Power opening and power closing.
 - 2. Features:
 - a. Adjustable opening and closing speeds.
 - b. Adjustable open check and close check speeds.
 - c. Adjustable hold-open time between 0 and 30 seconds.
 - d. Obstruction recycle.
 - e. On/Off switch to control electric power to operator.
 - f. Energy conservation switch that reduces door-opening width.
 - g. Closed loop speed control with active braking and acceleration.
 - h. Adjustable obstruction recycle time delay.
 - i. Self-adjusting stop position.
 - j. Self-adjusting closing compression force.
 - k. Onboard sensor power supply.
 - l. Onboard sensor monitoring.
 - m. Optional Switch to open/Switch to close operation.
 - n. Fire alarm interface, configurable to safely open or close the entrance on signal from fire alarm system.
 - 3. Mounting: Concealed.
 - 4. Drive System: Synchronous belt type
- C. Electrical service to door operators shall be provided under Division 26 Electrical. Minimum service to be 120 VAC, 5 amps.

2.05 CONTROLLERS, ACTUATORS, AND SAFETIES

- A. Controller: Provide microprocessor operated controller for each door.
- B. Comply with BHMA A156.10 for actuator and safety types and zones.
- C. Combined Activation and Safety Sensors: Combined activation and safety sensors shall, in a single housing, detect motion and presence in accordance with ANSI/BHMA A156.10. Motion shall be detected using K-band microwave technology, presence by active infrared reflection technology.
- D. Photoelectric Beams: In addition to the threshold sensor include a minimum of two (2) doorway holding beams. Photoelectric beams shall be pulsed infrared type, including sender receiver assemblies for recessed mounting.
- E. Presence Sensor Monitoring: Sliding automatic entrances control system shall include a means to verify the functionality of all active presence sensors in accordance with ANSI/BHMA A156.10. A detected fault shall cause automatic operation to cease until the fault is corrected.

2.06 HARDWARE

- A. General: Provide units in sizes and types recommended by automatic entrance door and hardware manufacturers for entrances and uses indicated.
- B. Emergency Breakaway Feature: Provide release hardware that allows panel(s) to swing out in direction of egress to full 90 degrees from any position in sliding mode. Maximum force to open panel shall be 50 lbf (222 N) according to ANSI/BHMA A156.10. Interrupt powered operation of panel operator while in breakaway mode.
 - 1. Emergency breakaway feature shall include at least one adjustable detent device mounted, in the top of each sliding breakaway panel, and in the top and bottom of each non-sliding breakaway panel, to control panel breakaway force.

2. Wind Resistant Damper: Provide factory installed concealed gas dampers in sliding or non-sliding breakaway panel to protect door panels from wind damage. Dampers shall be designed to slow panel movement after breakout.
- C. Deadlocks: Manufacturer's standard deadbolt operated by exterior cylinder and interior thumb turn; with minimum 1 inch (25 mm) long throw bolt; ANSI/BHMA A156.5, Grade 1.
- D. Control Switch: Provide manufacturer's standard rotary switch mounted on the interior jamb to allow for full control of the automatic entrance door.
- E. Power Switch: Sliding automatic entrances shall be equipped with a two position On/Off rocker switch to control power to the door.
- F. Sliding Weather Stripping: Manufacturer's standard replaceable components complying with AAMA 701; made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- G. Weather Sweeps: Manufacturer's standard adjustable nylon brush sweep mounted to underside of door bottom.

2.07 FABRICATION

- A. General: Factory fabricates automatic entrance door assembly components to designs, sizes, and thickness indicated and to comply with indicated standards.
 1. Form aluminum shapes before finishing.
 2. Use concealed fasteners to greatest extent possible.
- B. Framing: Provide automatic entrances as prefabricated assemblies.
 1. Fabricate tubular and channel frame assemblies with manufacturer's standard mechanical or welded joints. Provide sub-frames and reinforcement as required for a complete system to support required loads.
 2. Perform fabrication operations in manner that prevents damage to exposed finish surfaces.
 3. Form profiles that are sharp, straight, and free of defects or deformations.
 4. Prepare components to receive concealed fasteners and anchor and connection devices.
 5. Fabricate components with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.
- C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.
- D. Welding: Comply with AWS A5.10/A5.10M - Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods.
- E. Door Operators: Factory fabricated and installed in headers, including adjusting and testing.
- F. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated. Hardware: Factory install hardware to the greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site.
- G. Hardware: Factory install hardware to the greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available, at the correct location, and is of the correct characteristics.

3.02 INSTALLATION

- A. Install equipment in accordance with manufacturer's written instructions, except where more stringent requirements are specified.

- B. General: Do not install damaged components. Fit frame joints to produce joints free of burrs and distortion. Rigidly secure non-movement joints.
- C. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
 - 1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
 - 2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.
- D. Door Operators: Connect door operators to electrical power distribution system as specified in Division 26 Sections.
- E. Glazing: Performed under Division 8 Section "Glazing" in accordance with sliding automatic entrance manufacturer's instructions.
- F. Sealants: Comply with requirements specified in Division 7 Section "Joint Sealants".

3.03 ADJUSTING

- A. Adjust entrances for correct function and smooth operation, without binding or scraping and without excessive noise; lubricate operating hardware and other moving parts.

3.04 CLEANING

- A. Remove temporary protection; clean exposed surfaces.

3.05 CLOSEOUT ACTIVITIES

- A. Demonstrate operation, operating components, adjustment features, and lubrication requirements.

END OF SECTION

**SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.

1.02 RELATED REQUIREMENTS

- A. Section 08 42 29 - Automatic Entrances.
- B. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.
- C. Section 08 80 00 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site 2015.
- B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems 2015.
- C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections 2009.
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
- E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.
- F. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2019.
- G. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference 2014 (Reapproved 2021).
- H. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference 2000 (Reapproved 2016).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. All frame details which will incorporate glazing shall be coordinated with the glass manufacturer to assure that all details, methods of frame weepage, materials and methods of installation are in accordance with the glass manufacturer's requirements.
- C. All hardware preparation, reinforcing and other requirements shall be coordinated with the hardware supplier to assure proper operation and fit of all doors and hardware items.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
- D. Samples: Submit two samples of 4-inch long extrusions illustrating finished aluminum surface, glass, glazing materials.
- E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

- F. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.07 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.08 MOCK UP

- A. Install one representative aluminum frame condition for Owner/Architect approval prior to installing the remaining locations.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide 10 year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- D. Provide 10 year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

- A. Center-Set Style, Thermally-Broken (Exterior Aluminum Frames):
 - 1. Basis of Design: Kawneer North America; Trifab VG 451T: www.kawneer.com.
 - 2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
- B. Center-Set Style, Not Thermally-Broken (Interior Aluminum Frames):
 - 1. Basis of Design: Kawneer North America; Trifab II 450.
 - 2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
- C. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
 - 1. Manko Window Systems, Inc: www.mankowindows.com/#sle.
 - 2. EFCO, a Pella Company; S430: www.efcocorp.com/#sle.
 - 3. Tubelite Inc.; T14000 Series: www.tubeliteinc.com.

2.02 BASIS OF DESIGN -- SWINGING DOORS

- A. Wide Stile, Insulating Glazing, Thermally-Broken:
 - 1. Basis of Design: Kawneer North America; Model 500T: www.kawneer.com.
 - 2. Thickness: 2-1/4 inches.
- B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
 - 1. EFCO, a Pella Company: www.efcocorp.com/#sle.
 - 2. Manko Window Systems, Inc.: www.mankowindows.com.
 - 3. Tubelite Inc.: www.tubeliteinc.com.

2.03 ALUMINUM-FRAMED STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Finish: Class I color anodized.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - 2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.

3. Fabrication: To the greatest possible extent, complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.
4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
9. Maintain continuous air barrier and/or vapor retarder seal throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel, and heel bead of glazing compound.

2.04 PERFORMANCE REQUIREMENTS

- A. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
- B. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.
- C. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.
- D. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.
- E. Overall U-value Including Glazing: 0.45 Btu/(hr sq ft deg F), maximum.

2.05 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
 1. Framing members for interior applications need not be thermally broken.
 2. Glazing Stops: Manufacturer's standard blade-type stops.
- B. Glazing: See Section 08 80 00.
- C. Swing Doors: Glazed aluminum.
 1. Thickness: 1-3/4 inches.
 2. Glazing Stops: Manufacturer's standard blade-type stops.
 3. Finish: Same as storefront.
- D. Closure plates and brake metal: Provide matching closure plates and brake metal at locations noted on the Drawings. Brake metal shall be 0.040-inch thick aluminum.
- E. Insulated Infill Panel (IMFP):
 1. Insulated metal-faced panels shall be 1-inch thick Mapes Architectural Building panels manufactured by Mapes Industries, Inc. Panels shall consist of interior and exterior surfaces of 26-gauge embossed, primed aluminum sheets over 1/8-inch water-resistant tempered hardboard, all sandwiched over a polystyrene insulation core. Color shall match storefront color - See Section 09 99 90 - Color Schedule. Equal panels manufactured by Laminators, Inc. will also be acceptable.

2.06 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).

- B. Fasteners: Stainless steel.
 - 1. Do not use exposed fasteners except where unavoidable. Exposed fasteners shall match finish of frame members.
- C. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch minimum thickness; finish to match framing members.
- D. Concealed Flashings: Galvanized steel, 26 gauge, 0.0179 inch minimum base metal thickness.
- E. Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber.
- F. Glazing Accessories: See Section 08 80 00.
- G. Caulking materials for internal frame joints, fasteners, etc., shall be of a color to most closely match the aluminum framing, and of the types recommended by the frame manufacturer. Caulking which is totally concealed may be of any color selected by the manufacturer.
- H. All caulking of frame perimeters shall comply with the requirements, materials and colors specified in Section 07 92 00, and shall be included under this Section.

2.07 FINISHES

- A. Color: Black.

2.08 HARDWARE

- A. For each door, include weatherstripping, sill sweep strip, and threshold.
- B. Coordinate installation of security components at exterior doors. Coordinate as required with the door hardware supplier, the electrical sub-contractor and the Owner's security system provider. When there are electrical door hardware items being installed, the aluminum frame supplier shall provide boxes of the appropriate size to protect the hardware devices from damage and also to allow room for wire termination and installation of the electrified hardware items.
- C. Other Door Hardware: See Section 08 71 00.
- D. Weather-stripping:
 - 1. Meeting stiles on pairs of doors shall be equipped with an adjustable astragal utilizing wool pile with polymeric fin.
 - 2. The door weathering on a single acting offset pivot or butt hung door and frame (single or pairs) shall be comprised of a thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.
- E. Sill Sweep Strips: EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners
- F. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Anchor securely in place, separating aluminum and other corrodible metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials. At points where members are attached to structure, use nylon or neoprene washers or other non-metallic

materials for separation to allow for movement due to thermal range between aluminum unit and structure.

- E. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- F. Provide thermal isolation where components penetrate or disrupt building insulation.
- G. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- H. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- J. Set thresholds in bed of sealant and secure to provide weathertight construction. Comply with requirements of the frame manufacturer regarding sealant types. Caulking at the perimeter of all frames where abutting adjacent materials shall be included in Section 07 9200.
- K. Drill frames and doors and install hardware items with bolted connections, complying with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible. Check and adjust as required to maintain a tight fit against all weatherstripping.
- L. Install glass in accordance with Section 08 80 00, using glazing method required to achieve performance criteria.
- M. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

- A. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
 - 1. Perform a minimum of two tests in each designated area . Test not less than 2% minimum of each window system. Field verify exact location of testing with Architect in the field.
 - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.

3.05 ADJUSTING

- A. Adjust operating hardware for smooth operation.

3.06 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

3.07 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

**SECTION 08 71 00
FINISH HARDWARE**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Door Hardware, including electric hardware.
 - 2. Storefront and entrance door hardware.
 - 3. Power supplies for electric hardware.
 - 4. Low energy door operators plus sensors and actuators.
 - 5. Cylinders for doors fabricated with locking hardware.
 - 6. Wiring and riser diagrams for electric hardware.
- B. Related Sections:
 - 1. Section 08 11 00 - Hollow Metal Doors and Frames.
 - 2. Section 08 43 13 - Aluminum Framed Storefronts.

1.02 REFERENCES:

- A. Use date of standard in effect as of Bid date.
- B. American National Standards Institute – ANSI 156.18 – Materials and Finishes.
- C. ICC/ANSI A117.1 - 1998 – Specifications for making buildings and facilities usable by physically handicapped people.
- D. ADA – Americans with Disabilities Act of
- E. BHMA – Builders Hardware Manufacturers Association
- F. DHI – Door and Hardware Institute
- G. NFPA – National Fire Protection Association
 - 1. NFPA 80 – Fire Doors and Windows
 - 2. NFPA 101 – Life Safety Code
 - 3. NFPA 105 – Smoke and Draft Control Door Assemblies
 - 4. NFPA 252 – Fire Tests of Door Assemblies
- H. UL – Underwriters Laboratories
 - 1. UL10B – Fire Tests of Door Assemblies as amended to incorporate positive pressure testing.
 - 2. UL 305 – Panic Hardware
- I. WHI – Warnock Hersey Incorporated
- J. Local applicable codes
- K. SDI – Steel Door Institute
- L. AWI – Architectural Woodwork Institute
- M. NAAMM – National Association of Architectural Metal Manufacturers

1.03 SUBMITTALS & SUBSTITUTIONS

- A. SUBMITTALS: Submit six copies of schedule per Division 1. Organize vertically formatted schedule into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:
 - 1. Type, style, function, size, quantity and finish of hardware items. Use BHMA Finish codes per ANSI A156.18.
 - 2. Name, part number and manufacturer of each item.
 - 3. Fastenings and other pertinent information.
 - 4. Location of hardware set coordinated with floor plans and door schedule.
 - 5. Explanation of abbreviations, symbols, and codes contained in schedule.
 - 6. Mounting locations for hardware.
 - 7. Door and frame sizes, materials and degrees of swing.

8. List of manufacturers used and their nearest representative with address and phone number.
 9. Catalog cuts.
 10. Manufacturer's technical data and installation instructions for electronic hardware.
 11. Date of jobsite visit.
- B. Bid and submit manufacturer's updated/improved item if scheduled item is discontinued.
- C. Make substitution requests in accordance with Division 1. Include product data and indicate benefit to the Project. Furnish operating samples on request.
1. Items listed with no substitute manufacturers have been requested by Owner to meet existing standard.
- D. Furnish as-built/as-installed schedule with closeout documents, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

1.04 QUALITY ASSURANCE:

- A. Qualifications:
1. Hardware supplier: direct factory contract supplier who employs a Certified Architectural Hardware Consultant (AHC), available at reasonable times during course Work for project hardware consultation to Owner, Architect and Contractor. (This does not include DBA suppliers).
 - a. Responsible for detailing, scheduling and ordering of finish hardware.
- B. Hardware: New, free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.
- C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.
- D. Fire-Rated Openings: NFPA 80 compliant. Hardware UL10C / UBC Standard 7-2 (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, and resilient seals. Coordinate with wood door section for required intumescent seals. Furnish openings complete.
- E. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions.
1. Where scheduled item is now obsolete, bid and furnish manufacturer's updated item at no additional cost to Owner.
- F. Pre-Installation Meetings: Initiate and conduct with supplier, installer and related trades, coordinate materials and techniques, and sequence complex hardware items and systems installation. Include manufacturers' representatives of locks, panic hardware and door closers in the meetings. Convene at least one week prior to commencement of related work.

1.05 DELIVERY, STORAGE AND HANDLING:

- A. Delivery: coordinate delivery to appropriate locations (shop or field).
1. Permanent keys and cores: secured delivery direct to Owner's representative.
 2. Hardware for aluminum door manufacture direct to supplier excluding power supplies, electrical boards and actuators
- B. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.
- C. Storage: Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc.

1.06 PROJECT CONDITIONS:

- A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical as the same operation and quality as type specified, subject to Architect's approval.

- B. Prior to submittal, carefully inspect existing conditions to verify finish hardware required to complete Work, including sizes, quantities, existing hardware scheduled for re-use, and sill condition material. If conflict between the specified/scheduled hardware and existing conditions, submit request for direction from Architect. Include date of jobsite visit in the submittal.
 - 1. Submittals prepared without thorough jobsite visit by qualified hardware expert will be rejected as non-compliant.

1.07 SEQUENCING AND COORDINATION:

- A. Reinforce walls for wall-mounted hardware.
- B. Coordinate finish floor materials and floor-mounted hardware.
- C. Conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.
- D. Furnish manufacturer templates to door and frame fabricators.
 - 1. Ensure proper blocking in wood doors to support wood screws for panic hardware and door closers.
 - 2. Ensure proper reinforcement in aluminum doors, aluminum frames, metal doors and frames to support machine screws for panic hardware and door closers.
- E. Use hardware consultant to check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.

1.08 WARRANTY:

- A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' warranties:
 - 1. Locksets: ND series Seven years.
 - 2. Exit Devices: Three years mechanical, one year electrical.
 - 3. Closers: Thirty years mechanical, two years electrical.
 - 4. Butt Hinges Lifetime.
 - 5. Other Hardware: One year.

1.09 COMMISSIONING:

- A. Conduct these tests three weeks prior to request for certificate of substantial completion
- B. Test door hardware operation with climate control system and stairwell pressurization system both at rest and while in full operation.
- C. Test electrical, electronic and electro-pneumatic hardware systems for satisfactory operation.
- D. Test hardware interfaced with fire/life-safety system for proper operation and release.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Listed acceptable alternate manufacturers: submit for review products with equivalent function and features of scheduled products.

ITEM	MANUFACTURER	ACCEPTABLE SUB
Hinges	(IVE) Ives	McKinney, Stanley
Continuous Hinges	(IVE) Ives	McKinney, ABH
Key System	(SCH) Schlage Primus	No Substitution
Locks	(SCH) Schlage	No Substitution
Exit Devices	(VON) Von Duprin	No Substitution
Closers	(LCN) LCN	No Substitution
Operators	(LCN) LCN	No Substitution
Auto Flush Bolts	(IVE) Ives	Rockwood, Trimco
Coordinators	(IVE) Ives	Rockwood, Trimco
Push & Pull Plates	(IVE) Ives	Rockwood, Trimco
Kickplates	(IVE) Ives	Rockwood, Trimco

ITEM	MANUFACTURER	ACCEPTABLE SUB
Stops & Holders -	(IVE) Ives	Rockwood, Trimco
Overhead Stops	(GLY) Glynn-Johnson	ABH, Sargent
Thresholds	(IVE) Ives	NGP, Pemko
Seals & Bottoms	(IVE) Ives	NGP, Pemko

2.02 HINGING METHODS:

- A. Note: drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening. Advise architect if 8-inch width is insufficient.
- B. Conventional Hinges: Steel or stainless steel pins and concealed bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.
 - 1. Three hinges per leaf to 7 foot, 6 inch height. Add one for each additional 30 inches in height, or any fraction thereof.
 - 2. Extra heavy weight hinges on doors over 3 foot, 5 inches in width.
 - 3. Extra-heavy weight hinges on doors with panic hardware or fire exit devices.
 - 4. Out swinging exterior doors: non-ferrous with non-removable (NRP) pins.
 - 5. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.
 - 6. Provide shims and shimming instructions for proper door adjustment.
- C. Continuous Hinges:
 - 1. Geared-type aluminum at exteriors.
 - 2. Heavy-duty, extra-bearing units for doors over 3 foot, 5 inches in width.
 - 3. Heavy-duty, extra-bearing units for doors with panic hardware or fire exit devices.
 - 4. Use wide-throw units where needed for maximum degree of swing, advise architect if commonly available hinges are insufficient.
 - 5. Verify hinge type required; supply depending on door and frame being supplied in aluminum door and frame section. At no additional cost to Owner EXAMPLE (Kawneer 500 Wide Stile use Ives 112HD and EFCO use Ives 224HD).

2.03 LOCKSETS, LATCHSETS, DEADBOLTS:

- A. Extra Heavy Duty Cylindrical Locks and Latches: as scheduled.
 - 1. Chassis: cylindrical design, corrosion-resistant plated cold-rolled steel, through-bolted.
 - 2. Locking Spindle: stainless steel, interlocking design.
 - 3. Latch Retractors: forged steel. Balance of inner parts: corrosion-resistant plated steel, or stainless steel.
 - 4. Backset: 2-3/4" typically, more or less as needed to accommodate frame, door or other hardware.
 - 5. Lever Trim: accessible design, independent operation, spring-cage supported, minimum 2" clearance from lever mid-point to door face.
 - 6. Electric operation: Manufacturer-installed continuous duty solenoid.
 - 7. Strikes: 16 gage curved steel, bronze or brass with 1" deep box construction, lips of sufficient length to clear trim and protect clothing.
 - 8. Lock Series and Design: Schlage ND series, "Rhodes" and L series 06A/06N design.
 - a. Certifications:
 - 1) ANSI A156.2, 1994, Series 4000, Grade 1.
 - 2) UL listed for A label and lesser class single doors up to 4ft x 8ft.
 - 9. Accepted substitutions: Schlage No Substitutions

2.04 EXIT DEVICES / PANIC HARDWARE

- A. General features:
 - 1. Independent lab-tested 1,000,000 cycles.
 - 2. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.

3. End caps: impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.
 4. No exposed screws to show through glass doors.
 5. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
 6. Releasable in normal operation with 15-lb. maximum operating force per UBC Standard 10-4, and with 32 lb. maximum pressure under 250-lb. load to the door.
 7. Flush end cap design as opposed to typical "bottle-cap" design end cap.
 8. Comply with CBC Section 1003.3.1.9.
- B. Specific features:
1. Lever Trim: Breakaway type, forged brass or bronze escutcheon min .130" thickness, compression spring drive, match lockset lever design.
 2. Impact recessed devices: 1-1/4inch projection when push-pad is depressed. Sloped metal end caps to deflect carts, etc. No pinch points to catch skin between touchbar and door.
 3. Electrically Operated Devices: Single manufacturer source for electric latch retraction devices with hex dogging and slide cover omit hole; omit hex dogging for fire doors, power transfers, power supplies.
 4. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key.
 5. Accepted substitutions: Von Duprin No Substitutions

2.05 CLOSERS

- A. Surface Closers: [4011/4111]
1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
 2. ISO 2000 certified. Units stamped with date-of-manufacture code.
 3. Independent lab-tested 10,000,000 cycles.
 4. Non-sized and adjustable.
 5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
 6. Opening pressure: Exterior doors 8.5 lb., interior doors 5 lb., labeled fire doors 15 lb.
 7. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
 8. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units. EDA arms: rigid main and forearm, reinforced elbow.
 9. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
 10. Exterior doors do not require seasonal adjustments in temperatures from 120 degrees F to -30 degrees F, furnish data on request.
 11. Non-flaming fluid, will not fuel door or floor covering fires.
 12. Pressure Relief Valves (PRV): unsafe, not permitted.
 13. Accepted substitutions: LCN No Substitutions
- B. Low-Energy Door Operators: Comply with ANSI/BHMA 156.19 Electric power-open, hydraulically checked spring power closing. Modular construction. Finished metal cover. Field-adjustable opening force, opening speed, time-open, closing and latching speeds. Door reopens and timing cycle restores if system reactivated during closing cycle.
1. Self-contained low-voltage power supply, terminal strip and sequencing for incorporation of electric hardware with system operation.
 2. Accepted substitutions: LCN No Substitutions

2.06 OTHER HARDWARE

- A. Automatic Flush Bolts: Low operating force design, "LBR" type where scheduled.
- B. Kick Plates: Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.
- C. Door Stops: Provide stops to protect walls, casework or other hardware.

1. Unless otherwise noted in Hardware Sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
 2. Locate overhead stops for maximum possible opening. Consult with Owner for furniture locations. Minimum: 90deg stop / 95deg deadstop. Note degree of opening in submittal.
- D. Through-bolts: Do not use. Coordinate with wood doors, ensure provision of proper blocking to support wood screws for mounting panic hardware and door closers. Coordinate with metal doors and frames, ensure provision of proper reinforcement to support machine screws for mounting panic hardware and door closers.
- E. Silencers: Interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Omit where adhesive mounted seal occurs. Leave no unfilled/uncovered pre-punched silencer holes.

2.07 FINISH

- A. Generally BHMA 626 Satin Chromium.
1. Areas using BHMA 626 to have push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise noted.
- B. Door closers: factory powder coated to match other hardware, unless otherwise noted.

2.08 KEYING REQUIREMENTS:

- A. Key System: Schlage Everest keyway.
1. Keying is by owner.
- B. Key Cylinders: furnish 6-pin solid brass construction.
1. 2 keys per cylinder.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install hardware per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.
1. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.
 2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.
 3. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.
 4. Replace fasteners damaged by power-driven tools.
- B. Locate floor stops no more than 4 inches from walls and not within paths of travel. See paragraph 2.2 regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.
- C. Locate overhead stops for minimum 90 degrees and maximum allowable degree of swing.
- D. Drill pilot holes for fasteners in wood doors and/or frames.
- E. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

3.02 ADJUSTING

- A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.
1. Hardware damaged by improper installation or adjustment methods to be repaired or replaced to Owner's satisfaction.
 2. Adjust doors to fully latch with no more than 1 pound of pressure.

3. Adjust delayed-action closers on fire-rated doors to fully close from fully-opened position in no more than 10 seconds.
- B. Inspection: Use hardware supplier. Include supplier's report with closeout documents.
- C. Follow-up inspection: Installer to provide letter of agreement to Owner that approximately 6 months after substantial completion, installer will visit Project with representatives of the manufacturers of the locking devices and door closers to accomplish following:
 1. Re-adjust hardware.
 2. Evaluate maintenance procedures and recommend changes or additions, and instruct Owner's personnel.
 3. Identify items that have deteriorated or failed.
 4. Submit written report identifying problems and likely future problems.

3.03 DEMONSTRATION:

- A. Demonstrate electrical, electronic and pneumatic hardware systems, including adjustment and maintenance procedures.

3.04 PROTECTION/CLEANING:

- A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.
- B. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.

3.05 SCHEDULE OF FINISH HARDWARE

- A. See door schedule in drawings for hardware set assignments.
- B. Manufacturers and their abbreviations used in this schedule:

GLY	Glynn-Johnson Hardware
IVE	H. B. Ives
LCN	LCN Closers
SCH	Schlage Lock Company
SCE	Schlage Lock Electronics
VON	Von Duprin
ZE	Zero
- C. See Attached Document.

END OF SECTION

Cubby's Fremont Renovation

HW SET: 01

DOOR NUMBER:

108.1

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	224XY	628	IVE
1	EA	PANIC HARDWARE	99NL 990NL	626	VON
1	EA	RIM CYLINDER	20-022	626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW CS B4E	630	IVE
1	EA	DOOR VIEWER	495	626	PEE
1	SET	SEALS HEAD/JAMB	429A	BLK	ZER
1	EA	RAIN DRIP	142A	AL	ZER
1	EA	THRESHOLD	8655A	AL	ZER
1	EA	SWEEP	8197AA	AL	ZER

HW SET: 02

DOOR NUMBER:

105 106

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY SET	ND40S RHO	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	MOP PLATE	8400 4" X 1" LDW CS B4E	630	IVE
1	EA	KICK PLATE	8400 10" X 2" LDW CS B4E	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE

HW SET: 03

DOOR NUMBER:

107

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	224XY	628	IVE
1	EA	PASSAGE	ND10 RHO	626	SCH
1	EA	SURFACE CLOSER	4111 CUSH	689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW CS B4E	630	IVE
1	SET	SEALS HEAD/JAMB	488	BLK	ZER

HW SET: 04

DOOR NUMBER:

113

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PULL	8303-0	630	IVE
1	EA	PULL	8200 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW CS B4E	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE

Cubby's Fremont Renovation

HW SET: 05

DOOR NUMBER:

107.2 **107.1**

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	224XY	628	IVE
1	EA	PASSAGE	ND10 RHO	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	OVERHEAD STOP	450S	652	GLY
1	EA	KICK PLATE	8402 10" X 2" LDW CS B4E	630	IVE
1	SET	SEALS HEAD/JAMB	488	BLK	ZER
1	EA	THRESHOLD	8655A	AL	ZER
1	EA	SWEEP	8197AA	AL	ZER

HW SET: 06

DOOR NUMBER:

116

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRY SET	ND53 RHO	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW CS B4E	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE

END OF SECTION

**SECTION 08 80 00
GLAZING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Glazing compounds.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.
- B. Section 08 42 29 - Automatic Entrances: Glazing provided as part of door assembly.
- C. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.
- D. Section 10 28 00 - Toilet, Bath, and Laundry Accessories: Mirrors.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials Current Edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test 2015 (Reaffirmed 2020).
- C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers 2005 (Reapproved 2019).
- D. ASTM C1036 - Standard Specification for Flat Glass 2021.
- E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.
- F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass 2019.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
- H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass 2021a.
- I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings 2016.
- J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation 2019.
- K. GANA (SM) - GANA Sealant Manual 2008.
- L. NFRC 100 - Procedure for Determining Fenestration Product U-factors 2020.
- M. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence 2020.
- N. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems 2023.
- O. UL (DIR) - Online Certifications Directory Current Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples 12 by 12 inch in size of glass units.

- E. Certificate: Certify that products of this section meet or exceed specified requirements.

1.05 COORDINATION

- A. The glazing subcontractor shall coordinate his/her requirements with the steel frame subcontractors to assure that frames are provided with required bite, edge, and face clearance.

1.06 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: All areas of glazing shall comply with all applicable codes, including but not limited to the International Building Code, Edition as noted in the Drawings. In case of conflict between that regulation and these Drawings and Specifications, the requirements of the regulatory agency shall govern.
- B. Glass Standards: Glass installations shall meet the requirements of ASTM C1036. Heat-treated glass shall meet the requirements of ASTM C1048. Safety glass shall meet the requirements of Standard CPSC 16 CFR 1201.
- C. Glass material containing bubbles, scratches, or other glass shall be removed immediately upon notice.
- D. Manufacturer's Label: Each piece of glass shall bear the manufacturer's label.

1.07 STORAGE AND HANDLING

- A. Stack glazing sheets at 5 to 7 degrees from vertical. Separate sheets with interweaving of protection paper and cushion top and bottom edges with felt. Cover to protect material from wind-blown water or run-off, but provide for ventilation and circulation of cool, dry air. Maintain temperature above dew point. Protect glazing material from welding, sandblasting, and other potentially damaging operations before and after installation.
- B. Handle glazing sheets to prevent damage to edges and corners.

1.08 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Warranty on Hermetic Seals: Provide insulating glass manufacturer's written warranty, agreeing to, within specified warranty period, furnish FOB project site, replacement units for insulating glass units which have defective hermetic seals (excluding that due to glass breakage); defined to include intrusion of moisture or dirt, internal condensation at temperatures above -20F, and other visual evidence of seal failure or performance failure; provided manufacturer's instructions for handling, installation, protection, and maintenance have been adhered to during warranty period. If this warranty is not honored by the glass manufacturer because of defective installation procedures or other actions of the glazing subcontractor, that subcontractor shall be liable for the terms of that warranty for a period of 5 years after the date of Substantial Completion.
- C. Warranty period is 10 years after seal date permanently imprinted on unit, but not less than 9 years after date of Substantial Completion.
- D. All glass shall be warranted for 10 years against breakage due to defects in materials, workmanship or installation with all such glass immediately removed and replaced with matching new material at no additional cost to the Owner upon notification by the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Float Glass Manufacturers:
 1. Guardian Glass, LLC: www.guardianglass.com/#sle.
 2. Pilkington North America Inc: www.pilkington.com/na/#sle.
 3. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - 2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - 3. Glass thicknesses listed are minimum.
- B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
 - 1. In conjunction with weather barrier related materials described in other sections, as follows:
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
 - 1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 - 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 - 2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
 - 3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
 - 4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
- B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
 - 1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category II impact test requirements.

2.04 INSULATING GLASS UNITS

- A. Manufacturers:
 - 1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
 - 2. Guardian Glass, LLC: www.guardianglass.com/#sle.
 - 3. Insulite Glass Co.: www.insuliteglass.com.
 - 4. ITI Glass: www.itiglass.com.
 - 5. Oldcastle Building Envelope: www.obe.com.
 - 6. Pilkington North America Inc: www.pilkington.com/na/#sle. Pilkington North America Inc: www.pilkington.com/na/#sle.
 - 7. Viracon, Apogee Enterprises, Inc: www.viracon.com/#sle.
 - 8. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
 - 9. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Insulating Glass Units: Types as indicated.
 - 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 - 2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 - 3. Spacer Color: Aluminum.
 - 4. Edge Seal:
 - a. Single-Sealed System: Provide silicone sealant as seal applied around perimeter.
 - 5. Color: Grey.

6. Purge interpane space with dry air, hermetically sealed.
- C. Type CTIG - Clear Tempered Insulating Glass Units: Vision glass, double glazed.
 1. Applications: Exterior glazing unless otherwise indicated.
 2. Space between lites filled with air.
 3. Outboard Lite: Fully tempered float glass, 1/4 inch thick.
 - a. Tint: Clear.
 - b. Coating: VNE-63, on #2 surface.
 4. Inboard Lite: Fully tempered float glass, 1/4 inch thick.
 - a. Tint: Clear.
 5. Total Thickness: 1 inch.
 6. Thermal Transmittance (U-Value), .29 Winter and .26 Summer, nominal.
 7. Visible Light Transmittance (VLT): 51 percent, nominal.
 8. Shading Coefficient: .28, nominal.
 9. Solar Heat Gain Coefficient (SHGC): .25, nominal.

2.05 GLAZING UNITS

- A. Type CTG - Clear Tempered Glass: Non-fire-rated.
 1. Applications:
 - a. Glazed lites in doors, except fire doors.
 - b. Glazed sidelights to doors, except in fire-rated walls and partitions.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations indicated on drawings.
 2. Glass Type: Fully tempered safety glass as specified.
 3. Tint: Clear.
 4. Thickness: 1/4 inch.

2.06 GLAZING SEALANTS

- A. Glazing Sealant for the exterior perimeter of all glass panes where they abut frame members (unless recommended otherwise by the glass manufacturer) shall be the following type and manufacturer:
 1. General Electric Company; SCS2000 SilPruf.
- B. Other glazing sealants shall be of the type and manufacture recommended by the glazing manufacturer for the type of glass and application.
- C. Sealant Backer Rod: To be compressible continuous length rod stock of closed cell polyethylene foam for use as back-up of butt joint sealants as shown on the Drawings. Color shall be manufacturer's standard. Backer rod shall be of the diameter as recommended by the Fabricator/Installer and shall be one of the following or as otherwise recommended by the Fabricator/Installer:
 1. BASF; MasterSeal 920: www.basf.com.
 2. W.R. Meadows, Inc.; Kool-Rod: www.wrmeadows.com.
- D. Joint Primer/Sealer: To be the type of joint/sealer recommended by the sealant manufacturer for the joint surfaces to be primed, bonded, and sealed.

2.07 ACCESSORIES

- A. Setting Blocks: Neoprene or EPDM, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene or EPDM, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

- D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
- E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 STANDARDS AND PERFORMANCE

- A. Watertight and airtight window and door installation of each glass product is required, except as otherwise shown. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating doors), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the work.
- B. Protect all glass from edge damage during handling and installation, and subsequent operation of glazed components of the work. During installation, discard units with significant edge damage or other imperfections.
- C. Glazing channel dimensions as shown are intended to provide for necessary bite on glass, minimum edge clearance, and adequate sealant thicknesses, with reasonable tolerance. Adjust as required by job conditions at time of installation.
- D. Comply with combined recommendations and technical reports by manufacturers of glass and glazing products as used in each glazing channel, and with recommendations of Flat Glass Marketing Association "Glazing Manual," except where more stringent requirements are indicated.
- E. Install insulating glass units to comply with recommendations by Sealed Insulating Glass Manufacturers Association, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.

3.03 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry immediately before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.
- D. Coordinate with painter to assure that all metal frames have received their first coat of paint before glazing is started.

3.04 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

- F. Continuous glazing tape shall be installed at both faces of all glass. Exterior glazing shall be sealed at the full perimeter of each pane with silicone sealant where the glass abuts the metal frames.
- G. Make silicone joints where interior glass abuts glass and wall materials without frames.
- H. Install setting blocks of proper size and spacing, for glass sizes larger than 50 united inches, except where pre-shimmed tapes are used for glazing. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
- I. Install tempered glass sheets in frame openings with manufacturer's identification seal placed in the lower right hand corner of each lite opening.
- J. Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from the glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.
- K. Clean and trim excess glazing materials from glass and stops or frames promptly after installation, and eliminate stains and discolorations.

3.05 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

DIVISION 09 – FINISHES

**SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal stud wall framing.
- B. Metal channel ceiling framing.
- C. Acoustic insulation.
- D. Gypsum sheathing.
- E. Cementitious backing board.
- F. Gypsum wallboard.
- G. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 05 40 00 - Cold-Formed Metal Framing: Structural steel stud framing.
- B. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.
- C. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members 2016, with Supplement (2020).
- B. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing 2020.
- C. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing 2015, with Errata (2020).
- D. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units 2018.
- E. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units 2019.
- F. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire 2019.
- G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- H. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members 2015.
- I. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus 2019.
- J. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board 2017 (Reapproved 2022).
- K. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board 2004 (Reapproved 2020).
- L. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
- M. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.
- N. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2020.
- O. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness 2022.

- P. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2022.
- Q. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base 2019.
- R. ASTM C1278/C1278M - Standard Specification for Fiber-Reinforced Gypsum Panel 2017.
- S. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing 2018.
- T. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units 2022.
- U. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.
- V. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels 2019, with Editorial Revision (2020).
- W. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2021.
- X. GA-216 - Application and Finishing of Gypsum Panel Products 2021.
- Y. SSMA - Steel Stud Manufacturers Association Current Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on metal framing, gypsum board, glass mat faced gypsum board, accessories, and joint finishing system.
 - 1. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- C. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

1.05 QUALITY ASSURANCE

- A. Allowable Tolerances: On faces of work exposed in occupied spaces, including stairwells (if any), limit offsets between planes of board faces to 1/8-inch, and limit variations from plumb and location (including warp and bow) not to exceed 1/4-inch in 8'-0".
- B. Install gypsum board on walls, partitions and furring to within 1/8-inch of floor to provide full backing for resilient base.

1.06 DELIVERY STORAGE AND HANDLING

- A. Delivery: Gypsum wallboard shall not be delivered to the project site until immediately before application is to begin. All gypsum drywall materials shall be delivered in original packages, containers or bundles bearing brand name and identification nomenclature.
- B. Storage: Gypsum wallboard boards shall be stored inside under cover and stacked flat in a manner to keep material flat, dry, protected from weather, direct sunlight, surface contamination, traffic or other construction damage. Other materials and accessories shall remain in their original wrappings or containers, sorted flat and protected from damage or bending until ready for actual use.
- C. Handling: Handle gypsum boards in a manner to prevent damage to edges, ends and surfaces. Damaged gypsum boards and accessories shall not be incorporated within the work and shall be immediately removed from the site.
- D. Steel framing and related accessories shall be stored and handled in accord with A.I.S.I. "Code of Standard Practice".

1.07 JOB CONDITIONS

- A. Environmental Requirements, General: Comply with requirements of referenced gypsum board application standards and recommendations of gypsum board manufacturer, for environmental conditions before, during, and after application of gypsum board.

- B. Temperature: When outside temperatures are below 55F, maintain continuous interior temperature in the range of 55F to 70F for minimum period of 48 hours prior to, during, and following application of gypsum board, joint and finishing treatment materials or bonding of adhesives.
- C. Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent drying too rapidly.
- D. Protection: Protect all adjacent surfaces and work by suitable means from splatter or overspray from texture surface application.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
 - 1. See PART 3 for finishing requirements.

2.02 METAL FRAMING MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S240.
- B. Manufacturers - Metal Framing, Connectors, and Accessories:
 - 1. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com/#sle.
 - 2. MBA Metal Framing: www.mbastuds.com.
 - 3. Marino: www.marinoware.com/#sle.
 - 4. Phillips Manufacturing Co: www.phillipsmfg.com/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Structural Steel Framing for Application of Gypsum Board: See Section 05 40 00.
- D. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
 - 1. Framing and Suspension Materials: When 20-gauge and 25-gauge materials are specified below, they shall be fabricated from commercial quality galvanized steel with a minimum yield point of 33,000 psi. 20-gauge material shall have a design thickness of .0312-inch and the 25-gauge material shall have a design thickness of .0188-inch as defined by SSMA (Steel Stud Manufacturers Association).
 - 2. Studs: "C" shaped with flat or formed webs consisting of 25-gauge and 20-gauge galvanized steel, 1-5/8 inch, 3-5/8 inch, 4 inch and 6 inch screw type studs and track or as may otherwise be indicated on the Drawings.
 - a. 25-gauge studs shall be used throughout, except 20-gauge shall be used at the following locations:
 - 1) All interior studs that are over 12-feet total height.
 - 2) All 4-inch and 6-inch interior studs.
 - 3) All interior studs which support wall-mounted cabinets and plumbing fixtures.
 - 3. Runners: 20-gauge galvanized U shaped, sized to match studs with 1-1/2-inch minimum legs placed at the top of all walls abutting structural members above as indicated on the Drawings.
 - 4. Ceiling Channels: C-shaped.
 - 5. Furring: Hat-shaped sections, minimum depth of 7/8 inch fabricated from 0.021-inch hot dipped galvanized steel..
 - 6. Z-Channel: 2 inches.
- E. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection and prevent rotation of studs while maintaining structural performance of partition.
 - 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
 - 2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot-dipped galvanized coating.

- F. Non-structural Framing Accessories:
 - 1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

- G. Fastenings Shall be as Follows:

Studs to track	3/8-inch drywall, type S, pan head screws
Track to masonry	1/4-inch diameter hooked anchor bolts
Track to concrete floor and furring studs and channel to masonry	Cartridge driven studs or concrete nails
Track to metal deck	Self-tapping screws (toggle bolts required to hang heavy bulkheads in tension)

2.03 SUSPENSION SYSTEM

- A. Grid Suspension System: ASTM C645 , manufacturer's standard grid suspension system composed of main beams and cross furring members which interlock to form a modular supporting network.
- B. Wire for Hangers and Ties: ASTM A641/A641M , soft, Class 1 zinc coated (galvanized).
 - 1. Hanger Wire: No. 11 gauge galvanized wire.
 - 2. Tie Wire: No. 16 gauge galvanized wire.
- C. Runner Channels: 20 gauge galvanized channels. Size shall be 1-1/2-inches deep by 19/32-inch wide. Also, provide 25-gauge studs for ceiling/bulkhead suspension where shown on the Drawings.
- D. Furring Channels: 25 gauge electrogalvanized steel.
 - 1. Products:
 - a. Same manufacturers as other framing materials.
- E. Furring Channel Clips: For clipping to furring channels shall be of galvanized wire and of the same manufacturer as the furring channels.
- F. At the Contractor's Option: In lieu of the above specified tie wire, runner channels, furring channels and furring channel clips, provide pre-engineered suspension system including main tees and cross channels manufactured by United States Gypsum Company, or equal system by any other manufacturer listed above, or Drywall Grid System or Shortspan Drywall Grid (as appropriate to the location as manufactured by Armstrong).

2.04 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 - 1. American Gypsum Company: www.americangypsum.com/#sle.
 - 2. CertainTeed Corporation: www.certainteed.com/#sle.
 - 3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
 - 4. National Gypsum Company: www.nationalgypsum.com/#sle.
 - 5. USG Corporation: www.usg.com/#sle.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 - 2. Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
 - 3. Unfaced fiber-reinforced gypsum panels as defined in ASTM C1278/C1278M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
 - 4. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
 - b. Mold resistant board is required at the interior face of all exterior walls as noted on Sheet A0-0.

5. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.
 6. Paper-Faced Products:
 - a. CertainTeed Corporation; Type X Drywall: www.certainteed.com/#sle.
 - b. USG Corporation; Sheetrock Brand Firecode X Panels 5/8 in. (15.9 mm): www.usg.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
 7. Mold-Resistant, Paper-Faced Products:
 - a. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Gypsum Board: www.goldbondbuilding.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
 8. Glass Mat Faced Products:
 - a. USG Corporation; Sheetrock Brand Glass-Mat Panels Mold Tough Regular 5/8 in. (15.9 mm): www.usg.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Backing Board For Wet Areas:
1. Application: For use at all areas where wall tile is shown or scheduled (see wall types) to be installed over stud walls.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
 - a. Products:
 - 1) PermaBASE Building Products, LLC provided by National Gypsum Company; PermaBase Cement Board: www.goldbondbuilding.com/#sle.
 - 2) USG Corporation; Fiberock Brand Aqua-Tough AR Interior Panels Regular 5/8 in. (15.9 mm): www.usg.com/#sle.
 - 3) Substitutions: See Section 01 60 00 - Product Requirements.
- D. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
1. Application: Exterior sheathing, unless otherwise indicated.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Core Type: Regular.
 4. Regular Board Thickness: 5/8 inch.
 5. Edges: Square.
 6. Glass Mat Faced Products:
 - a. Georgia-Pacific Gypsum; DensGlass Sheathing: www.gpgypsum.com/#sle.
 - b. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Fire-Shield Sheathing: www.goldbondbuilding.com/#sle.
 - c. United States Gypsum Company; Fiberock Aqua-Tough Exterior Panels.

2.05 GYPSUM BOARD ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3 1/2 - 6 inches.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- C. Water-Resistive Barrier: See Section 07 25 00.
- D. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
 1. Corner Beads: Low profile, for 90 degree outside corners.
 - a. Products:
 - 1) ClarkDietrich: www.clarkdietrich.com/#sle.
 2. Corner Beads at High Traffic Areas: Low profile, for 90 degree outside corners.
 - a. Products:

- 1) Pittcon Industries Inc.; SO-HSN-90 High Strength Corner:
3. Expansion Joints:
 - a. Type: 1/4-inch by 7/16-inch deep V-shaped metal with factory-installed protective tape.
 - b. Products:
 - 1) ClarkDietrick; 093 Zinc Control Joint (ZNCJ): www.clarkdietrich.com.
- E. Wall Protection Board: Board shall be installed on all walls abutting mop sinks full height as noted on the Drawings. Provide and install all moldings, end caps, nylon fasteners and other accessories of matching color as required for a complete installation. Coordinate to provide continuous joint sealants along floor line/base at all wall protection board locations.
 1. Color: Selected from manufacturer's standards.
 2. Product:
 - a. Crane Composites; Glasbord Wall Panels with Surfaseal Finish: www.cranecomposites.com.
- F. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 1. Tape: 2 inch wide, creased paper tape for joints and corners.
- G. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- H. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.
- I. Screws shall be 1-inch, Type S, drywall screws for securing gypsum board to metal studs and 1-1/4-inch, Type W drywall screws for securing gypsum board to wood furring. Longer screws, as recommended by the gypsum board manufacturer, shall be utilized to secure the exposed layer of gypsum board to the framing and suspension systems through the concealed layer at double layer walls, ceilings and bulkheads, and to attach and secure accessories. Provide other screws as recommended by the manufacturer for attachment of tile backer board to metal studs.
- J. Fasteners for Glass-Mat Gypsum Sheathing Board: 1-5/8" (41 mm), No. 8 (4.2 mm diameter) wafer-head steel drill screws complying with ASTM C 954, with an organic-polymer coating or other corrosion-protective coating having a salt-spray resistance of more than 500 hours per ASTM B117.
- K. Nails for Attachment to Wood Members: Annular ring nails, 1-1/2-inches long, GWB 54, ASTM C514.
- L. Adhesive for direct lamination of gypsum board panels at double layer walls, ceilings and bulkheads, and direct lamination of gypsum board to other substrates shall be selected as recommended by the gypsum board manufacturer for the specific applications and as approved by the Architect/Engineer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with AISI S220 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated below.
 1. Level ceiling system to a tolerance of 1/1200.
 2. Laterally brace entire suspension system.
 3. Hanger wires shall be spaced at 4-foot centers along runner channels, or closer spacing if recommended by the materials manufacturer, and shall be located 6-inches from ends. Adjust to a closer spacing if required to provide secure anchorage for double layer ceilings.

4. Runner channels shall be spaced at 4-foot centers, and shall be within 6-inches of parallel walls or ceiling boundaries. Lap runner channels 12-inches and tie near each end with double loops of tie wire. Substitute 25 gauge studs where shown on the Drawings. Studs used for ceiling suspension system shall be spaced at 16-inches on center unless noted otherwise.
 5. Furring channels shall be placed at right angles to runner channels and spaced at 16-inch centers. Fasten to runner channel with clips on alternate sides of runner channels. Lap furring channels 6-inches at splices and tie near ends with double loops of tie wire.
 6. Under the contractor's option as previously described, in lieu of the runner channels and furring channels specified above, install hanger wires, main tees and cross channels as recommended by the materials manufacturer.
- C. Studs: Space studs at 16 inches on center.
1. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
 2. Align track at floor, top of masonry walls, frames and overhead structure as indicated on the Drawings. Secure base track at 24-inch centers and at ends with power-driven fasteners as specified above. Head track to be held within the down turn legs of special formed 20-gauged galvanized steel slip runner track welded or secured to bottom side of structure above for lateral support with deflection allowance of 1/2-inch or as indicated on the Drawings. Bulkhead or other similar construction which is to be hung under tension shall have head track secured to structure at 16-inch centers minimum. Butt weld or splice track at joints.
 3. Set studs at partition ends, corners, and intersections, at jambs of openings and at 16-inch centers in between unless shown otherwise on Drawings. Seat studs squarely into track and plumb or align. Secure studs to track as required.
 4. If the partition is of such height that the studs must be spliced, do so by installing 2 horizontal runner channels back-to-back (one for the top of the lower wall and one for the bottom of the upper wall). Fasten the runner channels to each other and then install 3-5/8-inch metal stud diagonal knee braces at 8-foot maximum centers from on face of the studs to the structure.
 5. Install horizontal stiffener channels through studs at cut-out locations at maximum 6-foot centers in partitions which do not have GWB installed in both faces.
 6. Install knee braces for metal frames and for walls which terminate above the ceiling as required to provide lateral support.
- D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- E. Standard Wall Furring: Install at concrete and masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
- F. Blocking: Install wood blocking for support of:
1. Framed openings.
 2. Wall-mounted cabinets.
 3. Plumbing fixtures.
 4. Toilet accessories.
 5. Wall-mounted door hardware.
 6. Other items as indicated

3.03 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
 1. Place one bead continuously on substrate before installation of perimeter framing members.

2. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.04 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board of maximum practical length with long dimensions at right angles to furring, cross channels, and studs, with ends and edges occurring over firm bearing.
- C. Double-Layer Non-Rated: The finish layer shall be installed with screws spaced as specified above, and with adhesive as recommended by the manufacturer. All joints of the second (finish) layer shall be staggered for a minimum of 16-inches from the joints of the base layer. All screws for the finish layer shall be driven through the base layer into the framing above.
- D. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- E. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
 1. Seal joints, cut edges, and holes with water-resistant sealant.
 2. Paper-Faced Sheathing: Immediately after installation, protect from weather by application of water-resistive barrier.
- F. Cementitious Backing Board: Install over steel framing members where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- G. Openings: End joints may occur not closer than 8-inches from either side of openings in walls. No joint shall align with edges of openings, and joints above openings shall be centered over openings.
- H. Fastenings: Panels shall be held in firm contact with the support member while the nails and screws are being driven. Fastenings shall proceed from the central portion of the board toward ends and edges. Fastenings shall proceed from the central portion of the board toward ends and edges. Fastenings shall be driven home with the heads slightly below the surface of the board. Care shall be taken to avoid breaking the paper face. Improperly driven fastenings shall be removed. Space screws at 15-inch centers and locate 3/8-inch to 1/2-inch from edges of panels. At double layer walls and bulkheads, install finish layer with longer screws and adhesive as noted above for ceilings.
- I. Checking Fasteners: After installation, pound on walls and ceilings to detect loose fastenings and push on board adjacent to fasteners to see if there is movement. If loose fasteners are detected, drive them tight. Whenever fastenings have punctured paper, hold board tight against framing and install another fastener properly, approximately 1-1/2-inches from fastener head which punctured paper, and remove faulty fastener. When fastenings wallboard to second side of a partition, check the opposite side for fasteners loosened by pounding and drive them tight again.

3.05 GROUT

- A. Grout all hollow metal door frames which occur in stud walls by spot-grouting at the jamb anchor clips prior to inserting the gypsum board into the frame. Grout tightly to assure solid anchorage of the frames. Do not fill metal jambs full of grout. Spot grouting will not be required at metal frames that have jamb anchors welded to the frames.
 1. Not more than 30 feet apart on walls and ceilings over 50 feet long and in continuous lengths with fasteners spaced at 6-inch centers.
- B. Casing Beads: Casing beads shall be applied to all exposed edges and ends of gypsum wallboard, and wherever indicated on the Drawings with nails at 6-inch centers.
- C. Aluminum Corners: Shall be placed where shown on the Drawings in continuous jointless lengths and screw secured to metal stud framing at 6-inch centers to a true and straight alignment. Install ceiling trim in coordination with finish ceiling trim installation.

- D. Reveals: Reveals shall be placed where shown on the Drawings in continuous jointless lengths and screw secured to metal stud framing at 6-inch centers to a true and straight alignment. Install ceiling trim in coordination with finish ceiling trim installation.

3.06 JOINT TREATMENT

- A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
 - 2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 3. Level 3: Walls to receive textured wall finish.
 - 4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - 5. Level 1: Ceiling plenum areas above finished ceilings, whether or not accessible in the completed construction.
 - 6. Level 0: Temporary partitions.
 - 7. Level 0: Surfaces indicated to be finished in later stage of project.
- C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Taping: A uniformly thin layer of joint compound, approximately 4-inches wide, shall be applied over the joint. Tape shall be centered over the joint and embedded into the compound, leaving sufficient joint compound under the tape to provide proper bond. Wall angles, corners, returns and inside corner angles shall be reinforced with tape to conform to the angle and embedded into the compound. Taping and finishing shall be required for all below ceiling line exposed joints, and all joints behind tackwall surfaces. Taping only without finishing will be required for all fire rated partitions above the ceiling line, and for all gypsum board which covers steel structure members at return air plenum.
 - 2. Joint compound combinations to be utilized at gypsum board locations shall be as follows (note: use portland based product at cement board locations):
 - a. Embedding and First Coat: Ready-mixed or job-mixed, drying-type, all-purpose or taping compound.
 - b. Fill (Second) Coat: Ready-mixed or job-mixed, drying-type, all-purpose or topping compound.
 - c. Finish (Third) Coat: Ready-mixed or job-mixed, drying-type, all-purpose or topping compound.
 - 3. Finishing Joints: After compound is thoroughly dry, the tape shall be covered with a coat of joint compound or taping compound spread over the tape approximately 3-inches on each side of the tape and feathered out at the edge. After thoroughly dry, another coat of joint compound or taping compound shall be applied with a slight, uniform crown over the joint. This coat shall be smooth and the edges feathered approximately 3-inches beyond the preceding coat.
 - 4. Finishing Corners: All inside corners shall be coated with at least one coat of joint compound or topping compound with the edges feathered out. Flanges of wallboard corner bead shall be concealed by at least 2 coats of compound. The first coat shall be joint compound, and the second coat may be joint compound or topping compound feathered out approximately 9-inches on both sides of the exposed metal nose.
 - 5. Finish Nail or Screw Heads and Dimples: Apply three coats of joint compound or taping compound to all exposed gypsum board surfaces below the ceiling, and concealed behind tackwall locations. This may be applied as each coat is applied to the joints. Allow 24 hours drying time between coats, sanding between if necessary. Caution shall be used to avoid roughing of wallboard paper.
- D. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.07 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.08 PROTECTION

- A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION

**SECTION 09 30 00
TILING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Metal trim.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- B. Section 09 21 16 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

- A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium) 2019.
- B. ANSI A108/A118/A136.1 - Specifications for the Installation of Ceramic Tile 2020.
- C. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive 2021.
- D. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation 2019.
- E. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation 2022.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers. Coordinate with Architect.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Samples: Submit samples of each type and color of tile, base, trim and grout color required to the Architect/Engineer.
- D. Manufacturer's Certification: Tile shall be Quality Certified by the Tile Council of America, Inc., to equal or exceed the standard grade requirements of TCA 137.1. The Certification Mark of the Tile Council of America shall appear on each label or carton of tile.
- E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Tile: 2 square feet of each ceramic tile (CT) and 10 square feet of each 12"x24" porcelain tile (PT).

1.06 QUALITY ASSURANCE

- A. Maintain one copy of and ANSI A108/A118/A136 and TCNA (HB) on site.
- B. Installer Qualifications:
 - 1. Company specializing in performing tile installation, with minimum of ten years of documented experience and must submit 3 project references where like kind specified tile has been installed.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store materials in original containers with seals unbroken and labels intact until the time of use.
- B. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.
- B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.
- C. Protect work from environmental conditions and construction activities during and after installation in accordance with manufacturer's printed recommendations.

1.09 SETTING PRODUCTS SYSTEM WARRANTY

- A. Provide 5 Year System Warranty from manufacturer of waterproofing/anti-fracture membrane, mortar, grout, and sealant. Contractor must use only products called for under manufacturer's warranty and install per manufacturer's instructions.

PART 2 PRODUCTS

2.01 TILE

- A. Porcelain Tile Type (PT-1): ANSI A137.1, and as follows:
 - 1. Through-body Colored Porcelain; Style: Slate Attache.
 - 2. Distributer:
 - a. Daltile; Madison Schwartz: madison.schwartz@daltile.com.
 - 3. Size: 12x24 inches and 24x24 inches.
 - a. Cut to 6"x24" base where noted in Drawings.
 - 4. Grout joint of 1/8 inch is recommended.
- B. Porcelain Tile Type (PT-2,3): ANSI A137.1, and as follows:
 - 1. Through-body Colored Porcelain; Style: Altered State.
 - 2. Manufacturer: Crossville.
 - 3. Distributer:
 - a. Virginia Tile; Pamela Kocina-Kerzman: pamela.kocina-kerzman@virginiatile.com.
 - 4. Size: 6x24 inches.
 - 5. Grout joint of 1/8 inch is recommended.
- C. Porcelain Tile Type (PT-4): ANSI A137.1, and as follows:
 - 1. Through-body Colored Porcelain; Style: Nest.
 - 2. Manufacturer: Crossville.
 - 3. Distributer:
 - a. Virginia Tile; Pamela Kocina-Kerzman: pamela.kocina-kerzman@virginiatile.com.
 - 4. Size: 8x36 inches.
 - 5. Grout joint of 1/8 inch is recommended.
- D. Ceramic Tile Type CT-1: ANSI A137.1, and as follows:
 - 1. Glazed Ceramic Tile, Style Color Story Wall.
 - 2. Manufacturer: American Olean.
 - 3. Distributer:
 - a. Virginia Tile; Pamela Kocina-Kerzman: pamela.kocina-kerzman@virginiatile.com.
 - 4. Size and Shape: 8x24 inches.
 - 5. Edges: Square.
 - 6. Surface Finish: Gloss.
- E. Ceramic Tile Type CT-2: ANSI A137.1, and as follows:
 - 1. Glazed Ceramic Tile, Style Color Story Wall.
 - 2. Manufacturer: American Olean.
 - 3. Distributer:

- a. Virginia Tile; Pamela Kocina-Kerzman: pamela.kocina-kerzman@virginiatile.com.
4. Size and Shape: 4x12 inches.
5. Edges: Square
6. Surface Finish: Gloss.

2.02 TRIM AND ACCESSORIES

- A. Metal Trim: Satin natural anodized extruded aluminum, dimensions to suit application, for setting using tile mortar or adhesive.
 1. Metal Edge Trim for edges of porcelain tile floors not abutting walls shall be Schiene by Schluter Systems or clear satin aluminum angles as shown on the Drawings or otherwise required. Depths of aluminum extrusions or angles shall be as required for depth of the tile and setting bed.
 2. Metal Edge Trim at all vertical outside corners of porcelain wall tile and base tile and exposed top edges of porcelain wall tile shall be Quadec by Schluter Systems. Use longest lengths available to avoid multiple pieces per corner. When piecing lengths together is necessary, edges touching each other shall be smooth, factory edges to ensure tight seam.
 3. Manufacturers:
 - a. Schluter-Systems: www.schluter.com/#sle.
 - b. Genesis APS International: www.genesis-aps.com/#sle.
 - c. Genotek: www.genotek.com

2.03 SETTING MATERIALS

- A. Provide setting and grout materials from same manufacturer.
- B. Manufacturers:
 1. Bostik Inc: www.bostik-us.com/#sle.
 2. Bonsal American, Inc.: www.prospec.com.
 3. Custom Building Products: www.custombuildingproducts.com/#sle.
 4. LATICRETE International, Inc: www.laticrete.com/#sle.
- C. Basis of Design Thinset:
 1. LATICRETE International, Inc; 253 Gold: www.laticrete.com/#sle.

2.04 GROUTS

- A. Provide setting and grout materials from same manufacturer.
- B. Manufacturers:
 1. Laticrete International, Inc: www.laticrete.com
 2. Bonsal American, Inc: www.prospec.com
 3. Bostik Inc: www.bostik-us.com.
 4. Custom Building Products: www.custombuildingproducts.com
 5. Substitutions: See Section 01 60 00 - Product Requirements.
- C. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
 1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
 2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
 3. Color(s): As specified in Section 09 99 90 - Color Schedule.
 4. Products:
 - a. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
- D. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
 1. Applications: Restroom floor tile.
 2. Color(s): As specified in Section 09 99 90 - Color Schedule.
 3. Products:

- a. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout:
www.laticrete.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.03 INSTALLATION - GENERAL

- A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.
- B. Lay tile to pattern indicated on the drawings. Do not interrupt tile pattern through openings. Align joints when adjoining tiles on floor, base, walls and trim are the same size. Layout tile work and center tile fields in both directions in each space on each wall area. Adjust to minimize tile cutting. Maintain 1/8-inch joints at porcelain tile, unless recommended otherwise by tile manufacturer(s).
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Install metal trim in accordance with manufacturer's instructions.
- F. Sound tile after setting. Replace hollow sounding units.
- G. Keep control and expansion joints free of mortar, grout, and adhesive.
- H. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
- I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- J. Grout tile joints. Use epoxy grout at floors and base in restrooms. Grout tile according to the grout manufacturer's printed instructions.
- K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.
- L. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 CLEANING

- A. Clean tile and grout surfaces per manufacturers' recommended procedures.

3.05 PROTECTION

- A. Do not permit traffic over finished floor surface for 3 days after installation.
- B. When recommended by the tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors.

- C. Protect installed tile work with Kraft paper or other heavy covering during the construction period to prevent damage and wear.
- D. Prior to final inspection, remove protective coverings and rinse protective cleaner from surfaces.

END OF SECTION

**SECTION 09 51 00
ACOUSTICAL CEILINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.02 RELATED REQUIREMENTS

- A. Section 23 37 00 - Air Outlets and Inlets: Air diffusion devices in ceiling.
- B. Section 26 51 00 - Interior Lighting: Light fixtures in ceiling system.
- C. Section 28 46 00 - Fire Detection and Alarm: Fire alarm components in ceiling system.

1.03 REFERENCE STANDARDS

- A. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2022.
- B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2019.
- C. ASTM E1264 - Standard Classification for Acoustical Ceiling Products 2022.
- D. UL (FRD) - Fire Resistance Directory Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

- A. See Section 01 33 00 - Submittals, for submittal procedures.
- B. Product Data: Provide data on suspension system components and acoustical units.
- C. Samples: Submit two samples 6" by 6" inch in size illustrating material and finish of acoustical units.
- D. Samples: Submit two samples each, 6 inches long, of suspension system main runner and perimeter molding.
- E. Manufacturer's Installation Instructions: Indicate special procedures.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Acoustical Units: Provide one additional unopened carton of each type and size of acoustical tiles on the project..

1.06 QUALITY ASSURANCE

- A. Fire-Resistive Assemblies: Complete assembly listed and classified by UL (FRD) for the fire resistance indicated.
- B. Subcontract the installation of acoustical ceilings to an experienced firm which is acceptable to the manufacturer of the acoustical units and suspension system.
- C. Warranty: Provide manufacturer's minimum 15 year system warranty for all acoustical ceiling tile and grid against sagging, shrinking and delamination, and resistance to the growth of mold / mildew and bacteria.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Material shall be delivered to the project in the original packages, with seals unbroken and with the manufacturer's name and brand stamped clearly thereon. No seconds or remnants shall be used. No materials shall be delivered or stored in the building until all glazing has been

completed and all exterior openings closed in. All wet work, including concrete, masonry, plastering, etc., shall be completed and dried out.

1.08 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation, or as required in Manufacturer's Installation Instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc: www.armstrong.com/#sle.
 - 2. CertainTeed Corporation: www.certainteed.com/#sle.
 - 3. USG: www.usg.com/#sle.
- B. Suspension Systems:
 - 1. Armstrong World Industries, Inc: www.armstrong.com/#sle.
 - 2. CertainTeed Corporation: www.certainteed.com/#sle.
 - 3. USG: www.usg.com/#sle.
 - 4. Chicago Metallic Corp..

2.02 ACOUSTICAL UNITS

- A. Acoustical Units - General: ASTM E1264, Class A.
 - 1. Units for Installation in Fire-Rated Suspension System: Listed and classified for the fire-resistive assembly as part of suspension system.
- B. Acoustical Tile Type ATC-1: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:
 - 1. Size: 24 x 24 inches (600 x 600 mm).
 - 2. Thickness: 3/4 inches.
 - 3. Composition: Wet Formed Mineral Fiber.
 - 4. Light Reflectance: 83-85 percent, determined in accordance with ASTM E1264.
 - 5. NRC: .70 determined as specified in ASTM E 1264.
 - 6. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
 - 7. Edge: Square.
 - 8. Surface Color: White.
 - 9. Surface Pattern: Nondirectional Fine Texture.
 - 10. Products:
 - a. Armstrong, Fine Fissured 1713.
 - 11. Acceptable Substitutions: Fine Fissured High NRC, HHF-457 by Certainteed; Radar High-NRC/High-CAC, 22111 by USG.
- C. Acoustical Panels Type ATC-2: Vinyl faced mineral fiber with the following characteristics:
 - 1. Size: 24 by 24 inches.
 - 2. Thickness: 5/8 inches.
 - 3. Composition: Factory-Applied Vinyl Latex Paint over Wet-Formed Mineral Fiber
 - 4. Light Reflectance: 80 percent, determined in accordance with ASTM E1264.
 - 5. Ceiling Attenuation Class (CAC): 40, determined in accordance with ASTM E1264.
 - 6. Edge: Square Lay-In.
 - 7. Surface Color: White.
 - 8. Surface Pattern: Medium Texture - Painted Visual.
 - 9. Products:
 - a. Armstrong, Clean Room VL Unperforated.
 - 10. Acceptable Substitution: VinylShield A by Certainteed.

2.03 SUSPENSION SYSTEM(S)

- A. Suspension Systems - General: ASTM C 635; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required. Sections

shall be thickness and strength to support the ceiling assembly indicated on the Drawings, with a maximum deflection of 1/360 of the span. Size attachment devices for 5 times the design load indicated in ASTM C 635, Table 1, direct hung.

- B. Exposed Steel Suspension System [for all ATC]: Formed galvanized steel, commercial quality cold rolled; intermediate-duty, minimum.
 - 1. Profile: Tee; 15/16 inch wide face.
 - 2. Construction: Double web.
 - 3. Finish: White Enamel Painted.
 - 4. Product shall be one of the following:
 - a. Prelude XL Exposed Tee by Armstrong
 - b. 15/16 Classic Stab System by Celotex/BPB
 - c. Exposed Tee Grid DX-24 by USG Interiors, Inc.
 - d. 200 or 1200 Double Web Grid System (contractor's option) by Chicago Metallic Corp.

2.04 ACCESSORIES

- A. Support Channels: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.
- B. Hanging Wires: No. 12 gauge galvanized wire unless heavier gauge is recommended by the manufacturer for the loads specified.
- C. Accessories: Provide prefinished 15/16-inch by 15/16-inch by 0.20 gauge hemmed edge wall angle molding and corners. All accessories shall be pre-finished to match Tee Grid System finish. Provide hold-down clips where indicated, and other special accessories as required for a complete installation. Accessories shall be supplied by the same manufacturer as the grid system.
- D. Perimeter Moldings: Same material and finish as grid.
 - 1. Provide special corners to conform to bullnose radius wall corners.
 - 2. At locations where suspended ceiling matches the adjacent bulkhead or soffit elevation, provide: Reveal Edge Wall Angle, Product No. 1461.01 - 3/4" reveal molding by Rockfon or equal.
- E. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work. Notify the Contractor and the Architect in writing of unsatisfactory conditions. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.
- B. Verify that layout of hangers will not interfere with the location of the electrical fixtures, and other items which penetrate ceiling. Examine the Electrical and Mechanical Drawings to coordinate this work. Examine the Reflected Ceiling Plan and various ceiling edge treatment details on the Drawings for exact coordination of relationships to the various building lines, surfaces and conditions.

3.02 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C 636/C 636M and ASTM C 636/C 636M and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Locate system on room axis according to reflected plan.
- D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- E. Install suspension system with hanger support coming from building structure only. Install hangers by looping and wire-tying directly to structures or with concrete nails or drive pins into solid structure members, toggles into hollow areas, or eye screws as appropriate to comply with

ASTM C 636. Attachment to ducts, conduit and other similar support will not be permitted. Space hangers not more than 4-feet on center as recommended by grid manufacturer along each member. Extra hanger wires shall be required as recommended by the grid manufacturer where grilles and troffers are installed parallel to main runners.

- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Do not eccentrically load system or induce rotation of runners.
- I. Install edge moldings, corners, special corners, reveal moldings and 2-inch by 2-inch expansion wall angles of the type indicated to coordinate with the grid system at edges of each acoustical ceiling area as noted on the reflected ceiling plan, and at locations where edge of units would otherwise be exposed after completion of work. Secure wall angle molding to building construction by fastening through holes made not more than 3-inches from end of molding and 6-inches on center. All moldings shall be standard wall angle moldings specified except where shown otherwise on the Drawings.

3.03 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install units after above-ceiling work is complete.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units:
 - 1. Cut to fit irregular grid and perimeter edge trim.
 - 2. Make field cut edges of same profile as factory edges.
- G. Install hold-down clips on each panel where noted on the Drawings and in areas where required by governing regulations for fire-resistance ratings. Space as recommended by the panel manufacturer, unless otherwise indicated or required. Comply with fire rating requirements.
- H. Upon completion of the installation, all soiled, deformed, discolored and otherwise damaged tile surfaces shall be cleaned or replaced. Completed acoustical ceiling system installation shall neither be altered nor disturbed by any other trade without specific prior approval from the Prime Contractor and Ceiling Subcontractor. Prior to Substantial Completion, the total acoustical ceiling system installation shall be inspected by the Contractor, adjusting all units and accessories for complete and proper placement and alignment. All soiled and otherwise damaged acoustic tile units and accessories shall be replaced with new items if minor finish damage cannot be successfully cleaned or repaired to original condition status completely free of damage or soil evidence to the satisfaction of the Architect/Engineer.

3.04 INSTALLATION - METAL CEILING SYSTEM

- A. Install metal ceiling system with clips, hanger wires, rods and other material in strict accord with the manufacturer's printed installation instructions with neat and tight joints.

END OF SECTION

**SECTION 09 65 00
RESILIENT FLOORING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Installation accessories.

1.02 REFERENCE STANDARDS

- A. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading 2022.
- B. ASTM F1344 - Standard Specification for Rubber Floor Tile 2021a.
- C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile 2020.
- D. ASTM F1913 - Standard Specification for Vinyl Sheet Floor Covering Without Backing 2019.

1.03 SUBMITTALS

- A. See Section 01 33 00 - Submittals, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Indicate seaming plans, floor patterns, and location of transition strips.
- D. Verification Samples: Submit two samples, 2 by 2 inch in size illustrating color and pattern for each resilient flooring product specified.
- E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Materials and Methods, for additional provisions.
 - 2. Extra Flooring Material: 12 square feet of each type and color.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F and 90 degrees F, or as recommended by manufacturers of resilient flooring products.
- D. Protect roll materials from damage by storing on end.

1.05 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 SHEET FLOORING

- A. Vinyl Sheet Flooring - Type SVF-1: Homogeneous without backing, with color and pattern throughout full thickness.
 - 1. Manufacturers:
 - a. Altro Floors, represented by Shannon Specialty Floors, Tony Barzycki (414) 687-2067.
 - 2. Minimum Requirements: Comply with ASTM F1913.
 - 3. Thickness: 0.010 inch nominal.
 - 4. Roll Dimension: 6'7" x 65'5".
 - 5. Static Load Limit: 2000 psi minimum, when tested as specified in ASTM F970.

6. Seams: Heat welded with color matching weld rod.
7. Corners: Provide "butterfly" style corners at cove base.
8. Integral coved base with cap strip, aluminum.
9. Pattern: Reliance 25.
10. Warranty: 15 year product warranty.
11. Color: see Color Schedule Section 09 99 90.
12. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
13. Wear Layer Thickness: 20 mil.
14. Total Thickness: 2.5mm.

2.02 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
- C. Moldings, Transition and Edge Strips: ES.
 1. Manufacturers:
 - a. [Johnsonite, a Tarkett Company <> : www.johnsonite.com/#sle].
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
 2. SVF Flooring to Concrete: RRS-XX-C

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Fit joints and butt seams tightly.
- E. Set flooring in place, press with heavy roller to attain full adhesion.
- F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
- H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - SHEET FLOORING

3.05 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.

- B. Clean in accordance with manufacturer's written instructions.

3.06 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

**SECTION 09 68 00
CARPETING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet tile.
- B. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

1.02 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring 2021.
- B. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2009.
- C. CRI (GLC) - Green Label Testing Program - Approved Product Categories for Carpet; Carpet and Rug Institute; Current Edition.
- D. CRI (GLP) - Green Label Plus Testing Program - Certified Products Current Edition.
- E. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source 2023.

1.03 SUBMITTALS

- A. See Section 01 33 00 - Submittals, for submittal procedures.
- B. Shop Drawings: Scaled drawings indicating products, seaming plan, installation method of carpet tile, direction of carpet , and location of edge moldings and edge bindings .
- C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, and method of installation.
- D. Shop Drawings: Indicate carpet location, installation method, direction of carpet tile , and location of edge moldings.
- E. Samples: Submit two samples 12 x 12 inch in size illustrating color and pattern for each carpet material specified. Or submit two full tile samples for each carpet tile specified.
- F. Manufacturer's Installation Instructions: Indicate special procedures.
- G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Two copies of the manufacturer's recommended maintenance data
 - 2. Extra Carpet: Provide 3% of each type, color, and pattern installed. Extra carpet shall be new, clean, unused carpet material in full factory width, carefully wrapped, sealed and identified as to carpet type designation, as extra stock for each manufacturer, pattern, color and dye lot. Extra carpet shall be provided immediately before installation begins, and shall be of the same dye lot of that which is installed.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in installing carpet with minimum three years experience and approved by manufacturer.

1.05 FIELD CONDITIONS

- A. Deliver carpet to jobsite in the original mill wrappings with each roll having its register number properly marked on each bale. Each pattern, type and color of carpet shall be of the same dye lot.
- B. Store materials in area of installation for minimum period of 24 hours prior to installation.
- C. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.
- D. Ventilate installation area during installation and for 72 hours after installation.

PART 2 PRODUCTS

2.01 CARPET

A. Carpet Tile : CPT-1

1. Product: Rough Idea Shear manufactured by Bentley.
2. Tile Size: 24in x 24in nominal.
3. Total Thickness: 26 inch.
4. Fiber: Bentley Premium Type 6, 6 Nylon.
5. Gauge: 5/64 inch.
6. Stitches: 6.3 per inch.
7. Total Weight: 82 oz/sq yd.
8. Dye Method: Solution Dyed.
9. Backing Material: AFIRMA II Hardback.
10. Installation Method: Quarter Turn.

2.02 ACCESSORIES

- A. Sub-Floor Filler: Type recommended by carpet manufacturer.
- B. Carpet Adhesive: Recommended by carpet manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Inspect all carpet upon receiving shipment and advise Architect in writing of any condition or defects deemed unacceptable for installation.
- B. Verify that sub-floor surfaces are clean and dry and in a condition satisfactory to the Carpet Subcontractor. The Carpet Subcontractor shall notify the General Contractor, in writing, with copies to the Architect, of conditions which will prevent him/her from producing satisfactory finished work. The installation of carpet shall be an indication of his/her acceptance of the substrates, and he/she will automatically assume the responsibility for any unacceptable finished work caused by substrate conditions. Under this Section 09 6800, the Carpet Subcontractor shall be responsible for installing fill at depressions, holes, cracks and minor variations, and to transition where adjacent to porcelain tile.
- C. Vacuum substrate immediately prior to carpet installation, and remove all substances which would interfere with the installation or be harmful to the work.
- D. Verify that concrete sub-floor surfaces are dry enough and ready for adhesive installation by testing for moisture emission rate and alkalinity in accordance with ASTM F 710. If test results are not within the adhesive manufacturer's specified limits for moisture emission rate and alkalinity, contact adhesive manufacturer for their recommended products to achieve appropriate levels.

3.02 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install carpet in accordance with manufacturer's instructions and CRI Carpet Installation Standard.
- C. Lay out carpet per drawings.
 1. Locate change of color or pattern between rooms under door centerline or as shown on drawings.
- D. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance.
- E. Extend carpet under open-bottom and raised-bottom obstructions and under removable flanges of obstructions. Extend carpet into closets, knee spaces and alcoves of rooms indicated to be carpeted. Extend carpet under movable furniture and equipment unless otherwise indicated.

3.03 CARPET TILE

- A. Install in accordance with manufacturer's written instructions for the specified carpet.

- B. Bond all modular carpet securely to the substrate in a full bed of "releasable" adhesive, and with self-adhesive backing where specified.
- C. Install in a grid pattern, tightly fitting carpet tiles to each other and to all vertical surfaces. Follow manufacturer's printed instructions regarding maintaining squareness and tightness of the installation.
- D. Carpet tiles less than half-size will not be allowed except where the configuration of the room will not permit larger size tiles. Avoid use of cut tiles in doorways and other high traffic areas to the maximum extent possible.
- E. Damaged, defective, wrinkled or shrunken modular carpet tiles, or carpet stained by adhesives shall be removed and replaced.

3.04 CLEANING

- A. Remove excess adhesive from floor and wall surfaces without damage.
- B. Clean and vacuum carpet surfaces with a beater-type vacuum cleaner.
- C. Remove all loose pieces of face yarn with sharp scissors.

END OF SECTION

**SECTION 09 90 00
PAINTING**

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 09 99 90 - Color Schedule.
- B. Division 32: Parking lot striping, directional arrows, and access aisle striping.

1.02 DESCRIPTION OF WORK

- A. Extent of painting work is shown on Drawings and schedules, and as herein specified.
- B. The work includes painting and finishing of interior and exterior exposed items and surfaces throughout project, except as otherwise indicated.
- C. "PAINT" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

1.03 WORK NOT INCLUDED

- A. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, miscellaneous metal, hollow metal work and similar items. The same applies for shop-fabricated or factory-built mechanical and electrical equipment and accessories. See list of items later in this Section. However, the presence of a shop-applied primer shall not reduce the number of coats required to be applied in the field as specified under the Paint and Stain Schedule later in this Section. Touch-up of primer on structural and miscellaneous steel items damaged or abraded shall be accomplished under Sections 05 12 00 and 05 50 00. Touch-up of primer on metal doors and frames damaged or abraded surfaces shall be accomplished under Section 08 12 13. The painter shall notify the Contractor if such repair has not been done prior to his/her application of the first coat of paint.
- B. Prefinished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such items as (but not limited to) toilet enclosures, acoustic materials, finished mechanical and electrical equipment including cabinet unit heaters, light fixtures, switchgear and distribution cabinets. See list of items later in this Section.
- C. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls and ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces and duct shafts. See list of items later in this Section.
- D. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting, unless otherwise indicated. See list of items later in this Section.
- E. Operating Parts and Labels: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts will not require finish painting, unless otherwise indicated.
- F. Do not paint over code-required labels, such as Underwriters' Laboratories and Factory Mutual, and equipment identification, performance rating, name, and nomenclature plates.
- G. Omit paint, stain, and/or finishing as noted for the following items:
 - 1. Acoustical tile ceilings
 - 2. Drawer bodies at architectural casework (prefinished)
 - 3. Fire alarm panels (prefinished)
 - 4. Fire extinguisher cabinets (as noted in Section 10 44 00)
 - 5. Flashings, gutters and downspouts (prefinished)

1.04 QUALITY ASSURANCE

- A. Acceptable manufacturers are as follows:
 - 1. Benjamin Moore and Company
 - 2. Diamond Vogel Paints (Vogel Paint Manufacturing Company)
 - 3. ICI Paints

4. Iowa Paint Manufacturing Company, Inc.
 5. Pittsburgh Paints, PPG Industries, Inc.
 6. Pratt and Lambert, Inc.
 7. The Sherwin-Williams Company
 8. Tnemec Company, Inc. (only on products as specified below)
- B. Pre-Painting Conference: Prior to the start of painting and after approval of required shop drawings and samples, the General Contractor shall arrange a Pre-painting Conference at the project site at a pre-arranged time approved by the Architect/Engineer. The conference shall include in attendance the painting subcontractor and his/her jobsite foreperson. The contractor shall record discussions and agreements that are made which are not specifically addressed in the Contract Documents, and shall furnish a copy to all involved participants.

1.05 SUBMITTALS

- A. Manufacturer's Data: Submit copies to the Architect/Engineer in accord with the General Conditions and Section 01 30 00 of the manufacturers' printed specifications and data sheets for each type of paint and other finishing materials proposed to be utilized. These submittals shall be for each paint system (designated PS herein) specified.
- B. Samples: Submit 3 samples of each type of finish and color to the Architect/Engineer in accord with the General Conditions and Section 01 30 00. Stain samples of ST-1 shall be submitted on 8-inch long piece of wood, matching species and cut specified. Paint samples shall be submitted on 8-1/2-inch by 11-inch Mead Mark I cover paper, coated one side, with paint sprayed or applied with a foam rubber roller. Front of paint samples shall show the paint manufacturer and the trade name of the proposed paint.
- C. Extra Stock: The Painting Contractor shall furnish the Owner with one gallon of **EACH COLOR in EACH PAINT SYSTEM**, sealed and unused, which are used on this project, together with explanation of what each paint system is used for and mixing formula attached thereto. The Painting Contractor shall furnish 2 copies of the mixing formula information to the Prime Contractor in addition to the instructions attached to paint containers for inclusion with the Owner's maintenance manuals.

1.06 DELIVERY, STORAGE AND PROTECTION

- A. Delivery and Storage of Materials: All paints, varnishes, enamels, lacquers, stains, and similar materials must be delivered in the original containers with seals unbroken. All containers must also include the following information:
1. Name of title of material
 2. Federal Specification numbers if applicable
 3. Manufacturer's stock number and date of manufacture
 4. Manufacturer's name
 5. Contents by volume, for major pigment and vehicle constituents
 6. Thinning instructions
 7. Application instructions
 8. Color name and number
- B. Store materials in a single place designated by the Prime Contractor and approved by the Owner and Architect/Engineer. Such storage place shall be kept neat and clean, and all damage thereto or to its surroundings shall be returned to the original or intended condition. Oil rags, waste, etc. shall be removed from the building every night, and every precaution taken to avoid the danger of fire.

1.07 JOB CONDITIONS

- A. Temperature: Surface temperature shall be maintained at a minimum of 50F during application and drying of paints and finishes. Exterior surfaces shall not be painted or finished during rainy or frosty weather nor when they are exposed to a hot sun. See manufacturer's printed instructions for more specific requirements.
- B. Protection: Adjacent work, building finishes and surfaces together with manufactured casework and similar items shall be totally protected with masking tape, drop cloths or other suitable

coverings. Manufactured casework, millwork, cabinetwork, food service equipment and similar items shall not be utilized for any construction related purpose or utilized as work surface, scaffolding, plank supports or in any way walked upon.

- C. Sequencing: Frames and doors shall be given their first coat of paint and stain/varnish before glass is installed.

PART 2 PRODUCTS

2.01 MATERIALS

- A. MATERIALS. The Contractor shall have the option of using materials and finishes manufactured by any one of the manufacturers previously listed. Materials used throughout shall be the products of one manufacturer only and shall be first line and top grade materials produced by the manufacturer selected. The mentioning of a specific brand name is done to establish a minimum acceptable standard or quality desired. Actual materials are listed in the Schedule of Finishes. In the case where Tnemec products are specified hereinafter, the above substitution policy for other listed products shall not apply, and only the specified Tnemec products will be acceptable.

PART 3 EXECUTION

3.01 INSPECTION

- A. Condition of Surfaces: The Painting Contractor shall examine all surfaces which are scheduled to receive paint, stain, varnish, or other coatings, and report in writing to the Prime Contractor with copy to the Architect/Engineer, any surfaces which cannot be put into proper condition for finishing by customer cleaning, sanding, puttying, or other similar preparation operations. Application of the first coat shall constitute acceptance of surfaces as fit and proper to receive finish.

3.02 PREPARATION

- A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.
- B. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted. Following completion of painting of each space or area, reinstall removed items.
- C. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.
- D. Cementitious Materials: Prepare cementitious surfaces of concrete, concrete block and cement plaster to be painted by removing efflorescence, chalk, dust, dirt, grease, oils and by roughening as required to remove glaze.
- E. Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed direction.
- F. Wood: Wood surfaces to be painted shall be cleaned of dirt, oil, or other foreign substances. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat, where finish is paint or enamel.
- G. Wood surfaces to be stained shall be finish sanded to 150 grit or equal, and dusted off.
- H. After application of first coat, putty nail holes, cracks, etc., with putty of a color to match that of the finish. Bring putty flush to the adjoining surface. Sandpaper smooth when dried.
- I. Ferrous Metals: Clean ferrous surfaces which are not galvanized or shop-coated, with S.S.P.C. SP 6 Commercial Blast.
- J. Galvanized Metals: Clean and treat chemically with a compound designed for this purpose, such as "Lithoform", "Stibley", or "Solfo Metallic Coat", in accord with the paint manufacturer's instructions.

- K. Aluminum (where specified to be painted): Thoroughly clean using solvents recommended by the paint manufacturer. Scuff sand surface to provide tooth for bonding.

3.03 APPLICATION

- A. General: All materials shall be applied in accordance with the paint manufacturer's printed instructions, using applicators and techniques best suited for substrate and type of material being applied. Apply all materials under adequate illumination, spread evenly, and flow on smoothly without runs or sags. All coats must be thoroughly dry before applying succeeding coats. The number of coats specified shall not be reduced, even if the item to be painted has been factory primed. Apply materials to provide total color and sheen uniformity on all surfaces.
- B. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind all permanently-fixed equipment and furniture with prime coat only before final installation of equipment.
- C. Spray application of paints will be permitted on wall surfaces and on exposed metal deck, steel joists, and exposed structural roof system areas provided the application is by airless-type spray equipment, and provided the application by spray is followed by a roller on wall surfaces. Roller shall thoroughly work paint into pores for complete surface coverage. Conventional paint spray equipment will be permitted on metal door frames, metal doors, and other metal fabrications. Sprayed surfaces shall be smooth, free of imperfections, and paint runs, and shall be completely covered by each coat.
- D. Undercoats of paint and enamel shall be of the approximate color as the final coat, except primers for accent colors may be white or off-white if recommended by the paint manufacturer to bring out the color depth of the finish color. Between coats, sand enamel finish applied to metal or wood with fine sand paper, clean and tack to produce an even, smooth finish.
- E. Staining and Varnishing: Cover surfaces to be stained with a uniform coat and wipe off if required. Between coats, sand varnish finish applied to wood with fine sandpaper, clean and tack to produce an even, smooth finish.
- F. Factory-Primed and Mill-Primed Surfaces: Use the materials specified in every case for such surfaces and use in accord with the manufacturer's directions for the first or priming coat.
- G. Non-Ferrous Metals: Copper, bronze, chromium plate, nickel, stainless steel, aluminum, and Monel metal shall not be painted or finished except as otherwise specified.

3.04 FIELD QUALITY CONTROL

- A. First Coat Inspection: When a coat of material has been applied, the Painting Subcontractor shall inform the Architect/Engineer so that the work may be inspected and approved. Credit for succeeding coats will not be given unless the preceding coat has been so examined and approved.

3.05 ADJUSTING AND CLEANING

- A. Clean adjacent and other surfaces which are smeared or splattered as a result of the painting. Use a knife blade to clean paint out of control joints in plaster or gypsum board, using care not to scratch or otherwise damage finished surfaces.

3.06 PROTECTION

- A. Protect work of other trades whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
- B. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.
- C. Do not paint telecommunications cables. Coordinate paint and cable installation schedule with the telecommunications contractor. Protect cabling from direct painting or over-spray. Cables which have been painted are void of the manufacturer's warranty and will be replaced at this contractor's expense.

- D. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

3.07 PAINT AND STAIN SCHEDULE

A. EXTERIOR WORK

- 1. FERROUS METAL (All items included in Sections 05 12 00 and 05 50 00)
 - a. Touch up damaged or scratched shop-applied primer
 - 1) Tnemec 135 Primer
 - b. 1 coat, 2.5-3.5 mils (spray, brush or roller)
 - 1) Tnemec Series 750, Semi-gloss
- 2. FERROUS METAL (Steel doors, frames, and other ferrous metal not primed with Tnemec primers)
 - a. 1 coat, 1.5-2.0 mils (spray, brush or roller)
 - 1) Tnemec Series 27 Typoxy (color similar to specified finish color)
 - b. 1 coat, 3.0-4.0 mils (spray, brush or roller)
 - 1) Tnemec Series 1075U Endura-Shield II, Semi-gloss
- 3. EXISTING METAL SIDING, FASCIA, CONDUIT, DOWNSPOUTS, AND GUTTERS
 - a. Prep: Powerwash all surfaces until clean/dry/dull
 - b. 1 coat
 - 1) Tnemec Series 115 Uni-Bond DF
 - c. 1 coat
 - 1) Tnemec Series 1029 Enduratone

B. INTERIOR WORK

- 1. INTERIOR SURFACES OF EXTERIOR METAL DOORS AND METAL FRAMES
 - a. Same as specified above for exterior steel doors and frames.
- 2. FERROUS METAL (Other items, i.e., metal doors, frames, etc.)
 - a. 1 coat
 - 1) Tnemec Series 115 Uni-Bond DF at 2.5-3.0 mils
 - b. 2 coats
 - 1) Tnemec Series 1029 Enduratone
- 3. EXPOSED STRUCTURAL STEEL AND DECK
 - a. 1 coat
 - 1) Tnemec Series: 115 Uni-Bond DF OR Sherwin Williams ProIndustrial 113.70 Waterborne Acrylic Dryfall Flat
- 4. GYPSUM BOARD (CEILINGS)
 - a. 1 coat
 - 1) Sherwin Williams ProMar 200 Zero VOC Interior latex primer
 - b. 2 coats
 - 1) Sherwin Williams ProMar 200 Zero VOC Interior Latex Flat B30-2600 Series
- 5. GYPSUM BOARD (WALLS)
 - a. 1 coat
 - 1) Sherwin Williams ProMar 200 Zero VOC Interior Latex Primer
 - b. 2 coats
 - 1) Sherwin Williams ProMar 200 Zero VOC Interior Latex Eg Shell B20-2600 Series
- 6. MECHANICAL AND ELECTRICAL ITEMS. New registers, grilles, steel-incased heating units, heating and water pipes, sprinkler piping, electrical conduits, outlet boxes, and panelboard fronts exposed in a finished room (except in Rooms at the Mezzanine / Clerestory level) shall be painted as specified for Metal Work or as specified or required for the surface to be painted. Color shall match color of adjacent wall or ceiling surfaces.
- 7. INSIDE OF NEW DUCTWORK AND PLENUM SPACES exposed to view through registers and grilles shall receive one coat of flat black paint.

3.08 PAINT AND STAIN LOCATION SCHEDULE

- A. THE FOLLOWING LIST of items requiring paint or stain contains the major areas of finish required. The Contractor shall verify the color and type of finish with the Architect/Engineer for any items which obviously require finish but for which a color is not listed hereinafter.
- B. EXTERIOR COLOR PLACEMENT
 - 1. Hollow metal doors and frames, including interior surfaces, unless noted otherwise
As noted on Door and Frame Schedule.
- C. INTERIOR COLOR PLACEMENT
 - 1. Hollow metal doors and frames As noted on Door and Frame Schedule
 - 2. GWB walls As noted on Room Finish Schedule
 - 3. GWB ceilings As noted on Room Finish Schedule
 - 4. GWB bulkheads P-3, U.N.O., see Drawings.
 - 5. Electrical panels and access doors
surfaces Match adjacent wall and ceiling
 - 6. Handrails, guardrails, brackets and supports As noted on Drawings
 - 7. Exposed columns As noted on Drawings
 - 8. Metal reveals in GWB Match adjacent wall surface

END OF SECTION

**SECTION 09 99 90
COLOR SCHEDULE**

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. This section covers color selections of paint and other building finishes and components which are specified in other Sections. Color is considered of prime importance for all aspects of this Project. Obtain colors for items not specifically noted herein from applicable Sections or Architect.
- B. Colors selected are those of the brand specified. Colors of items proposed as substitutes shall match those specified subject to approval of Architect.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Materials to be used and installation thereof are specified in other Sections of this Specification.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 INTERIOR COLOR SCHEDULE

- A. Architectural Wood Casework (06 41 00),
 - 1. Solid Surface Material
 - a. SSM-1, color: Bellavati - Buckeye, DFS1-300 (window sills).
- B. Tile Work (Section 09 30 00)
 - 1. Porcelain Tile
 - a. PT-1, color: Daltile - Slate Attache, Meta Light Gray SA06, 12"x24", 24"x24" (Flooring & tile base).
 - b. PT-2, color: Virginia Tile, Crossville - Altered State, White Hot, 6"x24", (Bathroom Typical Wall).
 - c. PT-3, color: Virginia Tile, Crossville - Altered State, Steel Gaze, 6"x24", (Bathroom Wall Accent).
 - d. PT-4, color: Virginia Tile, Crossville - Nest, Joyous Oak, 8"x36" (wood accent).
 - 2. Ceramic Tile
 - a. CT-1, color: Virginia Tile, American Olean - Color Story Wall, Ice White, 8"x24", (Grocery Backsplash Accent).
 - b. CT-2, color: Virginia Tile, American Olean - Color Story Wall, Balance, 4"x12", (Drink Station Backsplash).
 - 3. Grout
 - a. GRT-1, color: Laticrete, 60 Dusty Grey (Used with PT-1,2,3).
 - b. GRT-2, color: Laticrete, 61 Parchment (Used with PT-4).
 - c. GRT-3, color: Laticrete, 78 Sterling Silver (Used with CT-1,2).
- C. Acoustical Ceilings (Section 09 51 00)
 - 1. Acoustic Tile Ceiling
 - a. ATC-1, color: white (typical).
 - b. ATC-2, color: white (prep kitchen).
- D. Resilient Flooring (Section 09 65 00)
 - 1. Sheet Vinyl Flooring
 - a. SVF-1, color: Altro - Reliance 25, Rock, D2504.
- E. Carpeting (Section 09 68 13)
 - 1. Carpet
 - a. CPT-1, color: Bentley - Rough Idea 8RU26, Outline, 24"x 24" (Walk-Off Carpet).
- F. Painting and Coating (Section 09 90 00)
 - 1. Paint Color
 - a. P-1, color: Sherwin Williams - SW7671, On The Rocks (main wall color).
 - b. P-2, color: Sherwin Williams - SW7650, Ellie Gray (hollow metal).

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- c. P-3, color: Sherwin Williams - SW7005, Pure White (GWB ceilings).
 - d. P-4, color: Sherwin Williams - SW6871, Positive Red (red accent).
 - e. P-5, color: Sherwin Williams - SW7601, Santorini Blue (blue accent).
 - f. P-6, color: Sherwin Williams - SW6079 Diverse Beige (EIFS/Overhead Section Door - complimenting stone color).
 - g. P-7, color: Sherwin Williams - SW9090 Caraibe (EIFS/DEFS - matching wood composite).
- G. Wall and Door Protection (Section 10 26 00)
- 1. Corner Guards
 - a. CG, color: Stainless Steel.

END OF SECTION

DIVISION 10 – SPECIALTIES

**SECTION 10 14 00
SIGNAGE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Room and door signs.
- B. Interior directional and informational signs.
- C. Traffic signs.

1.02 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.
- B. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Provide shop drawings for fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, reinforcement, accessories, layout and installation details.
- D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Furnish maintenance instructions to the Owner which contain the manufacturer's recommended cleaning materials and application methods.

1.04 QUALITY ASSURANCE

- A. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Flat Signs:
 - 1. Best Sign Systems, Inc: www.bestsigns.com/#sle.
 - 2. Inpro: www.inprocorp.com/#sle.
 - 3. ASI Sign Systems Inc.: www.asisignage.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SIGNAGE APPLICATIONS

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

- B. Room and Door Signs: Provide a sign where required by applicable building codes. This includes, but is not limited to, restrooms, occupant load signage, stairwells, areas of refuge, and storm shelters.
 - 1. Sign Type: Flat signs with engraved panel media as specified.
 - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
 - 3. Character Height: 5/8 inch.
 - 4. Corresponding Symbol Height: 3 inches.
 - 5. Sign Height: 3 inches, unless otherwise indicated.
 - 6. Doors and Openings: Identify with room names and numbers to be determined later, not those indicated on drawings.
 - a. Coordinate Room Names and Numbers with the Owner.
 - 7. Rest Rooms: Identify with pictograms, "MENS" or "WOMENS" at restrooms, and braille.
 - a. Restroom Signs with Pictograms: 1'-2" diameter.
 - b. Restrooms may require different names; those shall be confirmed during shop drawing submittals.
- C. Traffic Signs: Handicap Parking Signs; locate where indicated on drawings.
 - 1. Type: R7-8 and R7-8a. See Detail on Drawings.

2.03 SIGN TYPES

- A. Flat Signs: Signage media without frame.
 - 1. Edges: Circular.
 - 2. Corners: Circular.
 - 3. Plastic Material: Meleanine plastic laminate, approximately 1/8-inch thick, with core painted a contrasting color, and rated non-static, fire-retardant, and self-extinguishing. Plastic laminate will be impervious to most acids, alkalies, alcohol, solvents, abrasives, and boiler water.
 - 4. Wall Mounting of One-Sided Signs: Tape adhesive.
- B. Color and Font: Unless otherwise indicated:
 - 1. Character Font: Standard Bold Helvetica, Arial, or other sans serif font.
 - 2. Character Case: Upper case only.
 - 3. Background Color: White.
 - 4. Character Color: Black color.
- C. Include the International Symbol of Accessibility where required and appropriate.

2.04 ACCESSORIES

- A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
- B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

**SECTION 10 26 00
WALL AND DOOR PROTECTION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Corner guards.

1.02 RELATED REQUIREMENTS

- A. Section 09 21 16 - Gypsum Board Assemblies: Placement of supports in stud wall construction.
- B. Section 09 99 90 - Color Schedule.

1.03 REFERENCE STANDARDS

- A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics 2010 (Reapproved 2018).
- B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents 2021.
- C. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies 2014.
- D. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015, with Editorial Revision (2021).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate physical dimensions, features, and rough-in measurements.
- C. Shop Drawings: Include plans, elevation, sections, and attachment details.
- D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
 - 1. Submit two sections of corner guards, 6 inches long.
 - 2. Submit two samples of protective wall covering, 6 by 6 inches square.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Stock Materials: Two of each kind of minimum 48 inches long unit of each kind of covers for corner guards and aluminum trim.
- F. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has previously installed wall surface protection systems similar in material, design, and extent to the systems indicated for this Project.
- B. Manufacturer Qualifications: Firm experienced in manufacturing wall surface protection system components that are similar to those required for this Project and that have a record of successful in-service performance.
- C. Single Source Responsibility: Obtain each color, grade finish and type of wall surface protection system component from a single source with resources to provided products of consistent quality in appearance and physical properties without delaying progress of the Work.
- D. Design Criteria: The Drawings indicate the size, profile and dimensional requirements of wall surface protection system components required and are based on the specific types and models indicated. Wall surface protection system components by other manufacturers may be considered provided color options are acceptable and deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.
- B. Protect work from moisture damage.
- C. Protect work from UV light damage.
- D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.
- E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Corner Guards (CG):
 - 1. Construction Specialties, Inc: www.c-sgroup.com/#sle.
 - 2. Inpro: www.inprocorp.com/#sle.
 - 3. Koroseal Interior Products: www.koroseal.com/#sle.

2.02 PERFORMANCE CRITERIA

- A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.
- B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance complying with applicable provisions of ASTM D543.
- C. Fungal Resistance: Unless otherwise noted, provide protection products and assemblies which pass ASTM G21 testing.

2.03 PRODUCT TYPES

- A. Corner Guards - Surface Mounted:
 - 1. Material: Type 304 stainless steel, No. 4 finish, 16 gauge, .0625 inch thick.
 - 2. Width of Wings: 1-1/2 inches.
 - 3. Corner: Square 1/4 inch.
 - 4. Color: As indicated in Section 09 99 90 - Color Schedule.
 - 5. Length: One piece - Full Height, reference Drawings.
- B. Adhesives and Primers: As recommended by manufacturer.

2.04 FABRICATION

- A. Fabricate components with tight joints, corners and seams.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.
- B. Verify that substrate surfaces for adhered items are clean and smooth.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Install wall surface protection units plumb, level and true to line without distortions. Do not use materials with chips, cracks, voids, stains or other defect that might be visible in the finished work.

3.03 CLEANING

- A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

**SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Commercial toilet accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00: Concealed supports for accessories, including in wall framing and plates.
- B. Section 26 05 83 - Equipment Connection: Equipment disconnecting means. If manufacturer has an option for an integral disconnect it should be provided in lieu of the add-on quick disconnect.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- C. ASTM C1036 - Standard Specification for Flat Glass 2021.
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. American Specialties, Inc: www.americanspecialties.com/#sle.
 - 2. Bradley Corporation: www.bradleycorp.com.
 - 3. Bobrick Washroom Equipment Co., Inc.: www.Bobrick.com.
- B. Diaper Changing Stations:
 - 1. American Specialties, Inc: www.americanspecialties.com/#sle.
 - 2. Bobrick Washroom Equipment Co., Inc.: www.Bobrick.com.
 - 3. Koala Kare Products; KB200: www.koalabear.com/#sle.

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
- B. Surface-Mounted Toilet Accessories - General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with full-length stainless steel piano hinge. Provide concealed anchorage wherever possible.
- C. Recessed Toilet Accessories - General: Except where otherwise indicated, fabricate units of all welded construction, without mitered corners. Hang doors or access panels with full-length stainless steel piano hinge. Provide anchorage which is fully concealed when closed.
- D. Stamped Names and Labels: On exposed faces of toilet accessory units are not permitted, except where otherwise indicated; unobtrusive labels on surfaces not exposed to view are acceptable.
- E. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six (6) keys for each accessory to Owner.
- F. Stainless Steel Sheet: ASTM A666, Type 304.

- G. Mirror Glass: Tempered safety glass, ASTM C1048ASTM C1048; and ASTM C1036ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required or stainless steel.
 - 1. Mirror shall be secured to hanger(s) with concealed Philips head locking screws located in bottom of frame.
- H. Fasteners, Screws, and Bolts: Shall be of the same material as accessory unit or of galvanized steel where concealed; tamper-proof.

2.03 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

3.02 PREPARATION

- A. Deliver inserts, anchorages, and rough-in frames to site for timely installation.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated. Verify all heights and locations with Owner and Architect in the field.

3.04 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.
- B. Protective coverings shall remain in place until all construction is complete.

3.05 SCHEDULE

- A. Model numbers specified are Bobrick Washroom Equipment Company, Inc. numbers to establish standard of quality; equivalent products by one of the specified manufacturers will be accepted.

<u>Item #</u>	<u>Model #</u>	<u>Item</u>	<u>Item Description</u>
Grab Bars	B-6806		
GB-1		36" Grab Bar	
GB-2		42" Grab Bar	
GB-3		18" Grab Bar	
MR-1	B-290	Mirror-Tempered Glass	24x36
NDL-1	B-254	Sanitary Napkin Disposal	Surface Mount
TD-1		Towel Dispenser	Owner Provided, Contractor Installed
SD-1		Soap Dispenser	Owner Provided, Contractor Installed
PH-1		Paper Holder	Owner Provided, Contractor Installed
HD-1		Hand Dryer	Owner Provided, Contractor Installed
BCT-1	KB200	Baby Changing Table	Koala Kare - color TBD

END OF SECTION

**SECTION 10 44 00
FIRE PROTECTION SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.

1.02 REFERENCE STANDARDS

- A. NFPA 10 - Standard for Portable Fire Extinguishers 2022.
- B. UL (DIR) - Online Certifications Directory Current Edition.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide cabinet type and materials, door construction style and materials, trim style, color and finish, anchorage details, and installation instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Activar Construction Products Group, Inc. - JL Industries; Cosmic Extinguisher - Multipurpose Chemical, 10E: www.activarcpg.com/#sle.
 - 2. Larsen's Manufacturing Co; MP Series, MP10: www.larsensmfg.com/#sle.
- B. Fire Extinguisher Cabinets and Accessories:
 - 1. J.L. Industries, a division of Activar Construction Products Group; Ambassador, Model No. 1016: www.activarcpg.com/#sle.
 - 2. Larsen's Manufacturing Co; Architectural Series, Model No. 2409-6R: www.larsensmfg.com/#sle.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Class: A:B:C type.
 - 2. Size: 10 pound.
 - 3. Finish: Baked polyester powder coat, red color.
 - 4. Temperature range: Minus 40 degrees F to 120 degrees F.
- C. Wet Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gauge.
 - 1. Class: K type.
 - 2. Size: 1.6 gallons.
 - 3. Finish: Polished stainless steel.
 - 4. Temperature range: Minus 20 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS (FEC-1)

- A. Cabinet Construction: Non-fire rated.
 - 1. Formed primed steel sheet; 0.036 inch thick base metal.
- B. Cabinet Configuration: Semi-recessed type.
 - 1. Size to accommodate accessories.
 - 2. Trim: Flat rolled edge, with 2-1/2 inch wide face.
- C. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with continuous piano hinge.
- D. Door Glazing: Full Glass style, Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

- E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- F. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.
- G. Finish of Cabinet Interior: White colored enamel.
- H. Letters on interior surface of the glass shall read: "Fire Extinguisher".
 - 1. Color: Red.
 - 2. Orientation: Vertical.

2.04 FIRE EXTINGUISHER CABINETS (FEC-2)

- A. Cabinet Construction: Non-fire rated.
 - 1. Formed primed steel sheet; 0.036 inch thick base metal.
- B. Cabinet Configuration: Surface mounted type.
- C. Style: To match existing. Provide exterior grade cabinet.
- D. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- E. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.
- F. Finish of Cabinet Interior: White colored enamel.
- G. Letters on door shall read: "Fire Extinguisher" .
 - 1. Color: Red.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, 5 feet-0 inches from finished floor to top of cabinets.
- C. Owner to furnish and place fire extinguishers in cabinets.

END OF SECTION

DIVISIONS 11 THROUGH 14 – NOT USED

DIVISION 21 – NOT USED

DIVISION 22 - PLUMBING

**SECTION 22 01 00
GENERAL REQUIREMENTS FOR PLUMBING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Division 22 and 23 Conditions apply to this Section.
- C. The Owner may contract directly with the Commissioning Authority (CxA) for this project. All Contractors shall cooperate with the CxA to complete all required commissioning. Specification Section 01 91 13 defines the Contractor's responsibilities with respect to the process. The Contractor shall review this section and shall include in their bids the work associated with the commissioning effort described.

1.02 SUMMARY

- A. This Section includes general mechanical requirements and shall apply to all phases of the work specified, indicated on the drawings or required to provide for complete installation of plumbing systems.
- B. Refer to Section 23 01 00 for "General Requirements for Mechanical Systems."
- C. Refer to Section 23 05 00 for "Basic Mechanical Materials and Methods."
- D. Refer to Section 23 05 05 for "Basic Mechanical Piping Materials and Methods."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

**SECTION 22 05 23
VALVES FOR PLUMBING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes general duty valves common to several mechanical piping systems. Special purpose valves are specified in Division 22 piping system Sections.

1.03 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Product Data for each valve type. Include body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions. Include list indicating valve and its application.
- C. Maintenance data for valves to include in the operation and maintenance manual specified in Division 01. Include detailed manufacturer's instructions on adjusting, servicing, disassembling, and repairing.
- D. See "Submittal Schedule" at the end of Section 23 01 00 "General Requirements for Mechanical Systems."

1.04 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.
- B. All valves used in potable water service shall be certified lead free per NSF-61G and NSF 372.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Gate Valves:
 - a. Crane Company; Valves and Fitting Division.
 - b. Hammond Valve Corporation.
 - c. Kitz Corp. of America.
 - d. Lunkenheimer/Cincinnati Valve Co.
 - e. Milwaukee Valve Company, Inc.
 - f. NIBCO Inc.
 - g. Powell: Wm. Powell Company (The).
 - h. Red-White Valve Corp.
 - i. Stockham Valves & Fittings, Inc.
 - 2. Ball Valves:
 - a. Conbraco Industries, Inc.; Apollo Division.
 - b. Hammond Valve Corporation.
 - c. Milwaukee Valve Company, Inc.
 - d. NIBCO Inc.
 - e. Stockham Valves & Fittings, Inc.
 - f. Tyler Pipe.
 - g. Victaulic Company of America.
 - 3. Check Valves:
 - a. Cla-Val Co.
 - b. Conbraco Industries, Inc.; Apollo Division.

- c. Hammond Valve Corporation.
- d. Keystone Valve USA, Inc.
- e. Kitz Corp. of America.
- f. Metraflex Company.
- g. Milwaukee Valve Company, Inc.
- h. NIBCO Inc.
- i. Red-White Valve Corp.
- j. Stockham Valves & Fittings, Inc.
- k. Tyler Pipe.
- l. Val-Matic Valve & Mfg. Corp.
- m. Victaulic Company of America.

2.02 BASIC, COMMON FEATURES

- A. Pressure and Temperature Ratings: As indicated in the "Application Schedule" of Part 3 of this Section and as required to suit system pressures and temperatures.
- B. Sizes: Same size as upstream pipe, unless otherwise indicated.
- C. Operators: Use specified operators and handwheels, except provide the following special operator features:
 - 1. Handwheels: For valves other than quarter turn.
 - 2. Lever Handles: For quarter-turn valves 6 inches and smaller.
 - 3. Memory Stops: For balancing applications.
- D. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.
- E. Threads: ASME B1.20.1.
- F. Flanges: ASME B16.1 for cast iron, ASME B16.5 for steel, and ASME B16.24 for bronze valves.
- G. Solder Joint: ASME B16.18.

2.03 GATE VALVES

- A. Gate Valves, 2-1/2 Inches and Smaller: MSS SP-80; Class 125, 200-psi cold working pressure (CWP), or Class 150, 300-psi CWP; ASTM B 62 cast-bronze body and bonnet, solid-bronze wedge, copper-silicon alloy rising stem, teflon-impregnated packing with bronze packing nut, threaded or soldered end connections; and with aluminum or malleable-iron handwheel. Gate valves shall be certified lead free.
- B. Gate valves shall be used only where required by code.

2.04 BALL VALVES

- A. Ball Valves, 4 Inches and Smaller: MSS SP-110, Class 150, 600-psi CWP, ASTM B 584 or ASTM B283 bronze body and bonnet, 2-piece construction; chrome-plated brass ball, standard port for 1/2-inch valves and smaller and conventional port for 3/4-inch valves and larger; blowout proof; bronze or brass stem; teflon seats and seals; threaded or soldered end connections, lever handle operator. Valves shall be certified lead free.

2.05 CHECK VALVES

- A. Swing Check Valves, 2-1/2 Inches and Smaller: MSS SP-80; Class 125, 200-psi CWP, or Class 150, 300-psi CWP; horizontal swing, Y-pattern, ASTM B 62 cast-bronze body and cap, rotating bronze disc with rubber seat or composition seat, threaded or soldered end connections. Valves shall be certified lead free.
- B. Wafer Check Valves: Class 125, 200-psi CWP, ASTM A 126 cast-iron body, bronze disc/plates, stainless-steel pins and springs, Buna N seals, installed between flanges. Valves shall be certified lead free.
- C. Lift Check Valves: Class 125, ASTM B 62 bronze body and cap (main components), horizontal or vertical pattern, lift-type, bronze disc or Buna N rubber disc with stainless-steel holder threaded or soldered end connections. Valves shall be certified lead free.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance of valves. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- C. Operate valves from fully open to fully closed positions. Examine guides and seats made accessible by such operation.
- D. Examine threads on valve and mating pipe for form and cleanliness.
- E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage.
- F. Do not attempt to repair defective valves; replace with new valves.

3.02 INSTALLATION

- A. Install valves as indicated, according to manufacturer's written instructions.
- B. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties.
- C. Install valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.
- D. Locate valves for easy access and provide separate support where necessary.
- E. Install valves in horizontal piping with stem at or above the center of the pipe.
- F. Install valves in a position to allow full stem movement.
- G. Installation of Check Valves: Install for proper direction of flow as follows:
 - 1. Swing Check Valves: Horizontal position with hinge pin level.
 - 2. Wafer Check Valves: Horizontal or vertical position, between flanges.
 - 3. Lift Check Valve: With stem upright and plumb.

3.03 VALVE END SELECTION

- A. Select valves with the following ends or types of pipe/tube connections:
 - 1. Copper Tube Size, 2-1/2 Inches and Smaller: Solder ends.

3.04 APPLICATION SCHEDULE

- A. General Application:
 - 1. Use gate, ball and butterfly valves for shutoff duty.
 - 2. Use ball and butterfly valves for throttling duty.
 - 3. Refer to piping system Specification Sections for specific valve applications and arrangements.
- B. Domestic Water Systems: Use the following valve types:
 - 1. Gate Valves: Class 125, bronze or cast-iron body to suit piping system. Gate valves shall be used only where required by code or local utility.
 - 2. Ball Valves: Class 150, 600-psi CWP, with stem extension.
 - 3. Butterfly Valves: Nickel-plated ductile iron, aluminum bronze, or elastomer-coated ductile iron disc; EPDM or Buna N sleeve and stem seals.
 - 4. Bronze Swing Check: Class 125, with rubber seat.
 - 5. Check Valves: Class 125, swing or wafer type as indicated.

3.05 ADJUSTING

- A. Adjust or replace packing after piping systems have been tested and put into service, but before final adjusting and balancing. Replace valves if leak persists.

END OF SECTION

**SECTION 22 07 20
PIPE INSULATION FOR PLUMBING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes preformed, rigid and flexible pipe insulation; insulating cements; accessories and attachments; and sealing compounds.

1.03 SUBMITTALS

- A. Product Data: Include product data description, list of materials, thickness, density and k-values for each product type, locations, manufacturer's installation instructions, flames spread and smoke developed ratings.
- B. See "Submittal Schedule" at the end of Section 23 01 00 "General Requirements for Mechanical Systems."

1.04 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
 - 1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Mineral-Fiber Insulation:
 - a. CertainTeed Manson.
 - b. Knauf FiberGlass GmbH.
 - c. Owens-Corning Fiberglas Corp.
 - d. Schuller International, Inc.
 - 2. Flexible Elastomeric Thermal Insulation:
 - a. Armstrong World Industries, Inc.
 - b. Rubatex Corp.

2.02 INSULATION MATERIALS

- A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:
 - 1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.
 - a. Nominal density is 2.5 lb/cu. Ft. or more.
 - b. Thermal conductivity (k-value) at 100 deg F is 0.28 Btu x in./h x sq. ft. x deg F or less
 - 2. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:
 - a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
 - b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.
 - 3. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
 - 4. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.

5. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.
- B. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
 - a. Thermal conductivity (k-value) at 90 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less.
 2. Adhesive: As recommended by insulation material manufacturer.
 3. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.
- C. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.
- D. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil- thick, high-impact, ultraviolet-resistant PVC.
 1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
 2. Adhesive: As recommended by insulation material manufacturer.

2.03 ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, pre-sized a minimum of 8 oz./sq. yd, 4 inch tape width.
- B. Bands: 3/4 inch wide, materials compatible with jacket:
- C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.

2.04 VAPOR RETARDERS

- A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
- B. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.02 GENERAL APPLICATION REQUIREMENTS

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
- B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.
- C. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- D. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- E. Apply insulation with the least number of joints practical.
- F. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.
- G. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.

- H. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- I. Apply adhesives and mastics at the manufacturer's recommended coverage rate.
- J. Apply insulation with integral jackets as follows:
 - 1. Pull jacket tight and smooth.
 - 2. Circumferential Joints: Cover with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches o.c.
 - 3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap.
 - 4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
 - 5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.
- K. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.
- L. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- M. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 - 4. Seal jacket to wall flashing with flashing sealant.
- N. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- O. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Division 07 for firestopping and fire-resistive joint sealers.
- P. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07.

3.03 MINERAL-FIBER INSULATION APPLICATION

- A. Apply insulation to straight pipes and tubes by securing each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
- B. Apply preformed pipe insulation to outer diameter of pipe flange.
- C. Apply insulation to fittings and elbows as follows:
 - 1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.

2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
 3. Cover fittings with standard PVC fitting covers.
- D. Apply insulation to valves and specialties as follows:
1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
 2. When premolded insulation sections are not available, apply glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
 4. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.04 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

- A. Apply insulation to straight pipes and tubes as follows:
1. Follow manufacturer's written instructions for applying insulation.
 2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
- B. Apply pipe insulation to outer diameter of pipe flanges.
- C. Apply insulation to fittings and elbows as follows:
1. Apply mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
- D. Apply insulation to valves and specialties as follows:
1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.
 2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.05 INSULATION APPLICATION SCHEDULE

- A. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
1. Flexible connectors.
 2. Vibration-control devices.
 3. Drainage piping located in crawl spaces, unless otherwise indicated.
 4. Below-grade piping, unless otherwise indicated.
 5. Chrome-plated pipes and fittings, unless potential for personnel injury.
 6. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.
- B. See "Piping Insulation Schedule" on Sheet M5-1.

END OF SECTION

**SECTION 22 11 16
WATER DISTRIBUTION PIPING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes water distribution piping from locations indicated to fixtures and equipment inside building.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the 125 psig minimum working-pressure ratings, unless otherwise indicated:

1.04 QUALITY ASSURANCE

- A. Provide listing/approval stamp, label, or other marking on piping made to specified standards.
- B. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
- C. Installer Qualifications: Installers of pressure-sealed joints are to be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

1.05 SUBMITTALS

- A. Product Data: Tube and fittings.
- B. System purging and disinfecting activities report.
- C. Field quality-control reports.
- D. See "Submittal Schedule" at the end of Section 23 01 00 "General Requirements for Mechanical Systems."

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Domestic water piping, tubing, fittings, joints, and appurtenances intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act, with requirements of authorities having jurisdiction, and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.02 PIPES AND TUBES

- A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.
- B. Soft Copper Tube: ASTM B 88, Types K, water tube, annealed temper.
- C. Hard Copper Tube: ASTM B 88, Types L, water tube, drawn temper.

2.03 PIPE AND TUBE FITTINGS

- A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.
- B. Copper, Solder-Joint Pressure Fittings: ASME B16.18 cast-copper alloy or ASME B16.22 wrought copper.
- C. Copper, Grooved-End Fittings: ASTM B 75 copper tube or ASTM B 584 bronze castings.
- D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

- E. Copper Unions: ASME B16.18, cast-copper-alloy, hexagonal-stock body with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends. Include threads conforming to ASME B1.20.1 on threaded ends.
- F. Pressure-Seal-Joint Fittings, Copper or Bronze - Domestic Water:
 - 1. Source Limitations: Obtain pressure-seal-joint fittings, copper or bronze, from single manufacturer.
 - 2. Housing: Copper.
 - 3. O-Rings and Pipe Stops: EPDM.
 - 4. Tools: Manufacturer's special tools.
 - 5. Minimum 200 psig working-pressure rating at 250 deg F.

2.04 JOINING MATERIALS

- A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.
- B. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for commonly used joining materials.
- C. Solder: ASTM B 32, Alloy Sn95, Sn94, or E; lead free.
- D. Brazing Filler Metal: AWS A5.8, BCuP, copper phosphorus or BAg, silver classification.
- E. Transition Couplings: Coupling or other manufactured fitting same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.
- F. Mechanical Couplings for Grooved-End Copper Tubing: Copper-tube dimensions and design similar to AWWA C606, ferrous housing sections, EPDM-rubber gaskets suitable for domestic hot and cold water (gasket to serve as dielectric fitting), bolts and nuts. Minimum pressure rating = 300 psig.

2.05 VALVES

- A. Refer to Division 22 Section "Valves for Plumbing" for general-duty valves.
- B. Refer to Division 22 Section "Plumbing Specialties" for special-duty valves.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.
- B. Fitting Option: Mechanically formed tee-branch outlets and brazed joints may be used on aboveground copper tubing.
- C. Service Entrance Piping, Underground:
 - 1. 2-1/2 Inch NPS and Smaller: Soft copper tube, Type K; copper, solder-joint pressure fittings; and brazed joints.
- D. Water Distribution Piping:
 - 1. Aboveground: Hard copper tube, Type L; copper, solder-joint fittings; and soldered joints or copper pressure-seal-joint fittings; and pressure-sealed joints.
 - 2. Underground: Soft copper tube, Type K; wrought-copper, solder-joint pressure fittings; and soldered joints.

3.02 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use ball, or butterfly valves.
 - 2. Throttling Duty: Use ball or butterfly valves.

3.03 PIPING INSTALLATION, GENERAL

- A. Refer to Division 23 Section "Basic Mechanical Piping Materials and Methods" for basic piping installation.

- B. Install piping level without pitch or with 0.25 percent slope downward toward drain when drains are indicated.

3.04 SERVICE ENTRANCE PIPING INSTALLATION

- A. Extend service entrance piping to exterior water service piping in sizes and locations indicated for service entrances into building.
- B. Rough-in water piping for water meter installation according to utility company's requirements. Verify water meter requirements with utility company. Provide water meters as required by utility company.
- C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside building at each service entrance pipe.
- D. Install water-pressure regulators downstream from shutoff valves. Refer to Division 22 Section "Plumbing Specialties" for water-pressure regulators.
- E. Install wall penetration system at each service entrance pipe penetration through foundation wall. Make installation watertight. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for wall penetration systems.

3.05 JOINT CONSTRUCTION

- A. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Mechanically Formed Outlets: Form tee in copper tube according to equipment manufacturer's written instructions. Use tool designed for copper tube, drill pilot hole, form collar for outlet, dimple tube forming seating stop, and braze branch tube into collar.
- C. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools and procedure recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.

3.06 VALVE INSTALLATION

- A. Sectional Valves: Install sectional valves close to main on each branch and riser serving plumbing fixtures or equipment, and where indicated. Use ball valves for piping 2-inch NPS and smaller.
- B. Shutoff Valves: Install shutoff valve on each water supply to equipment, on each supply to plumbing fixtures without supply stops, and where indicated. Use ball valves for piping 2-inch NPS and smaller.
- C. Drain Valves: Install hose-end drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
- D. Calibrated Balancing Valves: Install in each hot-water circulation return branch, discharge side of each pump and circulator, and where indicated. Refer to Division 22 Section "Plumbing Specialties" for calibrated balancing valves.

3.07 FIELD QUALITY CONTROL

- A. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- B. Test service entrance piping and water distribution piping as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave interior piping uncovered and unconcealed new, altered, extended, or replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
 - 3. Cap and subject piping to static water pressure as required by the local Plumbing Code. If the local Plumbing Code does not stipulate testing requirements, cap and subject piping to static water pressure of 100 psig, without exceeding pressure rating of piping system ma

terials. Isolate test source and allow to stand for 15 minutes. Leaks and loss in test pressure constitute defects that must be repaired.

4. If testing is to be performed at temperatures below freezing, an air test may be performed in lieu of water testing if allowed by local plumbing code and approved by engineer.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.08 CLEANING

- A. Clean and disinfect service entrance piping and water distribution piping as follows:
 1. Purge new piping and parts of existing water piping that have been altered, extended, or repaired before using.
 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed, procedure described in either AWWA C651 or AWWA C652 or as described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for 3 hours.
 - c. Flush system with clean, potable water until chlorine is no longer in water coming from system after the standing time.
- B. Prepare and submit reports for purging and disinfecting activities.
- C. Clean interior of piping system. Remove dirt and debris as work progresses.

3.09 START-UP

- A. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.
- B. Perform the following steps before putting into operation:
 1. Close drain valves, hydrants, and hose bibbs.
 2. Open shutoff valves to fully open position.
 3. Open throttling valves to proper setting.
 4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
 5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
- C. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.
- D. Set water-pressure regulators at 80 psig maximum outlet pressure, unless otherwise indicated.

END OF SECTION

**SECTION 22 11 23
DOMESTIC WATER PUMPS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes all-bronze and bronze-fitted centrifugal pumps for domestic hot-water circulation.

1.03 SUBMITTALS

- A. Product Data: For each type and size of domestic water pump specified. Include certified performance curves with operating points plotted on curves; and rated capacities of selected models, furnished specialties, and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and Maintenance Data: For domestic water pumps to include in operation and maintenance manuals.
- D. See "Submittal Schedule" at the end of Section 23 01 00 "General Requirements for Mechanical Systems."

1.04 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of domestic water pumps and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. UL Compliance: Comply with UL 778 for motor-operated water pumps.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - 1. Armstrong Pumps Inc.
 - 2. Bell & Gossett Domestic Pump; ITT Industries.
 - 3. Grundfos Pumps Corp.
 - 4. Taco, Inc.
 - 5. WILO USA LLC

2.02 CLOSE COUPLED, IN-LINE, CENTRIFUGAL PUMPS

- A. Description: Factory-assembled and -tested, single-stage, close-coupled, in-line, sealless centrifugal pumps as defined in ANSI/HI 5.1-5.6.
 - 1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge-type unit with motor and impeller on common shaft and designed for installation with pump and motor shaft mounted horizontally.
 - 2. Casing: Bronze, with threaded companion-flange connections.
 - 3. Impeller: Corrosion-resistant material.
 - 4. Motor: Single speed, unless otherwise indicated.

PART 3 - EXECUTION

3.01 PUMP INSTALLATION

- A. Comply with ANSI/HI 1.4.

- B. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.
- C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to pumps to allow service and maintenance.
- C. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.
- D. Install shutoff valve and strainer on suction side of pumps, and check valve and throttling valve on discharge side of pumps. Install valves same size as connected piping.

3.03 START UP

- A. Verify that pumps are installed and connected according to the Contract Documents.
- B. Perform the following preventive maintenance operations and checks before starting:
 - 1. Verify that pumps are free to rotate by hand and that pumps for handling hot liquids are free to rotate with pumps hot and cold. Do not operate pumps if they are bound or drag, until cause of trouble is determined and corrected.
 - 2. Check suction piping connections for tightness to avoid drawing air into pumps.
 - 3. Clean strainers.
 - 4. Verify that pump controls are correct for required application.

3.04 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain domestic water pumps.

END OF SECTION

**SECTION 22 13 16
DRAINAGE AND VENT PIPING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes sanitary drainage and vent piping inside building and to locations indicated.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Soil, Waste and Vent Piping: 10-foot head of water.
 - 2. Force-Main Piping: 100 psig.

1.04 SUBMITTALS

- A. Test Results and Reports: Specified in "Field Quality Control" Article.
- B. See "Submittal Schedule" located at the end of Section 23 01 00 "General Requirements for Mechanical Systems."

1.05 QUALITY ASSURANCE

- A. Provide listing/approval stamp, label, or other marking on piping made to specified standards.
- B. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

PART 2 - PRODUCTS

2.01 PIPES AND TUBES

- A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.
- B. Hub-and-Spigot, Cast-Iron Soil Pipe: ASTM A 74, Service and Extra Heavy classes. Include ASTM C 564 rubber gasket, with dimensions required for pipe class, for each hub.
- C. Hubless, Cast-Iron Soil Pipe: ASTM A 888 or CISPI 301.
- D. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.
- E. Hard Copper Tube: ASTM B 306, drainage tube, drawn temper.
- F. PVC Plastic Pipe: ASTM D 2665, solid wall, Schedule 40.

2.02 PIPE AND TUBE FITTINGS

- A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.
- B. Threaded-Fitting, End Connections: ASME B1.20.1.
- C. Hub-and-Spigot, Cast-Iron, Soil-Pipe Fittings: ASTM A 74, Service and Extra Heavy classes, hub and spigot. Include ASTM C 564 rubber gasket, with dimensions required for pipe class, for each hub.
- D. Hubless, Cast-Iron, Soil-Pipe Fittings: CISPI 301.
- E. Copper, Solder-Joint Drainage Fittings: ASME B16.23 cast copper or ASME B16.29 wrought copper.
- F. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311 drain, waste, and vent pipe patterns.

2.03 JOINING MATERIALS

- A. Refer to Division 23 Section "Basic Mechanical Piping Materials and Methods" for commonly used joining materials.
- B. Solder: ASTM B 32, Alloy Sn95, Sn94, or E; lead free.
- C. Hubless, Cast-Iron, Soil-Piping Couplings: CISPI 310/NSF assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve or gasket with integral, center pipe stop. Neoprene Couplings with stainless steel clamps.
- D. PVC: Solvent Welded fittings with primer-less type PVC cement listed for specific use.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.
- B. Aboveground, Sanitary Waste and Vent Piping: Use the following:
 - 1. 1-1/2 to 10-Inch NPS: Hubless, cast-iron soil pipe; hubless, cast-iron, soil-pipe fittings; and hubless, cast-iron, soil-piping couplings;
 - 2. 1-1/4 to 4-Inch NPS: Hard copper drainage tube; copper, solder-joint drainage fittings; and soldered joints.
 - 3. 1-1/4 to 12-Inch NPS: PVC plastic pipe, PVC socket fittings, and solvent-cemented joints. Do not install PVC piping in return air plenum.
- C. Underground, Sanitary Waste and Vent Piping: Use the following:
 - 1. 2- to 12-Inch NPS: Hub-and-spigot, cast-iron soil pipe, Service class; hub-and-spigot, cast-iron, soil-pipe fittings, Service class; and compression joints.
 - 2. 2- to 12-Inch NPS: PVC plastic pipe, PVC socket fittings and solvent welded joints.
- D. Forced Mains (piping under pressure): Use the following:
 - 1. Hard copper water tube, Type L; copper, solder-joint pressure fittings; and soldered joints.

3.02 PIPING INSTALLATION

- A. Refer to Division 23 Section "Basic Mechanical Piping Materials and Methods" for basic piping installation.
- B. Extend building sanitary drain piping and connect to sanitary sewer piping in sizes and locations indicated for service entrances into building. Install double grade cleanout and extension to grade at connections of building sanitary drains with building sanitary sewers.
- C. Install wall penetration system at each service entrance pipe penetration through foundation wall. Make installation watertight. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for wall penetration systems.
- D. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- E. Make changes in direction for drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not make change in direction of flow greater than 90 degrees. Use proper size of standard increasers and reducers if different sizes of piping are connected. Reducing size of drainage piping in direction of flow is prohibited.
- F. Lay buried building drain piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- G. Install drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Sanitary Drain: 1/4" per foot downward in direction of flow for piping 3-inch NPS and smaller; 1/8" per foot downward in direction of flow for piping 4-inch NPS and larger.
 2. Vent Piping: 1/8" per foot downward toward vertical fixture vent or toward vent stack.
- H. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
1. Compression Joints: Make with rubber gasket matching class of pipe and fittings.
 2. Hubless Joints: Make with rubber gasket and sleeve or clamp.
- I. PVC Piping Joints: Join drainage piping according to ASTM D 2665.
- J. Install indirect waste piping per local code requirements. Maintain code required air gaps.

3.03 FIELD QUALITY CONTROL

- A. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- B. Test drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedure, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
 3. Roughing-In Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10 feet of head. Water level must not drop from 15 minutes before inspection starts through completion of inspection. Inspect joints for leaks.
 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout the period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects using new materials and retest piping or portion thereof until satisfactory results are obtained.
 6. Prepare reports for tests and required corrective action.

3.04 CLEANING AND PROTECTING

- A. Clean interior of piping system. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION

**SECTION 22 13 19
PLUMBING SPECIALTIES**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes plumbing specialties for the following:
 - 1. Water distribution systems.
 - 2. Soil, waste, and vent systems.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Water Distribution Piping: 125 psig.
 - 2. Soil, Waste, and Vent Piping: 10-foot head of water.
 - 3. Force-Main Piping: 100 psig.

1.04 SUBMITTALS

- A. Product Data: For each plumbing specialty indicated. Include rated capacities of selected equipment and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following plumbing specialty products:
 - 1. Backflow preventers.
 - 2. Water regulators.
 - 3. Balancing valves.
 - 4. Water hammer arresters.
 - 5. Drain valves.
 - 6. Hose bibbs and hydrants.
 - 7. Outlet boxes.
 - 8. Cleanouts.
 - 9. Floor drains.
 - 10. Vent caps, vent terminals, and roof flashing assemblies.
- B. Reports: Specified in "Field Quality Control" Article.
- C. Maintenance Data: For specialties to include in the maintenance manuals. Include the following:
 - 1. Backflow preventers.
 - 2. Water regulators.
 - 3. Hose stations.
- D. See "Submittal Schedule" located at the end of Section 23 01 00 "General Requirements for Mechanical Systems."

1.05 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, dimensional requirements, and characteristics of plumbing specialties and are based on the specific types and models indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."
- B. Provide listing/approval stamp, label, or other marking on plumbing specialties made to specified standards.
- C. Listing and Labeling: Provide electrically operated plumbing specialties specified in this Section that are listed and labeled as defined in National Electrical Code, Article 100.
- D. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

- E. Comply with NFPA 70, "National Electrical Code," for electrical components.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Backflow Preventers:
 - a. Ames Co., Inc.
 - b. B & K Industries, Inc.
 - c. Cla-Val Co.
 - d. CMB Industries; Febco Div.
 - e. Conbraco Industries, Inc.
 - f. FLOMATIC Corp.
 - g. Grinnell Corp.; Mueller Co. Marketing Group for Hersey Products Div.
 - h. IMI Cash Valve.
 - i. Sparco, Inc.
 - j. Watts Industries, Inc.; Water Products Div.
 - k. Zurn Industries, Inc.; Wilkins Div.
 2. Water Pressure Regulators:
 - a. Bermad, Inc.
 - b. Cashco, Inc.
 - c. Cla-Val Co.
 - d. Conbraco Industries, Inc.
 - e. FLOMATIC Corp.
 - f. G A Industries, Inc.
 - g. Honeywell Braukmann.
 - h. IMI Cash Valve.
 - i. Kaye & Mac Donald, Inc.
 - j. Keckley: O.C. Keckley Co.
 - k. Spence Engineering Co., Inc.
 - l. Watts Industries, Inc.; Water Products Div.
 - m. Zurn Industries, Inc.; Wilkins Div.
 3. Calibrated Balancing Valves:
 - a. Amtrol, Inc.
 - b. Armstrong Pumps, Inc.
 - c. Flow Design, Inc.
 - d. ITT Fluid Technology Corp.; ITT Bell & Gossett Div.
 - e. Taco, Inc.
 - f. Tour & Andersson, Inc.; Valve Div.
 - g. Watts Industries, Inc.; Water Products Div.
 - h. Oventrop
 4. Memory-Stop Balancing Valves:
 - a. Crane Co.; Valve Div.
 - b. Grinnell Corp.
 - c. Hammond Valve Corp.
 - d. Milwaukee Valve Co., Inc.
 - e. Nibco, Inc.
 5. Thermostatic Water Mixing Valves:
 - a. Acorn
 - b. Lawler Manufacturing Co., Inc.
 - c. Leonard Valve Co.
 - d. Mark Controls Corp.; Powers Process Controls.
 - e. Symmons Industries, Inc.
 - f. T & S Brass and Bronze Works, Inc.
 6. Outlet Boxes:
 - a. Acorn Engineering Co.

- b. Guy Gray Manufacturing Co., Inc.
- c. IPS Corp.
- d. LSP-Specialty Products Co.
- e. Oatey Co.
- f. Plastic Oddities, Inc.
- g. Symmons Industries, Inc.
- 7. Hydrants:
 - a. Enpoco, Inc.
 - b. Josam Co.
 - c. Murdock, Inc.
 - d. Smith: Jay R. Smith Mfg. Co.
 - e. Tyler Pipe; Wade Div.
 - f. Watts Industries, Inc.; Ancon Drain Div.
 - g. Watts Industries, Inc.; Water Products Div.
 - h. Woodford Manufacturing Co.
 - i. Zurn Industries, Inc.; Hydromechanics Div.
- 8. Water Hammer Arresters:
 - a. Amtrol, Inc.
 - b. Enpoco, Inc.
 - c. Josam Co.
 - d. Precision Plumbing Products, Inc.
 - e. Sioux Chief Manufacturing Co., Inc.
 - f. Smith: Jay R. Smith Mfg. Co.
 - g. Sparco, Inc.
 - h. Tyler Pipe; Wade Div.
 - i. Watts Industries, Inc.; Ancon Drain Div.
 - j. Watts Industries, Inc.; Water Products Div.
 - k. Zurn Industries, Inc.; Hydromechanics Div.
 - l. MIFAB, Inc.
- 9. Floor Drains, Drain Specialties
 - a. Josam Co.
 - b. Sioux Chief Manufacturing Co., Inc.
 - c. Smith: Jay R. Smith Mfg. Co.
 - d. Tyler Pipe, Wade Div.
 - e. Watts Industries, Inc., Ancon Drain Div.
 - f. Zurn Industries, Inc., Hydromechanics Div.
 - g. MIFAB, Inc.

2.02 BACKFLOW PREVENTERS

- A. General: ASSE standard, backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.
 - 1. 2-Inch NPS and Smaller: Bronze body with threaded ends.
 - 2. Interior Components: Corrosion-resistant materials.
 - 3. Exterior Finish: Polished chrome-plate if used in chrome-plated piping system.
 - 4. Strainer on inlet.
- B. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent.
- C. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7 garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.
- D. Intermediate Atmospheric-Vent Backflow Preventers: ASSE 1012, suitable for continuous pressure application. Include inlet screen and 2 independent check valves with intermediate atmospheric vent.
- E. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013, suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet;

test cocks; and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves.

- F. Double-Check Backflow Prevention Assemblies: ASSE 1015, suitable for continuous pressure application. Include shutoff valves on inlet and outlet, and strainer on inlet; and test cocks with 2 positive-seating check valves.
- G. Hose-Connection Backflow Preventers: ASSE 1052, suitable for at least 3-gpm flow and applications with up to 10-foot head back pressure. Include 2 check valves; intermediate atmospheric vent; and nonremovable, ASME B1.20.7 garden-hose thread on outlet.

2.03 WATER PRESSURE REGULATORS

- A. General: water regulators, rated for initial working pressure of 150 psig minimum, of size, flow rate, and inlet and outlet pressures indicated. Include integral factory-installed or separate field-installed Y-pattern strainer.
 - 1. 2-Inch NPS and Smaller: Bronze body, renewable nickel alloy seats, stainless steel internal parts, with threaded ends.

2.04 BALANCING VALVES

- A. Calibrated Balancing Valves: Adjustable, with 2 readout ports and memory setting indicator. Include manufacturer's standard hoses, fittings, valves, differential pressure meter, and carrying case.
 - 1. 2-Inch NPS and Smaller: Bronze body with brass ball, adjustment knob, calibrated nameplate, and threaded or solder-joint ends.
 - 2. 2-Inch NPS and Smaller: Bronze, Y-pattern body with adjustment knob and threaded ends.
- B. Memory-Stop Balancing Valves, 2-Inch NPS and Smaller: ball valve, rated for 400-psig minimum CWP. Include 2-piece, ASTM B 62 bronze body with standard port, chrome-plated brass ball, replaceable seats and seals, blowout-proof stem, solder-joint ends, and vinyl-covered steel handle with memory-stop device.

2.05 THERMOSTATIC WATER MIXING VALVES

- A. General: ASSE 1017, manually adjustable, thermostatic water mixing valve with bronze body. Include check stop and union on hot- and cold-water-supply inlets, adjustable temperature setting, and capacity at pressure loss as indicated.
 - 1. Bimetal Thermostat, Operation and Pressure Rating: 125 psig minimum.
 - 2. Liquid-Filled Motor, Operation and Pressure Rating: 100 psig minimum.
- B. Thermostatic Water Mixing Valves: Unit, with the following:
 - 1. Piping, of sizes and in arrangement indicated. Include valves and unions.
 - 2. Piping Component Finish: Polished chrome-plate.
 - 3. Piping Component Finish: Satin spray.
 - 4. Piping Component Finish: Rough brass.
 - 5. Cabinet: Steel box with steel hinged door and white enameled finish.
 - 6. Cabinet: Stainless-steel box with stainless-steel hinged door.
 - 7. Cabinet Mounting: Recessed.
 - 8. Cabinet Mounting: Surface.
 - 9. Thermometer: Manufacturer's standard.
- C. Manifolder, Thermostatic Water Mixing Valve Assemblies: Factory-fabricated unit consisting of parallel arrangement of thermostatic water mixing valves.
 - 1. Arrangement: One large-flow, thermostatic water mixing valve with flow-control valve, pressure regulator, inlet and outlet pressure gages, and one small-flow, thermostatic water mixing valve with flow-control valve. Include outlet thermometer, factory- or field-installed inlet and outlet valves, and other indicated options.
 - 2. Piping, of sizes and in arrangement indicated. Include valves and unions.
 - 3. Piping Component Finish: Polished chrome-plate.
 - 4. Piping Component Finish: Satin spray.
 - 5. Piping Component Finish: Rough brass.

6. Cabinet: Steel box with steel hinged door and white enameled finish.
 7. Cabinet: Stainless-steel box with stainless-steel hinged door.
 8. Cabinet Mounting: Recessed.
 9. Cabinet Mounting: Surface.
- D. Single Fixture under counter thermostatic mixing valves. Rough chrome, thermostatic mixing valve with adjustable outlet temperature, integral check valves on both inlets, elastomer seal to prevent cross connection from hot to cold.

2.06 STRAINERS

- A. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A 666, Type 304, stainless-steel screens with 3/64-inch round perforations, unless otherwise indicated. Screwed screen retainer with centered blowdown with hose-end drain valve

2.07 OUTLET BOXES

- A. General: Recessed-mounting outlet boxes with fittings complying with ASME A112.18.1M. Include box with faceplate, services indicated for equipment connections, and wood-blocking reinforcement.
- B. Clothes Washer Outlet Boxes: With recessed box and faceplate, two 1/2" hose connections with shut-off valves, 2" standpipe and drain, as indicated on drawings.
- C. Ice Maker Outlet Boxes: With recessed box and faceplate, hose connection and shut-off valve.

2.08 INTERCEPTORS

- A. Grease Interceptor: Construct grease interceptor per local code requirements.

2.09 HYDRANTS

- A. See "Plumbing Fixture Schedule" on Sheet M5-2.

2.10 CLEANOUTS

- A. Cleanout Plugs: PVC Cast iron or brass, threads complying with ANSI B2.1, countersunk head. Engrave heads to identify system.
- B. Floor Cleanouts: Cast iron body and frame with cleanout plug and adjustable round nickel bronze top. Provide to match floor system:
1. Exposed finish type, standard mill finish.
 2. Exposed flush type, standard non-slip scored or abrasive finish.
 3. Exposed flush type, standard mill finish and carpet marker.
 4. Heavy duty for traffic applications.
- C. Wall Cleanouts: Cast iron or PVC body adaptable to pipe with cast bronze, brass or PVC cleanout plug; stainless steel cover, vandal proof screws.

2.11 FLOOR DRAINS

- A. See "Plumbing Fixture Schedule" on Sheet M5-2.

2.12 FLASHING

- A. Floor Drains: Non-plasticized, chlorinated, polyethylene, concealed, water-proof membrane, 0.40" thick, solvent weldable. 48" square minimum.
- B. Vents thru Roof (VTR): 24" square minimum
1. Non-plasticized, chlorinated, polyethylene, concealed, water-proof membrane, 0.40" thick, solvent weldable.
 2. Lead sheet, 2-1/2" lb/sf, concealed

2.13 MISCELLANEOUS PIPING SPECIALTIES

- A. Water Hammer Arresters: ASME A112.26.1M, ASSE 1010, or PDI-WH 201, bellows or piston type with pressurized cushioning chamber. Sizes are based on water-supply fixture units, ASME A112.26.1M sizes A through F and PDI-WH 201 sizes A through F.
- B. Domestic water expansion tanks: Precharged hydropneumatic expansion tank approved for potable water, with steel shell, polypropylene liner, stainless steel system connection and FDA

diaphragm. Working temperature and pressure shall be 200°F and 150 psig. Tanks over 5 cubic feet capacity of 250 psi shall be ASME constructed.

- C. Roof Flashing Assemblies: Manufactured assembly made of 4-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 8 inches from pipe with galvanized steel boot reinforcement, and counterflashing fitting.
- D. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.
- E. Air-Gap Fittings: ASME A112.1.2, cast iron or cast bronze, with fixed air gap, inlet for drain pipe or tube, and threaded or spigot outlet.
- F. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
- G. Vent Terminals: Commercially manufactured, shop-fabricated or field-fabricated, frost-proof assembly constructed of galvanized steel, copper, or lead-coated copper. Size to provide 1-inch enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing, as indicated.

PART 3 - EXECUTION

3.01 PLUMBING SPECIALTY INSTALLATION

- A. General: Install plumbing specialty components, connections, and devices according to manufacturer's written instructions.
- B. Install backflow preventers of type, size, and capacity indicated, at each water-supply connection to mechanical equipment and systems, and to other equipment and water systems as indicated. Comply with authorities having jurisdiction. Locate backflow preventers in same room as connected equipment. Install air-gap fitting on units with atmospheric-vent connection and pipe relief outlet drain to nearest floor drain. Do not install bypass around backflow preventer.
- C. Install pressure regulators with inlet and outlet shutoff valves and balance valve bypass. Install pressure gages on inlet and outlet.
- D. Install strainers on supply side of each control valve, pressure regulator, and solenoid valve, and where indicated.
- E. Install cleanouts in aboveground piping and building drain piping as indicated, and where not indicated, according to the following:
 - 1. Size same as drainage piping up to 4-inch NPS. Use 4-inch NPS for larger drainage piping unless larger cleanout is indicated.
 - 2. Locate at each change in direction of piping greater than 45 degrees.
 - 3. Locate at minimum intervals of 50 feet for piping 4-inch NPS and smaller and 100 feet for larger piping.
 - 4. Locate at base of each vertical soil and waste stack.
- F. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.
- G. Install cleanout wall access covers with frame and cover flush with finished wall, for cleanouts located in concealed piping.
- H. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.
- I. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.
- J. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.
- K. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor or as indicated. Size outlets as indicated.

- L. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- M. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
- N. Position floor drains for easy access and maintenance.
- O. Install interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.
- P. Install individual stop valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated. Install water-supply stop valves in accessible locations.
- Q. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
- R. Locate drainage piping as close as possible to bottom of floor slab supporting fixtures and drains.
- S. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.
- T. Install water hammer arrestor at each battery of plumbing fixture connections and additionally as required to eliminate water hammer. Locate per manufacturer's recommendations or Standard PDI-WH 201. Locate in easily accessible location for future maintenance.
- U. Install flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Arrange for electric-power connections to plumbing specialties and devices that require power. Electric power, wiring, and disconnect switches are specified in Division 26 Sections.
- C. Supply Runouts to Plumbing Specialties: Install hot- and cold-water-supply piping of sizes indicated, but not smaller than required by authorities having jurisdiction
- D. Drainage Runouts to Plumbing Specialties: Install drainage and vent piping, with approved trap, of sizes indicated, but not smaller than required by authorities having jurisdiction.

3.03 START-UP

- A. Before startup, perform the following checks:
 - 1. System tests are complete.
 - 2. Damaged and defective specialties and accessories have been replaced or repaired.
 - 3. Clear space is provided for servicing specialties.
- B. Before operating systems, perform the following steps:
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open general-duty valves to fully open position.
 - 3. Remove and clean strainers.
 - 4. Verify that drainage and vent piping are clear of obstructions. Flush with water until clear.
- C. Startup Procedures: Follow manufacturer's written instructions. If no procedures are prescribed by manufacturer, energize circuits for electrically operated units. Start and run units through complete sequence of operations.
- D. Adjust operation and correct deficiencies discovered during commissioning.

3.04 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.05 DEMONSTRATION

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

END OF SECTION

**SECTION 22 33 00
DOMESTIC WATER HEATERS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following electric water heaters:
 - 1. Light-commercial gas water heaters
 - 2. Compression tanks.
 - 3. Water heater accessories.

1.03 SUBMITTALS

- A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and Maintenance Data: For water heaters to include in operation and maintenance manuals.
- D. Warranty: Special warranty specified in this Section.
- E. See "Submittal Schedule" at the end of Section 23 01 00 "General Requirements for Mechanical Systems."

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of electric water heaters and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.
- E. ASHRAE Standards: Comply with performance efficiencies prescribed for the following:
 - 1. ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," for commercial water heaters.

1.05 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including storage tank and supports.
 - b. Faulty operation of controls.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Period(s): From date of Substantial Completion:
 - a. Gas Water Heaters:
 - 1) Storage Tank: Three years.
 - 2) Burner and Controls: One year.
 - b. Compression Tanks: One year.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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

2.02 LIGHT COMMERCIAL GAS WATER HEATERS

- A. Description: Comply with ANSI Z21.10.1/CSA 4.1.
1. Manufacturers:
 - a. American Water Heater Company.
 - b. Apollo Heating & Cooling; a division of State Industries, Inc.
 - c. Bradford White Corporation.
 - d. GSW Water Heating Company.
 - e. Lochinvar Corporation.
 - f. Maytag Corp.; Water Heating Appliances Div.
 - g. Rheem Water Heater Div.; Rheem Manufacturing Company.
 - h. Ruud Water Heater Div.; Rheem Manufacturing Company.
 - i. Smith, A. O. Water Products Company.
 - j. State Industries, Inc.
 2. Storage-Tank Construction: Steel.
 - a. Tappings: ASME B1.20.1 pipe thread.
 - b. Pressure Rating: 150 psig.
 - c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.
 3. Factory-Installed, Storage-Tank Appurtenances:
 - a. Anode Rod: Replaceable magnesium.
 - b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
 - c. Drain Valve: ASSE 1005.
 - d. Insulation: Comply with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
 - e. Jacket: Steel with enameled finish.
 - f. Burner: For use with direct vented water heaters and for natural-gas fuel.
 - g. Automatic Ignition: ANSI Z21.20, electric, automatic, gas-ignition system.
 - h. Temperature Control: Adjustable thermostat.
 - i. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
 - j. Combination Temperature and Pressure Relief Valve: ANSI Z21.22/CSA 4.4. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.
 4. Venting
 - a. Direct-Vent System: Through-wall, coaxial- or double-channel, vent assembly with water heater manufacturers' outside intake/exhaust screen.

2.03 COMPRESSION TANKS

- A. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air pre-charge to minimum system-operating pressure at tank.
1. Manufacturers:
 - a. AMTROL Inc.
 - b. Armstrong Pumps, Inc.
 - c. Flexcon Industries.
 - d. Honeywell Sparco.
 - e. Myers, F. E.; Pentair Pump Group (The).
 - f. Smith, A. O.; Aqua-Air Div.
 - g. State Industries, Inc.
 - h. Taco, Inc.
 - i. Watts Regulator Co.
 - j. Wessels Co.
 2. Construction:

- a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
- b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
- c. Air-Charging Valve: Factory installed.

2.04 WATER HEATER ACCESSORIES

- A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

PART 3 - EXECUTION

3.01 WATER HEATER INSTALLATION

- A. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- B. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- C. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains.
- D. Fill water heaters with water.
- E. Charge compression tanks with air.

3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.
- C. Connect hot- and cold-water piping with shutoff valves and unions. Connect hot-water-circulating piping with shutoff valve, check valve, and union.
- D. Make connections with dielectric fittings where piping is made of dissimilar metal.

3.03 FIELD QUALITY CONTROL

- A. Perform startup service per manufacturer's recommendations.
- B. In addition to manufacturer's written installation and startup checks, perform the following:
 - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 2. Verify that piping system tests are complete.
 - 3. Check for piping connection leaks.
 - 4. Check for clear relief valve inlets, outlets, and drain piping.
 - 5. Test operation of safety controls, relief valves, and devices.
 - 6. Adjust hot-water-outlet temperature settings. Do not set above 140 deg F unless piping system application requires higher temperature.

3.04 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain water heaters.
 - 1. Train Owner's maintenance personnel on procedures for starting and stopping, troubleshooting, servicing, and maintaining equipment.
 - 2. Review data in maintenance manuals.
 - 3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION

**SECTION 22 40 00
PLUMBING FIXTURES**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes plumbing fixtures and trim, faucets, other fittings, and related components.

1.03 DEFINITIONS

- A. Accessible: Plumbing fixture, building, facility, or portion thereof that can be approached, entered, and used by physically handicapped, disabled, and elderly people.

1.04 SUBMITTALS

- A. Product Data for each plumbing fixture category and type specified. Include selected fixture, trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.
- B. Wiring diagrams from manufacturer for electrically operated units.
- C. Maintenance data for plumbing fixtures and components to include in the operation and maintenance manuals.
- D. See "Submittal Schedule" located at the end of Section 23 01 00 "General Requirements for Mechanical Systems."

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements of CABO A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; regarding plumbing fixtures for physically handicapped people.
- B. Energy Policy Act Requirements: Comply with requirements of Public Law 102-486, "Energy Policy Act," regarding water flow rate and water consumption of plumbing fixtures.
- C. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

1.06 EXTRA MATERIALS

- A. Repair kits complete with all necessary washers, springs, pins, retainers, packings, O-rings, sleeves and seats: Furnish quantity of identical units not less than 5 percent of each type and size installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Vitreous-China and Enameled Fixtures:
 - a. Kohler Co.
 - b. American Standard, Inc.
 - c. Briggs Industries, Inc.
 - d. ProFlo (Manufactured by Briggs, supplied by Ferguson)
 - e. Crane Plumbing.
 - f. Eljer Industries.
 - g. Gerber Plumbing Fixtures Corp.
 - h. Mansfield Plumbing Products, Inc.
 - i. Universal-Rundle Corp.

Cubby's Fremont Renovation

- j. Sloan Valve Co.
2. Flushometer Valves:
 - a. Sloan Valve Co
 - b. Coyne & Delany Co.
 - c. Speakman Co.
 - d. TOTO KIKI USA, Inc.
 - e. Zurn Industries, Inc.; Flush Valve Operations.
3. Toilet Seats:
 - a. American Standard, Inc.
 - b. Bemis Mfg. Co.
 - c. Centoco Manufacturing Corp.
 - d. Church Seat Co.
 - e. Eljer Industries.
 - f. Kohler Co.
 - g. Olsonite Corp.
 - h. Sanderson Plumbing Products, Inc.; Beneke Industries, Ltd.
 - i. Sperzel.
4. Supply Fittings and Faucets:
 - a. American Standard, Inc.
 - b. Chicago Faucet Co.
 - c. Crane Plumbing.
 - d. Eljer Industries.
 - e. Kohler Co.
 - f. Masco Canada, Ltd.; Cambridge Brass Div.
 - g. Masco Corp.; Delta Faucet Co.
 - h. Moen, Inc.
 - i. Price Pfister, Inc.
 - j. Speakman Co.
 - k. Symmons Industries, Inc.
 - l. T & S Brass and Bronze Works, Inc.
 - m. Zurn Industries, Inc.
5. Stainless-Steel Sinks:
 - a. Elkay Manufacturing Co.
 - b. Just Manufacturing Co.
 - c. Kohler Co.
 - d. Moen, Inc.
6. Fitting Insulation Kit:
 - a. Brocar Products, Inc.
 - b. Engineered Brass Co.
 - c. McGuire Manufacturing Co., Inc.
 - d. Plumberex Specialty Products.
 - e. TCI Products.
 - f. TRUEBRO, Inc.
7. Mop Sinks:
 - a. Fiat Products, Inc.
 - b. Stern-Williams Co., Inc.
 - c. Aqua Glass Corp.
 - d. Mustee: E.L. Mustee & Sons, Inc.
8. Fixture Carriers
 - a. J. R. Smith
 - b. Josam
 - c. Zurn
 - d. Wade
 - e. Acorn

2.02 FITTINGS

- A. Fittings for Plumbing Fixtures: Refer to plumbing fixture schedules at the end of this Section for materials for supplies, supply stops, supply risers, traps, and other fittings.
 - 1. Supply Inlets: Brass pipe or copper tube, size required for final connection.
 - 2. Supply Stops: Chrome-plated brass, angle or straight; compression, 1/4 turn ball stop valve, wheel-handle or loose-key type; same size as supply inlet and with outlet matching supply riser. Brass ball with PTFE seat. Rated for 40-deg F to 180-deg F and 125 psi maximum.
 - 3. Supply Risers: flexible copper tube with knob end. Use chrome-plated tube for exposed applications.
 - 4. Traps: Tubular brass with 0.045-inch wall thickness, slip-joint inlet, cleanout, wall flange, escutcheons, and size to match equipment. Use chrome-plated tube for exposed applications.
 - 5. Continuous Waste: Tubular brass, 0.045-inch wall thickness, with slip-joint inlet, and size to match equipment.
 - 6. Indirect Waste: Tubular brass, 0.045-inch wall thickness, and size to match equipment.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine roughing-in for potable, hot- and cold-water supply piping systems; soil, waste, and vent piping systems; and supports. Verify that locations and sizes of piping and locations and types of supports match those indicated, before installing and connecting fixtures. Use manufacturer's roughing-in data when roughing-in data are not indicated.

3.02 APPLICATIONS

- A. Include supports for plumbing fixtures according to the following:
 - 1. Carriers: For wall-hanging water closets and fixtures supported from wall construction.
 - 2. Chair Carriers: For wall-hanging urinals, lavatories, sinks, drinking fountains, and electric water coolers.
 - 3. Heavy-Duty Chair Carriers: For accessible urinals, lavatories, and other fixtures where indicated.
- B. Include fitting insulation kits for accessible fixtures according to the following:
 - 1. Lavatories: Cover hot- and cold-water supplies, stops and handles, drain, trap, and waste to wall.
 - 2. Sinks: Cover hot- and cold-water supplies, stops and handles, drain, trap, and waste to wall.
 - 3. Other Fixtures: Cover exposed fittings below fixture.

3.03 PLUMBING FIXTURE INSTALLATION

- A. Field Measurements: Coordinate roughing-in and final fixture locations and verify that plumbing fixtures can be installed to comply with original design and referenced standards.
- B. Assemble plumbing fixtures and trim, fittings, faucets, and other components according to manufacturers' written instructions.
- C. Install fixtures level and plumb according to manufacturers' written instructions, roughing-in drawings, and referenced standards.
- D. Install wall hanging, back-outlet water closets with support manufacturer's tiling frame or setting gage.
- E. Install toilet seats on water closets.
- F. Install wall hanging, back-outlet urinals with gasket seals.
- G. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for handicapped people to reach.
- H. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.

- I. Fasten floor-mounted fixtures to substrate. Fasten fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.
- J. Fasten recessed, wall-mounted fittings to reinforcement built into walls.
- K. Fasten wall-mounted fittings to reinforcement built into walls.
- L. Fasten counter-mounting plumbing fixtures to casework.
- M. Secure supplies to supports or substrate within pipe space behind fixture.
- N. Set mop sink basins in leveling bed of cement grout.
- O. Install individual stop valve in each water supply to fixture. Use gate or globe valve where specific stop valve is not specified.
 - 1. Exception: Omit stop valves on supplies to emergency equipment, except when permitted by authorities having jurisdiction. When permitted, install valve chained and locked in OPEN position.
- P. Install water supply stop valves in accessible locations.
- Q. Install faucet, laminar-flow fittings with specified flow rates and patterns in faucet spouts when faucets are not available with required rates and patterns. Include adapters when required.
- R. Install supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.
- S. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts when faucets are not available with required rates and patterns. Include adapters when required.
- T. Install traps on fixture outlets. Omit traps on fixtures having integral traps. Omit traps on indirect wastes, except where otherwise indicated.
- U. Install escutcheons at wall, floor, and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons where required to conceal protruding pipe fittings.
- V. Seal joints between fixtures and walls, floors, and counters using sanitary-type, 1-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.

3.04 CONNECTIONS

- A. Supply and Waste Connections to Plumbing Fixtures: Refer to plumbing fixture schedules at the end of this Section for fitting sizes and connection requirements for each plumbing fixture. Install hot- and cold-water-supply, waste and vent piping of sizes indicated, but not smaller than required by authorities having jurisdiction.

3.05 FIELD QUALITY CONTROL

- A. Check that fixtures are complete with trim, faucets, fittings, and other specified components.
- B. Inspect installed fixtures for damage. Replace damaged fixtures and components.
- C. Test installed fixtures after water systems are pressurized and demonstrate proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.06 ADJUSTING AND CLEANING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets, and flushometer valves having controls, to produce proper flow and stream.
- C. Replace washers and seals of leaking and dripping faucets and stops.
- D. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

3.07 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities, except when approved in writing by Owner.

3.08 PLUMBING FIXTURE SCHEDULE

A. See Sheet M5-2.

END OF SECTION

**DIVISION 23 – HEATING, VENTILATING
AND AIR CONDITIONING (HVAC)**

**SECTION 23 01 00
GENERAL REQUIREMENTS FOR MECHANICAL SYSTEMS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Owner may contract directly with the Commissioning Authority (CxA) for this project. All Contractors shall cooperate with the CxA to complete all required commissioning. Specification Section 01 91 13 defines the Contractor's responsibilities with respect to the process. The Contractor shall review this section and shall include in their bids the work associated with the commissioning effort described.

1.02 SUMMARY

- A. This Section includes general mechanical requirements and shall apply to all phases of the work specified, indicated on the drawings or required to provide for complete installation of all mechanical systems including: fire protection systems, plumbing systems; and heating, ventilation, and air conditioning (HVAC) systems.

1.03 WARRANTIES

- A. All materials, workmanship and equipment shall be warranted against defects or against injury from proper and usual wear for a period of one year after the date of substantial completion. Any item which becomes defective within the warranty period shall be repaired or replaced, at no additional cost to the Owner.
- B. All manufacture's warranties shall run to the benefit of the Owner. No manufacturer's warranties shall be voided or impaired.
- C. Warranty shall include repair of faulty workmanship.

1.04 INTERPRETATION OF DOCUMENTS

- A. Any questions regarding the meaning of any portion of the contract documents shall be submitted to the Architect/Engineer for interpretation. Definitive interpretations or clarification will be published by addenda or supplemental information. Verbal interpretation not issued by addendum or supplemental information shall not be considered part of the contract documents.
- B. The Architect/Engineer shall be the sole judge of interpretations of discrepancies within the contract documents.
- C. If ambiguities should appear in the contract documents, the Contractor shall request clarification from the Architect/Engineer before proceeding with the work. If the Contractor fails to make such request, no excuse will thereafter be entertained for failure to carry out the work in a manner satisfactory to the Architect/Engineer. Should a conflict occur within the contract documents, the Contractor is deemed to have estimated the more expensive way of doing the work unless a written clarification from the Architect/Engineer was requested and obtained before submission of proposed methods or materials.

1.05 DEFINITIONS ABBREVIATIONS

- A. The following shall apply throughout the contract documents
 - 1. Code All applicable national state and local codes
 - 2. Furnish Supply and deliver to site ready for installation
 - 3. Indicated Noted, scheduled or specified
 - 4. Provide Furnish, install and connect complete and ready for final use by owner
 - 5. ADA Americans with Disabilities Act
 - 6. ANSI American National Standards Institute
 - 7. ARI Air-Conditioning and Refrigeration Institute
 - 8. ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers
 - 9. ASME American Society of Mechanical Engineers
 - 10. ASTM American Society for Testing and Materials

- 11. HI Hydraulic Institute
- 12. NEC National Electric Code (NFPA 70)
- 13. NEMA National Electrical Manufacturers Association
- 14. NFPA National Fire Protection Association
- 15. SMACNA Sheet Metal and Air Conditioning Contractors' National Association
- 16. UL Underwriters Laboratories Inc.

1.06 CODES AND STANDARDS

- A. All work shall be performed by competent craftsmen skilled in the trade involved and shall be done in a manner consistent with normal industry standards.
- B. All work shall conform to the currently adopted edition of the National Electric Code (NEC), International Building Code with local amendments, Uniform Mechanical Code with local amendments, Uniform Plumbing Code with local amendments, 2018 International Energy Conservation Code with local amendments, and all other applicable state and local codes or standards.
- C. Where there is a conflict between the code and the contract documents, the code shall have precedence only then it is more stringent than the contract documents. Items that are allowed by the code but are less stringent than those specified shall not be substituted.

1.07 PERMITS

- A. Contractor shall become familiar and comply with all requirements regarding permits, fees, licenses, etc. All permits, licenses, inspections and arrangements required for the work shall be obtained by Contractor's effort and expense. All utilities shall be installed in accordance with the local rules and regulations and all charges shall be paid by the Contractor.

1.08 SUBMITTALS

- A. Division 01 section "Submittals" shall be adhered to if more stringent than this section.
- B. Shop drawings shall be submitted to Architect/Engineer for review when required by other sections of this specification and for all equipment scheduled or specified on drawings.
 - 1. A letter of transmittal shall be accompany each submittal. Submittals shall be numbered consecutively and list products covered.
 - 2. Unless otherwise noted, submit an electronic copy of shop drawing and product data for review. Submit one (1) sample of each item required.
- C. Shop Drawings
 - 1. Shop drawings include fabrication and installation drawings, diagrams, schedules of other data specifically prepared for the project. Include dimensions and notations showing compliance with specified standards.
 - 2. Drawing sheet size shall be at least 8 ½" x 11" and not larger than 30"x42". For sheets larger than 11"x17", submit one sheet of reproducible media and one blue-line or photocopy print. Architect/Engineer action will be returned on reproducible media.
- D. Product Data
 - 1. Product data includes printed information, such as manufacture's installation instructions, catalog cuts, standard color charts, rough-in diagrams, wiring diagrams and performance curves.
 - 2. Each copy shall clearly indicate conformance with specified capacities, characteristics, dimensions and details. Mark all equipment with same item number as used on drawings. Mark each copy to clearly indicate applicable choices and options.
- E. Samples
 - 1. Samples are physical examples used to illustrate materials, equipment or workmanship
- F. Architect/Engineer will review or take appropriate action for submittals. Review is only to determine general conformance with design shown in contract documents.
- G. Architect/Engineer review of submittals shall not relieve contractor of responsibility for deviation from requirements of the contract documents or from errors or omissions within submittals.
- H. No portion of the work requiring submittals shall be commenced until the Architect/Engineer has reviewed the submittal.

- I. Electronic Floor Plan Drawings in AutoCAD 2018 format may be requested for use in preparation of shop drawings. Morrissey Engineering reserves the right to reject requests for electronic drawings. Electronic files shall be prepaid at \$50/sheet. Submit written request to Morrissey Engineering or email request to info@morrisseyengineering.com. Indicate the project name, and floor plan sheets requested. The use of these drawings is intended solely for preparation of drawings required by this specification. Copyright law prohibits any other use. The user of the electronic files assumes full responsibility for the accuracy and scale of the drawings.
- J. See "Submittal Schedule" at the end of Section 23 01 00 "General Requirements for Mechanical Systems."

1.09 OPERATION AND MAINTENANCE MANUALS

- A. Assemble (3) complete sets of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
 - 1. Operation Data:
 - a. Emergency instructions and procedures.
 - b. System, subsystem, and equipment descriptions, including operating standards.
 - c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
 - d. Description of controls and sequence of operations.
 - e. Piping and wiring diagrams.
 - 2. Maintenance Data:
 - a. Manufacturer's information, including list of spare parts.
 - b. Name, address, and telephone number of installer or supplier.
 - c. Maintenance procedures.
 - d. Maintenance and service schedules for preventive and routine maintenance.
 - e. Maintenance record forms.
 - f. Sources of spare parts and maintenance materials.
 - g. Copies of maintenance service agreements.
 - h. Copies of warranties and bonds.
- B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.
- C. Provide an electronic copy of the entire Operation and Maintenance Manual.

1.10 PROJECT RECORD DOCUMENTS

- A. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
 - 1. Mark Record Prints to show the actual installation where installation varies from that shown originally.
 - 2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 - 3. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - 4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
 - 5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
- B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

- C. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All materials and equipment used in the construction of the project shall be new unused and undamaged unless otherwise specified. Materials and equipment shall be of latest design standards of manufacturer specified.
- B. Materials and equipment are limited by the requirements of the contract documents. Material and equipment shall be provided in accordance with the following:
 - 1. Basis of Design Products: Basis of Design Products are those products around which the project was designed in terms of capacity, performance, physical size and quality. Basis of Design Products shall be provided unless substitutions are made in accordance with this specification.
 - 2. Substitutions: Substitutions are product of manufacturers other than listed as Basis of Design. Substitutions shall meet each of the following requirements:
 - a. The product shall be manufactured by one of the acceptable manufacturers listed in the contract documents.
 - b. The product shall meet or exceed the requirements of the contract documents in terms of quality, performance, suitability, appearance and characteristics.
 - c. The contractor providing the substitution shall bear the total cost of all changes due to substitutions. These may include but are not limited to redesign costs and increased work by other contractors or the owner.
 - d. The Architect/Engineer shall be the sole judge of the suitability of the substitution items.
- C. Verify installation details and requirements for materials and equipment furnished by others and installed under this contract.

PART 3 - EXECUTION

3.01 DEMONSTRATION AND TRAINING

- A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Provide instructors experienced in operation and maintenance procedures.
 - 2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
 - 3. Schedule training with Owner and Architect/Engineer with at least seven days' advance notice.
- B. Program Structure. Include instruction for the following:
 - 1. System design and operational philosophy.
 - 2. Review of documentation.
 - 3. Operations.
 - 4. Adjustments.
 - 5. Troubleshooting.
 - 6. Maintenance.
 - 7. Safety.

3.02 STARTING AND ADJUSTING

- A. Start and test all equipment and operating components to confirm proper operation. Test and adjust all systems to achieve designed capacity and performance.
- B. Provide three (3) copies of all test report to the Architect/Engineer for review prior to date of substantial completion.
- C. All equipment and systems discrepancies shall be corrected prior to final acceptance.

MECHANICAL SUBMITTAL SCHEDULE

Refer to individual specification sections for additional requirements and detail on each submittal.

Section	Section Name	Product Data	Shop Dwgs	Test Reports / Quality Control	Warranty	Extra Materials	O&M Data	Record Docs	Demonstration / Training
220100	General Requirements for Plumbing	√	√		√				
220523	Valves for Plumbing	√					√		
220720	Pipe Insulation for Plumbing	√							
221116	Water Distribution Piping			√				√	
221123	Domestic Water Pumps	√	√				√		√
221316	Drainage and Vent Piping	√		√				√	
221319	Plumbing Specialties	√					√		√
223100	Domestic Water Softeners	√	√	√	√		√		√
223300	Domestic Water Heaters	√	√	√	√		√		√
224000	Plumbing Fixtures	√		√		√	√		
230100	General Requirements for Mechanical Systems	√	√		√		√	√	√
230500	Basic Mechanical Materials and Methods	√	√				√		
230505	Basic Mechanical Piping Materials and Methods	√					√		
230593	Testing, Adjusting, and Balancing			√					
230700	Duct Insulation	√							
230720	Pipe Insulation for HVAC	√							
230993	Sequence of Operation for HVAC Controls		√	√			√	√	√
231123	Fuel Gas Piping	√		√			√	√	
233113	Metal Ducts and Accessories	√	√		√		√	√	
233423	Power Ventilators	√	√		√	√	√		√
233813	Commercial Kitchen Hoods	√	√		√		√		√
237313	Rooftop Air Handling Units	√	√	√	√	√	√		√
237434	Make-Up Air Units	√	√	√	√	√	√		√

END OF SECTION

**SECTION 23 05 00
BASIC MECHANICAL MATERIALS AND METHODS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following basic mechanical materials and methods and shall apply to all phases of the work specified, indicated on the drawings or required to provide for complete installation of mechanical systems.
 - 1. Indenting Devices and Labels
 - 2. Grout
 - 3. Sealants
 - 4. Access Doors
 - 5. Electrical Requirements
 - 6. Motors
 - 7. Mechanical Equipment Installation
 - 8. Labeling and Identifying
 - 9. Demolition
 - 10. Construction Layout
 - 11. Data and Measurements

1.03 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.04 SUBMITTALS

- A. Product Data: For sealants and identification materials and devices.
- B. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.
- C. See "Submittal Schedule" at the end of Section 23 01 00 "General Requirements for Mechanical Systems."

1.05 QUALITY ASSURANCE

- A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
- B. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appro-

ropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Each contractor shall make provisions for delivery and safe storage of materials. Materials shall be delivered in a timely manner to expedite the work.
- B. Protect stored piping, supplies and equipment from cold, moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

1.07 COORDINATION

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for pipe, duct and equipment spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces.
- G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.
- H. Motors, equipment, controls, etc. shall be furnished, mounted and connected according to the following schedule unless otherwise noted (E =Electrical Contractor, M = Mechanical Contractor):

Item	Furnished By	Set in place or mounted by	Power wiring and connection by	Control Wiring and connection by
1) Equipment Motors	M	M	E	M
2) Magnetic Motor Starters:				
a) Automatically controlled, with or without HOA switches.	E	E	E	M
b) Automatically controlled, with or without HOA switches and furnished as part of factory-wired mechanical equipment	M	M	E	M
c) Manually controlled	E	E	E	---
d) Manually controlled and furnished as part of factory-wired mechanical equipment	M	M	E	---
3) Disconnect switches, thermal overload switches, manual operating switches				
a) Furnished as part of factory wired mechanical equipment	M	M	E	--
b) Loose mounted	E	E	E	--
4) Transformers				
a) Serving 120 Volt and higher	E	E	E	--

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	loads				
	b) Serving 24 Volt control power	M(1)	M	E	M
5)	Contactors	E	E	E	E
6)	Line voltage thermostats and time clocks.	E	E	E	E
7)	Low voltage controls and thermostats	M	M	M	M(2)
8)	Motorized control valves, damper motors, solenoid valves, etc.				
	a) Line Voltage	M	M	E	M
	b) Low Voltage	M	M	M	M
9)	Electric wall and unit heaters	E	E	E	M
10)	Fire protection controls	M	M	E	E
11)	Fire and smoke detectors including relays for fan shutdown	E	E	E	E(3)

J. Notes:

1. When control power is not available, mechanical contractor shall provide control transformers as required to power all valves, dampers, etc.
2. Conduit rough-in for thermostats by electrical contractor where indicated on plans.
3. Wiring from alarm contacts to alarm system by Electrical; control function wiring by Mechanical.

PART 2 - PRODUCTS

2.01 IDENTIFYING DEVICES AND LABELS

- A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 23 Sections. If more than one type is specified for application, selection is Installer's option, but provide one selection for each product category.
- B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.
 1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
 2. Location: Accessible and visible location.
- C. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated.
 1. Fabricate in sizes required for message.
 2. Engraved with engraver's standard letter style, of sizes and with wording to match equipment identification.
- D. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.
- E. Valve Tags: 19 gauge, 1-1/2" diameter, polished brass, stamped or engraved 1/4" high piping system abbreviation in and 1/2" high sequenced valve numbers.
 1. Valve tag fastener: solid brass wire link or beaded chain, or 'S'-hook or size required for proper attachment of tags to valves.
- F. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap on, color-coded, complying with ASME A13.1.
- G. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl, complying with ASME A13.1.
- H. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.

2.02 SEALANTS

- A. Polyurethane Sealant: Single component, chemical curing, non-staining, non-bleeding, capable of continuous water immersion, non-sagging for application in vertical and horizontal joints. Color as selected by architect.
- B. Accessories: Primer, joint cleaner, joint backing and bond breaker as recommended by sealant manufacturer to suit application.
- C. Firestopping Materials: Provide firestopping material to maintain required rating of all fire-resistive assemblies according to requirements of "Firestopping" section of this specification.

2.03 ACCESS DOORS

- A. Prime Coated 14 gauge steel, flush, with screw driver operated cam lock. Frame to accommodate construction type; size as indicated.
- B. Architectural access panel with concealed hardware and gypsum board inlay. Provide with concealed frame, latch, and hinge. Panel shall be Access Panel Solutions Inc. Bauco Plus II or approved equal.

2.04 ELECTRICAL REQUIREMENTS

- A. Compliance for HVAC Equipment
 - 1. Comply with applicable requirements of the National Electric Code (NFPA 70)
 - 2. Provide equipment and accessories that are listed and labeled as defined in NFPA 70
 - 3. Comply with applicable requirements of Underwriters Laboratory (UL)
 - 4. Comply with applicable requirements of NEMA standards
- B. Electrical Wire
 - 1. Wiring material shall be in accordance with the latest version of the National Electric Code (NFPA 70) and all applicable local codes and carry the UL label where applicable.
 - 2. All exposed wiring in return air plenums shall be rate cable for fire and smoke spread.

2.05 MOTORS

- A. BASIC MOTOR REQUIREMENTS
 - 1. Motors $\frac{3}{4}$ HP and Larger shall be polyphase. Motors Smaller than $\frac{3}{4}$ HP shall be single phase unless otherwise indicated
 - 2. Frequency Rating shall be 60 Hz. Voltage Rating is determined by voltage of circuit to which motor is connected.
 - 3. Service Factor: According to NEMA MG 1, unless otherwise indicated.
 - 4. Capacity and Torque Characteristics: Rated for continuous duty and sufficient to start, accelerate, and operate connected loads at designated speeds, in indicated environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
 - 5. Enclosure: Open dripproof, unless otherwise indicated.
- B. POLYPHASE MOTORS
 - 1. General
 - a. Design Characteristics: NEMA MG 1, Design B, Energy-Efficient Design, unless otherwise indicated.
 - b. Stator: Copper windings, unless otherwise indicated. Multispeed motors have separate winding for each speed.
 - c. Rotor: Squirrel cage, unless otherwise indicated.
 - d. Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading.
 - e. Temperature Rise: Match insulation rating, unless otherwise indicated.
 - f. Insulation: Class F, unless otherwise indicated.
 - 2. Motors Used with Reduced-Inrush Controllers: Match wiring connection requirements for indicated controller, with required motor leads brought to motor terminal box to suit control method.

1. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer. Inverter rated motors used in conjunction with variable speed drives shall be equipped with a shaft grounding ring. Grounding ring shall be Helwig Carbon Bearing Protector, installed per manufacturer requirements. Grounding ring may be epoxy mounted if manufacturer's recommended epoxy adhesive is used.
 2. Rugged-Duty Motors: Where indicated, motors are totally enclosed with 1.25 minimum service factor, greased bearings, integral condensate drains, and capped relief vents. Windings are insulated with nonhygroscopic material. External finish is chemical-resistant paint over corrosion-resistant primer.
- C. SINGLE-PHASE MOTORS
1. Permanent-split capacitor, Split-phase start, capacitor run or capacitor start, capacitor run as indicated or selected by manufacturer, to suit starting torque and other requirements of specific motor application.
 2. Thermal Protection: Where indicated or required, internal protection automatically opens power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal protection device automatically resets when motor temperature returns to normal range, unless otherwise indicated.
 3. Bearings: Ball-bearing type for belt-connected motors and other motors with high radial forces on motor shaft. Sealed, prelubricated sleeve bearings for other single-phase motors.
- D. ELECTRONICALLY COMMUTATED MOTORS (ECM)
1. Permanent magnet type motor with near-zero rotor losses designed for synchronous rotation.
 2. Brushless DC motor controlled by an integrated controller/inverter that operates the wound stator and senses rotor position to electrically commutate the stator as indicated or selected by manufacturer, to suit starting torque and other requirements of specific motor application. Coordinate input signal for speed with specific application.
 3. Motor shall be designed to maintain a minimum 70 percent efficiency over the entire operating range.
 4. Thermal Protection: Where indicated or required, internal protection automatically opens power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal protection device automatically resets when motor temperature returns to normal range, unless otherwise indicated.
 5. Bearings: Sealed, prelubricated ball bearing type for poly-phase or single-phase motors.

PART 3 - EXECUTION

3.01 EQUIPMENT INSTALLATION

- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- E. Install equipment giving right of way to piping installed at required slope.

3.02 POSITION OF DEVICES

- A. Devices shall be installed at the height indicated below unless otherwise noted. All heights of outlets are measured from finished floor to centerline of device. Locate devices mounted on finish surfaces with regards to furring, trim, etc. Heights may be adjusted as necessary to clear

wall mounted cabinets, electrical devices, etc. Where installed in masonry walls, mounting heights may be adjusted to correspond to block coursing. Where thermostats are located adjacent to light switches, match light switch mounting height. In no case shall devices requiring wheelchair accessibility be mounted above 48".

1. Thermostats (where located adjacent to light switches, match light switch height) 48"
2. Space Sensors (where located adjacent to light switches, match light switch height) 48"
3. Temperature Control Panels (not requiring occupant interface) 60"

3.03 LABELING AND IDENTIFYING

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
 1. Plastic markers, with application systems. Install on insulation segment if required for hot, uninsulated piping.
 2. Locate pipe markers as follows if piping is exposed in finished spaces, machine rooms, and accessible maintenance spaces, such as shafts, tunnels, plenums, and exterior non-concealed locations:
 - a. Near each valve and control device.
 - b. Near each branch, excluding short takeoffs for fixtures and terminal units. Mark each pipe at branch, if flow pattern is not obvious.
 - c. Near locations if pipes pass through walls, floors, ceilings, or enter nonaccessible enclosures.
 - d. At access doors, manholes, and similar access points that permit view of concealed piping.
 - e. Near major equipment items and other points of origination and termination.
 - f. Spaced at maximum of 50-foot intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.
 - g. On piping above removable acoustical ceilings, except omit intermediately spaced markers.
- B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of mechanical equipment.
- C. Valve Tags:
 1. Install valve tag at all valves in piping systems listed below
 - a. Domestic water (excluding individual fixture isolation valves)
 2. Provide reproducible set of drawings indicating all valve locations.
- D. Label duct access doors at fire and smoke damper locations per NFPA 90A.
- E. Adjusting: Relocate identifying devices as necessary for unobstructed view in finished construction.

3.04 FIRESTOPPING

- A. Apply firestopping to all duct and pipe penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly.

3.05 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 3-1/2" inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi, 28-day compressive-strength concrete and reinforcement.

3.06 DEMOLITION

- A. Disconnect, demolish, and remove Work specified in Division 23 Sections.
- B. If pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.

- D. Work Abandoned in Place: Cut and remove underground pipe a minimum of **2 inches** beyond face of adjacent construction. Cap and patch surface to match existing finish.
- E. Removal: Remove indicated equipment from Project site.
- F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

3.07 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

3.08 CONSTRUCTION LAYOUT

- A. Layout work in advance of installation using data and measurements from the site, the appropriate architectural and structural drawings and shop drawings.
- B. Confirm adequate clearance for installation, operation, maintenance and code required clearance including items installed by other contractors.
- C. If layout to provide clearance is not possible, promptly notify Architect/Engineer for clarification.

3.09 DATA AND MEASUREMENTS

- A. The data given herein and on the drawings is as accurate as could be secured. The existence and location of construction as indicated is not guaranteed. Before beginning work investigate and verify the existence and location of items affecting work. Obtain exact locations, measurements, levels, etc., at the site and adapt work to actual conditions.
- B. Only Architectural drawings, Structural drawings, and site measurements may be utilized in calculations. Mechanical and electrical drawings are diagrammatic or schematic.

3.10 PAINTING AND FINISHING

- A. Refer to individual sections for paint materials, surface preparation, and application of paint.
- B. Do not paint piping specialties with factory-applied finish.
- C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.11 HANGERS AND SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with applicable codes and standards.

3.12 ACCESS

- A. Provide access to all equipment, valves, controls, etc. as required for operation, repair and maintenance.
- B. Access doors shall be provided when access through ceilings, chases, etc. is not provided by others.

3.13 ELECTRICAL WIRING

- A. Install all electrical wiring in accordance with the National Electric Code and Division 26 of this specification.
- B. All line voltage and low voltage wire shall be installed in metal raceways.

END OF SECTION

**SECTION 23 05 05
BASIC MECHANICAL PIPING MATERIALS AND METHODS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following basic mechanical materials and methods to complement other Division 22 and 23 Sections.
 - 1. Piping materials and installation instructions common to mechanical piping systems.
 - 2. Dielectric fittings.
 - 3. Mechanical sleeve seals.
 - 4. Escutcheons.
 - 5. Pipe hangers and supports
 - 6. Thermometers
 - 7. Pressure Gages
- B. Pipe and pipe fitting materials are specified in Division 23 piping system Sections.

1.03 DEFINITIONS

- A. MSS: Manufacturer's Standardization Society for the Valve and Fittings Industry.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.04 PERFORMANCE REQUIREMENTS

- A. Design support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

1.05 SUBMITTALS

- A. Product Data: For dielectric fittings, mechanical sleeve seals, and each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated. Include scale range, ratings, and calibrated performance curves for each meter, gage, fitting, specialty, and accessory specified.
- B. Maintenance Data: For meters and gages to include in maintenance manuals. Submit valve schedules to include in maintenance manuals for each piping system. Valve schedule shall indicate valve number, piping system and location of valve.
- C. See "Submittal Schedule" located at the end of Section 23 01 00 "General Requirements for Mechanical Systems."

1.06 QUALITY ASSURANCE

- A. Welders shall be qualified in accordance with applicable codes. Welding procedures and testing shall comply with ANSI B31.10 "Standard for Pressure Piping. Power Piping" and AWS Welding Handbook.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Dielectric Unions, Couplings, Flanges:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Co.
 - c. Eclipse, Inc.; Rockford-Eclipse Div.
 - d. Epco Sales Inc.
 - e. Hart Industries International, Inc.
 - f. Watts Industries, Inc.; Water Products Div.

- g. Zurn Industries, Inc.; Wilkins Div.
- 2. Mechanical Sleeve Seals:
 - a. Calpico, Inc.
 - b. Metraflex Co.
 - c. Thunderline/Link-Seal.
- 3. Pipe Hangers and Supports:
 - a. AAA Technology and Specialties Co., Inc.
 - b. Anvil
 - c. B-Line Systems, Inc. by Eaton
 - d. Carpenter & Patterson, Inc.
 - e. Grinnell Corp. B-Line Systems, Inc.
 - f. Grinnell Corp.; Power-Strut Unit.
 - g. GS Metals Corp.
 - h. Michigan Hanger Co., Inc.; O-Strut Div.
 - i. National Pipe Hanger Corp.
 - j. Thomas & Betts Corp.
 - k. Unistrut Corp.
 - l. Wesanco, Inc.
 - m. Thermal-Hanger Shield Inserts
- 4. Thermometers:
 - a. AMETEK, Inc.; U.S. Gauge Div
 - b. Dresser Industries, Inc.; Instrument Div.; Ashcroft Commercial Sales Operation.
 - c. Dresser Industries, Inc.; Instrument Div.; Weksler Instruments Operating Unit.
 - d. Ernst Gage Co.
 - e. Marshalltown Instruments
 - f. Miljoc Corporation
 - g. Noshok, Inc.
 - h. Reotemp Instrument Corp.
 - i. Tel-Tru Manufacturing Co., Inc.
 - j. Trerice: H. O. Trerice Co.
 - k. Weiss Instruments, Inc.
 - l. Winter's Thermogauges, Inc.
- 5. Pressure Gages:
 - a. AMETEK, Inc.; U.S. Gauge Div.
 - b. Dresser Industries, Inc.; Instrument Div.; Ashcroft Commercial Sales Operation.
 - c. Dresser Industries, Inc.; Instrument Div.; Weksler Instruments Operating Unit.
 - d. Ernst Gage Co.
 - e. Marsh Bellofram.
 - f. Miljoco Corporation
 - g. Noshok, Inc.
 - h. Trerice: H. O. Trerice Co.
 - i. Weiss Instruments, Inc.
 - j. WIKA Instruments Corp.
 - k. Winter's Thermogauges, Inc.

2.02 PIPE AND PIPE FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.03 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Solder Filler Metals: ASTM B 32.
 - 1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
 - 2. Alloy E: Approximately 95 percent tin and 5 percent copper, with 0.10 percent maximum lead content.

3. Alloy HA: Tin-antimony-silver-copper zinc, with 0.10 percent maximum lead content.
 4. Alloy HB: Tin-antimony-silver-copper nickel, with 0.10 percent maximum lead content.
 5. Alloy Sb5: 95 percent tin and 5 percent antimony, with 0.20 percent maximum lead content.
- C. Brazing Filler Metals: AWS A5.8.
1. BCuP Series: Copper-phosphorus alloys.
 2. BAg1: Silver alloy.
- D. Solvent Cements: Manufacturer's standard solvent cements for PVC Piping. ASTM D 2564. Include primer according to ASTM F 656.

2.04 DIELECTRIC FITTINGS

- A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.
- B. Description: Assembly or fitting of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- C. Insulating Material: Suitable for system fluid, pressure, and temperature.
- D. Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
- E. Dielectric Unions:
1. Standard: ASSE 1079.
 2. Pressure Rating: 125 psig minimum at 180 deg F.
 3. End Connections: Solder-joint copper alloy and threaded ferrous.
- F. Dielectric Flanges:
1. Standard: ASSE 1079.
 2. Factory-fabricated, bolted, companion-flange assembly.
 3. Pressure Rating: 125 psig minimum at 180 deg F.
 4. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- G. Dielectric-Flange Insulating Kits:
1. Nonconducting materials for field assembly of companion flanges.
 2. Pressure Rating: 150 psig.
 3. Gasket: Neoprene or phenolic.
 4. Bolt Sleeves: Phenolic or polyethylene.
 5. Washers: Phenolic with steel backing washers.
- H. Dielectric Nipples:
1. Standard: IAPMO PS 66.
 2. Electroplated steel nipple, complying with ASTM F 1545.
 3. Pressure Rating: 300 psig at 225 deg F.
 4. End Connections: Male threaded or grooved.
- I. Lining: Inert and noncorrosive, propylene.

2.05 MECHANICAL SLEEVE SEALS

- A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.06 PIPING SPECIALTIES

- A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
 2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
 3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
 4. PVC: Manufactured, permanent, with nailing flange for attaching to wooden forms.
 5. PVC Pipe: ASTM D 1785, Schedule 40.

- B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
 - 1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
 - 2. OD: Completely cover opening.
 - 3. Stamped Steel: One piece, with set screw, spring clips, concealed hinge and chrome-plated finish.

2.07 PIPE HANGERS AND SUPPORTS

- A. Pipe Hangers, Supports, and Components: factory-fabricated components.
 - 1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
 - 2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.
 - 1. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
 - 2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- C. Thermal-Hanger Shield Inserts: 100-psi minimum compressive-strength insulation, encased in sheet metal shield. ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier

2.08 MISCELLANEOUS PIPE SUPPORTING MATERIALS

- A. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- C. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

2.09 THERMOMETERS, GENERAL

- A. Scale Range: Temperature ranges for services listed are as follows:
 - 1. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions.
 - 2. Domestic Hot Water: 30 to 240 deg F, with 2-degree scale divisions.
- B. Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.

2.10 LIQUID-IN-GLASS THERMOMETERS

- A. Case: Die-cast aluminum with hard powder-coat finish, acrylic front, 9 inches long.
- B. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.
- C. Tube: Blue reading, organic-liquid filled with magnifying lens.
- D. Scale: Satin-faced nonreflective aluminum with permanently etched markings or white finished aluminum with black markings.
- E. Stem: Die-cast aluminum for separable socket; of length to suit installation.

2.11 DIRECT-MOUNTING, FILLED-SYSTEM DIAL THERMOMETERS

- A. Description: Vapor-actuated, universal-angle dial type.
- B. Case: Stainless steel with 4-1/2-inch diameter, clear acrylic lens.
- C. Adjustable Joint: Brass, 180-degree adjustment in vertical plane, with locking device.
- D. Thermal Bulb: Copper with phosphor-bronze bourdon pressure tube.
- E. Movement: Brass, precision geared.
- F. Scale: Progressive, white finished aluminum with black markings.
- G. Stem: Copper for separable socket; of length to suit installation.

2.12 PRESSURE GAGES

- A. Description: ASME B40.1, phosphor-bronze bourdon-tube type with bottom connection; dry type, unless liquid-filled-case type is indicated.
- B. Case: Stainless steel with 4-1/2-inch diameter, clear acrylic lens.
- C. Connector: Brass, NPS 1/4.
- D. Scale: White-coated aluminum with permanently etched markings or white finished aluminum with black markings.
- E. Accuracy: Grade 1A, plus or minus 1 percent of full scale.
- F. Range: Comply with the following:
 - 1. Fluids under Pressure: Two times the operating pressure.
- G. Gage Fitting Valves: NPS 1/4 brass or stainless-steel needle type.

PART 3 - EXECUTION

3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 22 and 23 piping Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
- C. Install piping at indicated slope.
- D. Install components with pressure rating equal to or greater than system operating pressure.
- E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- F. Install piping free of sags and bends.
- G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- I. Install piping to allow application of insulation plus 1-inch clearance around insulation.
- J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- K. Install fittings for changes in direction and branch connections.
- L. Install couplings according to manufacturer's written instructions.
- M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings.
- N. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 2. Build sleeves into new walls and slabs as work progresses.
 - 3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
- O. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

- P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials
- Q. Verify final equipment locations for roughing-in.
- R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- S. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
 - 1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 - 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 - 3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
 - 4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 - 5. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to manufacturer's recommendations.
- T. Piping Connections: Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
 - 2. Install dielectric unions and flanges to connect piping materials of dissimilar metals.

3.02 HANGER AND SUPPORT APPLICATIONS

- A. Comply with MSS SP-69 for pipe hanger selections and applications.
- B. Comply with MSS SP-89 for fabrication and installation procedures.
- C. Horizontal-Piping Hangers and Supports: Use swivel ring or clevis type hangers.
- D. Vertical-Piping: Use riser clamps.
- E. Saddles and Shields: Install of length recommended by manufacturer to prevent crushing insulation.

3.03 HANGER AND SUPPORT INSTALLATION

- A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems. Field assemble and install according to manufacturer's written instructions.
- C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes.
- D. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- F. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- G. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

- H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.
- I. Insulated Piping: Comply with the following:
 - 1. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - 2. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - 3. Do not exceed pipe stress limits according to ASME B31.9.
 - 4. Install protection saddles or thermal hanger shields, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - 5. Install protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.
- J. Support vertical piping and tubing at base and at each floor.
- K. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:
 - 1. 3/4-Inch NPS and Smaller: Maximum horizontal spacing, 60 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 - 2. 1-Inch NPS: Maximum horizontal spacing, 72 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 - 3. 1-1/4-Inch NPS: Maximum horizontal spacing, 72 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 - 4. 1-1/2 and 2-Inch NPS: Maximum horizontal spacing, 96 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 - 5. 2-1/2-Inch NPS: Maximum horizontal spacing, 108 inches with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 - 6. 3-Inch NPS: Maximum horizontal spacing, 10 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 - 7. 4- and 5-Inch NPS: Maximum horizontal spacing, 10 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
- L. Install hangers for steel, cast and ductile-iron piping with the following maximum spacing and minimum rod diameters:
 - 1. 1-1/4-Inch NPS and Smaller: Maximum horizontal spacing, 84 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.
 - 2. 1-1/2-Inch NPS: Maximum horizontal spacing, 108 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.
 - 3. 2-Inch NPS: Maximum horizontal spacing, 10 feet with 3/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.
 - 4. 2-1/2-Inch NPS: Maximum horizontal spacing, 11 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 15 feet.
 - 5. 3-Inch NPS: Maximum horizontal spacing, 12 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 15 feet.
 - 6. 4- and 5-Inch NPS: Maximum horizontal spacing, 12 feet with 5/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.
- M. Install hangers for PVC plastic piping with the following maximum spacing and minimum rod diameters:
 - 1. 2-Inch NPS and Smaller: Maximum horizontal spacing, 48 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 48 inches.
 - 2. 2-1/2- to 3-1/2-Inch NPS: Maximum horizontal spacing, 48 inches with 1/2-inch minimum rod diameter; maximum vertical spacing, 48 inches.
 - 3. 4- and 5-Inch NPS: Maximum horizontal spacing, 48 inches with 5/8-inch minimum rod diameter; maximum vertical spacing, 48 inches.
- N. Pipe Stand Installation:
 - 1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

3.04 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor.
- B. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.
- C. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.05 METER AND GAGE INSTALLATION, GENERAL

- A. Install meters, gages, and accessories according to manufacturer's written instructions for applications where used.
- B. Install meters and gages adjacent to machines and equipment to allow service and maintenance.
- C. Calibrate meters and gauges according to manufacturer's written instructions, after installation

3.06 THERMOMETER INSTALLATION

- A. Install thermometers and adjust vertical and tilted positions.
- B. Install thermometers at locations indicated on plans and at the following locations:
 - 1. Inlet and outlet of each domestic water heater.
- C. Install separable sockets in vertical position in piping tees where fixed thermometers are indicated.
- D. When thermometers are installed in piping 1" and smaller, install well in 1-1/4" with reducers to prevent restriction of flow.

3.07 PRESSURE-GAGE INSTALLATION

- A. Install pressure gages in piping tees with pressure-gage valve located on pipe at most readable position.
- B. Install pressure gages at locations indicated on plans and at the following locations:
 - 1. Discharge of each pressure-reducing valve.
- C. Install pressure-gage needle valve and snubber in piping to pressure gages.

END OF SECTION

**SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives.

1.03 DEFINITIONS

- A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.
- B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.
- C. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- D. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.
- E. AABC: Associated Air Balance Council.
- F. AMCA: Air Movement and Control Association.
- G. NEBB: National Environmental Balancing Bureau.
- H. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.04 SUBMITTALS

- A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.
- B. Certified Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.
- C. Sample Report Forms: Submit 2 sets of sample testing, adjusting, and balancing report forms.
- D. See Submittal Schedule located at the end of Section 23 01 00 "General Requirements for Mechanical Systems."

1.05 QUALITY ASSURANCE

- A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by either AABC or NEBB.
- B. Testing, Adjusting, and Balancing Conference: Meet with the Owner's and the Architect's representatives on approval of the testing, adjusting, and balancing strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of testing, adjusting, and balancing team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel.
- C. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
 - 2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

- D. Testing, Adjusting, and Balancing Reports: Use testing, adjusting, and balancing Agent's standard forms approved by the Architect/Engineer.
- E. Instrumentation Type, Quantity, and Accuracy: As described in NEBB standards.
- F. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.06 PROJECT CONDITIONS

- A. Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.07 COORDINATION

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.
- B. Perform testing, adjusting, and balancing after leakage and pressure tests on air systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.
- B. Examine approved submittal data of HVAC systems and equipment.
- C. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- D. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.
- E. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- F. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- G. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- H. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- I. Examine automatic temperature system components to verify proper operation.
- J. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.02 GENERAL TESTING AND BALANCING PROCEDURES

- A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balanc

ing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

- C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.03 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- D. Check dampers for proper position to achieve desired airflow path.
- E. Check for airflow blockages.
- F. Check condensate drains for proper connections and functioning.

3.04 CONSTANT-VOLUME AIR SYSTEMS' BALANCING PROCEDURES

- A. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer.
 - 1. Measure fan static pressures to determine actual static pressure as follows:
 - 2. Measure static pressure across each air-handling unit component.
 - 3. Adjust fan speed higher or lower than design with the approval of the Architect/Engineer. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes. Do not make fan-speed adjustments that result in motor overload.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.
- C. Adjust terminal outlets and inlets for each space to design airflows within specified tolerances of design values. Make adjustments using volume dampers rather than extractors and the dampers at the air terminals.

3.05 TEMPERATURE TESTING

- A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.
- B. Measure indoor wet- and dry-bulb temperatures. Measure when the building or zone is occupied.
- C. Measure outside-air, wet- and dry-bulb temperatures.

3.06 TOLERANCES

- A. Set HVAC system airflow and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans: minus 10 to plus 10 percent.
 - 2. Air Outlets and Inlets: minus 10 to plus 10 percent.

3.07 FINAL REPORT

- A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.
- B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
- C. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:
 - 1. Title page.
 - 2. Name and address of testing, adjusting, and balancing Agent.
 - 3. Project name.

4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of testing, adjusting, and balancing Agent who certifies the report.
 10. Summary of contents.
 11. Notes to explain why certain final data in the body of reports vary from design values.
 12. Test conditions for fans and pump performance forms.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems.
- E. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data: Include the following:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches, and bore.
 - i. Sheave dimensions, center-to-center and amount of adjustments in inches.
 - j. Number of belts, make, and size.
 - k. Number of filters, type, and size.
 2. Motor Data: Include the following:
 - a. Make and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Sheave dimensions, center-to-center and amount of adjustments in inches.
 3. Test Data: Include design and actual values for the following:
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Filter static-pressure differential in inches wg.
 - f. Preheat coil static-pressure differential in inches wg.
 - g. Cooling coil static-pressure differential in inches wg.
 - h. Heating coil static-pressure differential in inches wg.
 - i. Outside airflow in cfm.
 - j. Return airflow in cfm.
 - k. Outside-air damper position.
 - l. Return-air damper position.
 - m. Variable frequency drive setting.
- F. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data: Include the following:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Sheave dimensions, center-to-center and amount of adjustments in inches.
 2. Motor Data: Include the following:

- a. Make and frame type and size.
- b. Horsepower and rpm.
- c. Volts, phase, and hertz.
- d. Full-load amperage and service factor.
- e. Sheave make, size in inches, and bore.
- f. Sheave dimensions, center-to-center and amount of adjustments in inches.
- g. Number of belts, make, and size.
- 3. Test Data: Include design and actual values for the following:
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
- G. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
 - 1. Report Data: Include the following:
 - a. System and air-handling unit number.
 - b. Location and zone.
 - c. Duct static pressure in inches wg.
 - d. Duct size in inches.
 - e. Duct area in sq. ft..
 - f. Design airflow rate in cfm.
 - g. Design velocity in fpm.
 - h. Actual airflow rate in cfm.
 - i. Actual average velocity in fpm.
 - j. Barometric pressure in psig.
- H. Air Outlet Reports:
 - 1. Air outlet data
 - a. Make and type.
 - b. Model number and size.
 - 2. Test data: Include design and actual data for the following:
 - a. Airflow rate in cfm.
- I. Instrument Calibration Reports: For instrument calibration, include the following:
 - 1. Report Data: Include the following:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.08 ADDITIONAL TESTS

- A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

END OF SECTION

**SECTION 23 07 00
DUCT INSULATION**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes semi-rigid and flexible duct insulation; acoustical duct liner; field applied jackets; accessories and attachments; and sealing compounds.

1.03 SUBMITTALS

- A. Product Data: Include product data description, list of materials, thickness, density, k-values and r-values for each product type, locations, manufacturer's installation instructions, flames spread and smoke developed ratings.
- B. See "Submittal Schedule" located at the end of Section 23 01 00 "General Requirements for Mechanical Systems."

1.04 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
 - 1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Insulation:
 - a. CertainTeed
 - b. Armaflex
 - c. Rubatex
 - d. Knauf
 - e. Owens-Corning
 - f. Halstead
 - g. Armstrong
 - h. Manville
 - i. Pittsburgh Corning

2.02 INSULATION MATERIALS

- A. Mineral-Fiber Board Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IB, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.
- B. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type I, 0.75 pcf density, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.
- C. Acoustical duct liner: ASTM C 518 with resin and black mat coated surface exposed to air stream to prevent erosion of glass fibers. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature. Nominal Density 1.5 lbs per cubic foot, minimum noise reduction character

istic shall be 0.55 for 1" thickness; rated for 6000 fpm air velocity; air friction multiplier less than 1.6 at 2000 fpm.

- D. Fire Rated Duct Insulation: UL Classified glass fiber blanket completely encapsulated in UL Classified aluminum foil facing. Flame spread rating of 25 or less, and smoke-developed rating of 50 or less. Insulation shall meet the requirements of NFPA 96 for zero clearance from the duct to the interior surfaces of enclosures of noncombustible and limited combustible construction. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions with the least number of joints practical. Seal joints and seams with vapor retarder mastic on cold air ducts. Seal penetrations in insulation at hanger supports, anchors, and other projections with vapor retarder mastic bonded with a thermosetting resin.
- E. Exterior Jacket: Alumaguard 60 or equal. UV Resistant, watertight, laminated waterproofing and vapor barrier membrane.

2.03 ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, pre-sized a minimum of 8 oz./sq. yd..
- B. Bands: 3/4 inch wide, materials compatible with jacket:
- C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.
- D. Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitor-discharge welding and galvanized speed washer. Pin length sufficient for insulation thickness indicated.
- E. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

2.04 VAPOR RETARDERS

- A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

2.05 FIELD-APPLIED JACKETS

- A. Field-applied jackets comply with ASTM C921, Type I, unless otherwise indicated.
- B. Metal Jacket:
 - 1. Aluminum Jacket: Comply with ASTM B209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - a. Sheet and roll stock ready for shop or field sizing.
 - b. Finish and thickness are indicated in field-applied jacket schedules.
 - c. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.02 MINERAL-FIBER BOARD INSULATION APPLICATION

- A. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
 - 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.

3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.]

3.03 MINERAL-FIBER BLANKET INSULATION APPLICATION

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.
- B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct system.
- C. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- D. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- E. Apply insulation with the least number of joints practical.
- F. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
- G. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.
- H. Apply insulation with integral jackets as follows:
 1. Pull jacket tight and smooth.

2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
 3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- I. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- J. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- K. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.
- L. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.
- M. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.
- N. Secure insulation with adhesive and anchor pins and speed washers.

SHOP APPLICATION OF LINER IN RECTANGULAR DUCTS

- O. Adhere a single layer of indicated thickness of duct liner with 90 percent coverage of adhesive at liner contact surface area. Multiple layers of insulation to achieve indicated thickness are prohibited.
- P. Butt transverse joints without gaps and coat joint with adhesive.
- Q. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
- R. Do not apply liners in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.
- S. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely around perimeter; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
- T. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profile or are integrally formed from duct wall.
- U. Ductwork sizes indicated on drawings are the free area size. Ductwork sizes shall be increased to accommodate the addition of liner to maintain the plan indicated free area size.

3.04 FIELD-APPLIED JACKET INSTALLATION

- A. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof

sealant recommended by insulation manufacturer. Secure jacket with stainless steel bands 12 inches o.c. and at end joints.

3.05 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Comply with manufacturer's written installation instructions.
- B. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- C. Insulate duct access panels and doors to achieve same fire rating as duct.
- D. Install firestopping at penetrations through fire-rated assemblies.

3.06 DUCT AND PLENUM APPLICATION SCHEDULE

- A. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
 - 1. Fibrous-glass ducts.
 - 2. Factory-insulated flexible ducts.
 - 3. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
 - 4. Flexible connectors.
 - 5. Vibration-control devices.
 - 6. Testing agency labels and stamps.
 - 7. Nameplates and data plates.
 - 8. Access panels and doors in air-distribution systems.
- B. See "Ductwork Insulation Schedule" on Sheet M5-1.

END OF SECTION

**SECTION 23 11 23
FUEL GAS PIPING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes fuel gas piping, specialties, and accessories within the building.

1.03 PROJECT CONDITIONS

- A. Gas System Pressures: Two pressure ranges. Primary pressure is more than 0.5 psig but not more than 2.0 psig, and is reduced to secondary pressure of 0.5 psig or less.
- B. Design values of fuel gas supplied for these systems are; Nominal Heating Value of 1000 Btu/cu. ft. and Nominal Specific Gravity: 0.6.

1.04 SUBMITTALS

- A. Product Data: For the following:
 - 1. Specialty valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
 - 2. Pressure regulators. Include pressure rating, capacity, and settings of selected models.
- B. Maintenance Data: For natural gas specialties and accessories to include in maintenance manuals.
- C. See "Submittal Schedule" located at the end of Section 23 01 00 "General Requirements for Mechanical Systems."

1.05 QUALITY ASSURANCE

- A. Electrical Components and Devices: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. ANSI Standard: Comply with ANSI Z223.1, "National Fuel Gas Code."
- C. UL Standard: Provide components listed in UL's "Gas and Oil Equipment Directory" if specified to be UL listed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Pressure Regulators:
 - a. Fisher Controls International, Inc.
 - b. Maxitrol Co.

2.02 PIPES, TUBES, FITTINGS, AND JOINING MATERIALS

- A. Steel Pipe: ASTM A 53; Type E or S; Grade B; Schedule 40; black.
 - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threaded ends according to ASME B1.20.1.
 - 2. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends according to ASME B1.20.1.
 - 3. Cast-Iron Flanges and Flanged Fittings: ASME B16.1, Class 125.
 - 4. Steel Welding Fittings: ASME B16.9, wrought steel or ASME B16.11, forged steel.
 - 5. Steel Threaded Fittings: ASME B16.11, forged steel with threaded ends according to ASME B1.20.1.
 - 6. Joint Compound and Tape: Suitable for natural gas.
 - 7. Steel Flanges and Flanged Fittings: ASME B16.5.

8. Gasket Material: Thickness, material, and type suitable for natural gas.
- B. Drawn-Temper (Hard) Copper Tube: ASTM B 88, Type L.
 1. Copper Fittings: ASME B16.22, wrought copper, streamlined pattern.
 2. Brazing Filler Metals: AWS A5.8, Silver Classification BAg-1. Filler metal containing phosphorus is prohibited.
 3. Bronze Flanges and Flanged Fittings: ASME B16.24, Class 150.
 4. Gasket Material: Thickness, material, and type suitable for natural gas.
- C. Transition Fittings: Type, material, and end connections to match piping being joined.
- D. Common Joining Materials: Refer to Division 23 Section "Basic Mechanical Materials and Methods" for joining materials not in this Section.

2.03 PIPING SPECIALTIES AND VALVES

- A. Flexible Connectors: ANSI Z21.24, copper alloy.
- B. Quick-Disconnect Devices: ANSI Z21.41, convenience outlets and matching plug connector.
- C. Valves, NPS 2 and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.
- D. Gas Stops: Bronze body with AGA stamp, plug type with bronze plug and flat or square head, ball type with chrome-plated brass ball and lever handle, or butterfly valve with stainless-steel disc and fluorocarbon elastomer seal and lever handle; 2-psig minimum pressure rating.
- E. Gas Valves, NPS 2 and Smaller: ASME B16.33 and IAS-listed bronze body and 125-psig pressure rating.
- F. Automatic Gas Valves: ANSI Z21.21, with electrical operator for actuation by appliance automatic shutoff device.
- G. Electrically Operated Gas Valves: UL 429, bronze, aluminum, or cast-iron body solenoid valve; 120-V ac, 60 Hz, Class B, continuous-duty molded coil. Include NEMA ISC 6, Type 4, coil enclosure and electrically opened and closed dual coils. Valve position shall normally be closed.

2.04 PRESSURE REGULATORS

- A. Description: Single stage and suitable for fuel gas service. Include steel jacket and corrosion-resistant components, elevation compensator, and atmospheric vent.
 1. NPS 2 and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.
 2. Line Pressure Regulators: ANSI Z21.80 with 2-psig- minimum inlet pressure rating.
 3. Appliance Pressure Regulators: ANSI Z21.18. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS

- A. Flanges, unions, transition, and special fittings with pressure ratings same as or higher than system pressure rating may be used in applications below, unless otherwise indicated.
- B. Fuel Gas Piping, 0.5 psig or Less: Use the following:
 1. NPS 1 and Smaller: Steel pipe, malleable-iron threaded fittings, and threaded joints.
 2. NPS 1 and Smaller: Hard copper tube, copper fittings, and brazed joints.
 3. NPS 1-1/4 to NPS 2: Steel pipe, malleable-iron threaded fittings, and threaded joints.
- C. Fuel Gas Piping 2 psig: Use the following:
 1. NPS 2 and Smaller: Steel pipe, malleable-iron threaded fittings, and threaded joints.
- D. No other pipe, conduit or electrical conductor should be located within 12 inches horizontally of underground natural-gas piping.

3.02 PIPING INSTALLATION

- A. Refer to Division 23 Section "Basic Mechanical Piping Materials and Methods" for basic piping installation requirements.
- B. Install fuel gas piping per NFPA 54 "National Fuel Gas Code" and City of Fremont Gas Department.

- C. Concealed Locations: Except as specified below, install concealed gas piping in airtight Schedule 40 PVC conduit.
 - 1. Above-Ceiling Locations: Gas piping may be installed in accessible spaces, subject to approval of authorities having jurisdiction, without containment conduit. Do not locate valves above ceilings.
 - 2. In Floors: Do not install gas piping in concrete floors.
 - 3. In Partitions: Do not install concealed piping in solid partitions. Protect tubing from physical damage when installed inside partitions or hollow walls. Piping may pass through partitions or walls.
 - 4. Prohibited Locations: Do not install gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
 - 5. Conduit with One End Terminating Outdoors: Conduit shall extend into an accessible portion of the building be sealed to prevent gas leakage from entering the building. The other end shall extend at least 4 inches outside the building, and be vented outdoors above finished grade with a weatherproof cap and insect screen.
 - 6. Conduit with Both Ends Terminating Indoors: Where the conduit originates and terminates within the same building, it shall extend not less than 2 inches beyond the point where the pipe emerges from the floor and shall not be sealed at either end.
- D. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of service meters. Locate where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.
- E. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels, unless indicated to be exposed to view.
- F. Install fuel gas piping at uniform grade of 0.1 percent slope upward toward risers.
- G. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- H. Connect branch piping from top or side of horizontal piping.
- I. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices. Install flanges on valves, specialties, and equipment having NPS 2-1/2 and larger connections.
- J. Install strainer on inlet of each line pressure regulator and automatic and electrically operated valve.
- K. Install vent piping for gas pressure regulators and gas trains, extend outside building, and vent to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end.
- L. Install piping adjacent to appliances to allow service and maintenance.
- M. Connect piping to appliances using gas with shutoff valves and unions. Install valve upstream from and within 72 inches of each appliance. Install union downstream from valve.

3.03 FIELD QUALITY CONTROL

- A. Inspect, test, and purge piping according to ANSI Z223.1, Part 4 "Inspection, Testing, and Purging," and requirements of authorities having jurisdiction.
- B. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.
- C. Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.

END OF SECTION

**SECTION 23 31 13
METAL DUCTS AND ACCESSORIES**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes metal ducts and accessories for heating, ventilating, and air-conditioning systems, diffusers, registers and grilles.

1.03 DEFINITIONS

- A. Pressure Classification for Ductwork: As defined by to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and applicable codes.
 - 1. Low Pressure: Maximum 2500 fpm velocity; maximum 2.0" WG positive or -2.0" WG negative static pressure class.

1.04 SUBMITTALS

- A. Product data including product construction, installation instructions and performance data for the following:
 - 1. Sealing materials.
 - 2. Backdraft dampers.
 - 3. Manual-volume dampers.
 - 4. Remote damper operators.
 - 5. Fire dampers.
 - 6. Duct-mounted access doors and panels.
 - 7. Flexible ducts
 - 8. Diffusers, Registers & Grilles
 - 9. Hangers and Supports
- B. No requirement for shop drawings if after examining the contract documents and actual conditions, contractor agrees system can be installed as shown.
- C. Shop Drawings: Show details of the following:
 - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - 2. Duct layout indicating pressure classifications and sizes on plans.
 - 3. Fittings.
 - 4. Reinforcement and spacing.
 - 5. Seam and joint construction.
 - 6. Penetrations through fire-rated and other partitions.
 - 7. Terminal unit, coil, and humidifier installations.
 - 8. Hangers and supports, including methods for building attachment, vibration isolation, seismic restraints, and duct attachment.
- D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- E. Record Drawings: Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.
- F. See "Submittal Schedule" located at the end of Section 23 01 00 "General Requirements for Mechanical Systems."

1.05 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," unless otherwise indicated.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Backdraft and Volume Dampers
 - a. Greenheck
 - b. Air Balance
 - c. American Warming
 - d. Cesco
 - e. Louvers and Dampers, Inc.
 - f. Penn
 - g. Prefco
 - h. Carnes
 - i. Ruskin
 - j. Vent Products
 2. Remote Manual Damper Operators
 - a. Young Regulator
 - b. Metalaire
 - c. United Enertech
 - d. Ruskin
 3. Fire Dampers
 - a. Greenheck
 - b. Air Balance
 - c. American Warming
 - d. Cesco
 - e. Louvers and Dampers, Inc.
 - f. Penn
 - g. Pottorff
 - h. Prefco
 - i. Carnes
 - j. Ruskin
 - k. Vent Products
 - l. Nailor Industries
 4. Flexible Ducts
 - a. Flexible Air Products
 - b. Flexmaster
 - c. Thermaflex
 - d. Certainteed
 - e. Wiremold
 - f. General Flex Corp
 - g. H.K. Porter
 5. Duct Access Doors
 - a. Air Balance
 - b. American Warming
 - c. Cesco
 - d. Ventfrabrics
 - e. Penn
 - f. Prefco
 - g. Carnes
 - h. Ruskin
 - i. Kees
 - j. United McGill
 - k. Nailor Industries
 6. Diffusers, Registers, Grilles
 - a. Carnes
 - b. J & J Register
 - c. Krueger

- d. Reliable
- e. Price
- f. Tuttle and Bailey
- g. Metal-Aire
- h. Titus
- i. Hart and Cooly
- j. Anemostat
- k. Nailor Industries
- 7. Duct Hangers & Supports:
 - a. Ductmate Industries, Inc.
 - b. Duro Dyne
 - c. Eberl Iron Works, Inc.
 - d. Gripple
 - e. Miro Industries, Inc.
 - f. The Pate Company
 - g. PHP Systems / Design

2.02 SHEET METAL MATERIALS

- A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.
- B. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets; commercial quality; with oiled, exposed matte finish.
- C. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.03 SEALANT MATERIALS

- A. Duct Sealant: UL classified, non-combustible, flame spread 25 or less, smoke developed rating of 540 or less, resistant to water, pressure rupture rating of 16" WG minimum, suitable for use alone or with tape, application an operational temperature ranges appropriate for usage.

2.04 MANUFACTURED DUCT JOINTS

- A. Manufactured duct joining system to consist of roll formed angles, corner pieces, metal cleats and gasket material. Construct and join ductwork in accordance with the latest SMACNA test data and joint reinforcement schedule corresponding to duct gauge used. Corners to be down set design, no bolt design except bolting is required for medium pressure applications. Reinforcement requirement for sheet metal to comply with latest SMACNA for manufactured duct joining technique appropriate to get to pressure class.

2.05 BACKDRAFT DAMPERS

- A. Dampers to be multi-blade, parallel action, counter-balanced backdraft dampers of galvanized steel or extruded aluminum, with center pivoted blades linked together with blade edge seals, brass or steel bearings, and plated steel pivot pin.

2.06 MANUAL-VOLUME DAMPERS

- A. Fabricate in accordance with latest edition of SMACNA HVAC Duct Construction Standards – Metal and Flexible and as indicated.
- B. Fabricate single blade dampers for duct sizes 9 ½" high x 30" width maximum. Single blade dampers to have spring end bearing regulator. Provide end brace for static pressure greater than 2.0" WG. Provide end brace for static pressure greater than 2.0".
- C. Fabricate multi-blade damper of opposed blade pattern using minimum 16 gauge steel with maximum blade sizes 6" x 48". Where width exceeds 48", provide regulator at both ends. Assemble center and edge crimped blades in 16 gauge channel frame with suitable hardware. Blades and frame to be galvanized or prime coated steel except where indicated for special application.

- D. Provide end bearings with end seals for pressure class required except in round duct 12" in diameter and smaller.
- E. Provide with locking quadrant actuator unless scheduled for remote actuation.

2.07 REMOTE DAMPER OPERATORS

- A. Description: Cable system designed for remote manual damper adjustment.
 - 1. Tubing: Aluminum.
 - 2. Cable: Stainless steel.
 - 3. Remote adjusting device shall be either wall or diffuser/register mounted for adjustment.
 - 4. Wall-Box Mounting: Recessed.
 - 5. Wall-Box Cover-Plate Material: Stainless steel

2.08 FIRE DAMPERS

- A. General: Labeled to UL 555
 - 1. 1-1/2 hour fire rating with 165°F fusible link unless otherwise indicated. Where wall or ceiling rating requires longer more than 1-1/2 hour rating, provide appropriate rated dampers. Where application requires higher temperature rating, use appropriate temperature rating.
 - 2. All fire dampers shall be rated for dynamic closure unless otherwise noted.
 - 3. Dynamic fire dampers shall be rated for minimum velocity of 2000 fpm. When duct velocity exceeds 2000 fpm, use appropriate velocity rating.
 - 4. Static rated dampers may be used only where HVAC systems are automatically shut down in the event of a fire or for transfer duct openings in walls or partitions.
- B. Frame: SMACNA Type B with blades out of airstream; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.
- C. Mounting Sleeve: Factory- or field-installed galvanized, sheet steel.
 - 1. Minimum Thickness: 0.052 inch or 0.138 inch thick as indicated, and length to suit application.
 - 2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.
- D. Mounting Orientation: Vertical or horizontal as indicated.
- E. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized, sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized steel blade connectors.
- F. Horizontal Dampers: Include a blade lock and stainless-steel negator closure spring.

2.09 TURNING VANES

- A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Manufactured Turning Vanes: Fabricate of 1-1/2-inch- wide, curved blades set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches on center; and set into side strips suitable for mounting in ducts.

2.10 DUCT-MOUNTED ACCESS DOORS AND PANELS

- A. General: Fabricate doors and panels airtight and suitable for duct pressure class.
- B. Frame: Galvanized, sheet steel, with bend-over tabs and foam gaskets.
- C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.
- D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.
- E. Insulation: 1-inch- thick, fibrous-glass or polystyrene-foam board.
- F. Label: Label access doors at fire and smoke damper locations per NFPA 90A.

2.11 FLEXIBLE CONNECTORS

- A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- B. Neoprene double-coated woven glass fiber fabric in accordance with NFPA 90A, suitable for temperatures and pressures of application, approximately 6" wide, crimped into metal edge strip.

2.12 FLEXIBLE DUCTS

- A. General: Comply with UL 181, Class 1.
- B. Factory-fabricated, insulated, round duct, with an outer jacket enclosing glass-fiber insulation around a continuous inner liner.
 - 1. Reinforcement: Steel-wire helix encapsulated in inner liner.
 - 2. Outer Jacket: Polyethylene film or Glass-reinforced, silver Mylar with a continuous hanging tab, integral fibrous-glass tape, and nylon hanging cord.
 - 3. Inner Liner: Polyethylene film.
- C. Pressure Rating: 4-inch wg positive, 3/4-inch wg negative.
- D. Minimum R-value: R-6 for ducts inside building envelope. R-8 for ducts in unconditioned spaces.

2.13 DIFFUSER, REGISTERS AND GRILLES

- A. General: Sizes, types and capacities as indicated. Verify ceiling and wall frame types and dimensions from architectural drawings. Factory baked enamel finish with color selected by Architect unless otherwise indicated.
- B. Diffusers: Circular, square, or rectangular air distribution outlet comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air. Opposed blade dampers.
- C. Grilles: Streamlined blades, single or double deflection as indicated.
- D. Registers: Combination grille and opposed damper assembly.

2.14 ACCESSORY HARDWARE

- A. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches to suit duct size.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.15 HANGERS AND SUPPORTS

- A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for building materials.
- B. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- C. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- D. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- E. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.01 DUCT FABRICATION

- A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
- B. Low Pressure duct
 - 1. Seams and Joints (Rectangular Ducts): Longitudinal seams shall be Pittsburgh lock, grooved seams or button punch snap lock. Transverse joints shall be drive slip. Joints 36" and larger shall be manufactured duct joining system with downset corners, or SMACNA T-25 formed on flanges with corner and cleat. Contractor option on smaller sizes
 - 2. Seams and Joints (Concealed Round Duct): Transverse joints in low velocity concealed round ducts shall be slip type secured with sheet metal screws equally spaced on 6" centers maximum with a minimum of three screws per joint. Joints shall be sealed with mastic during joining. Exposed inside edge of duct at joint shall point in direction of airflow. All duct joints exposed to weather shall be caulked weathertight.
 - 3. Seams and joints (Exposed Round Duct): Longitudinal seams shall be lock type spiral or grooved seams rolled spirally. Transverse joints shall be slip type up to 36" in diameter and shall be sealed with mastic during joining. Flanged and gasketed joints shall be used on size larger than 36" diameter.
- C. Fabricate range hood exhaust ducts with 0.0598-inch- thick, carbon-steel sheet for concealed ducts and 0.0500-inch- thick stainless steel for exposed ducts. Weld and flange seams and joints. Comply with NFPA 96.
- D. Rectangular fittings: Construct tees, bends and elbows with centerline radius of 1-1/2 times width of duct.
- E. Round Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate bend radius of die-formed, gored, and pleated elbows one and one-half times elbow diameter. Unless elbow construction type is indicated, fabricate elbows as follows:
- F. Static-Pressure Classifications: Unless otherwise indicated, construct ducts to low pressure standards.
- G. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of unbraced panel area, unless ducts are lined.
- H. Sizes shown on plans are inside clear dimensions. Ductwork utilizing duct liner shall be increased in size to accommodate the duct liner thickness.

3.02 DUCT INSTALLATION

- A. Drawings indicate general arrangement of ducts, fittings, and accessories. Minor modifications to route, size and shape of duct may be required to meet structural and other interference. Changes which could affect system performance shall be reviewed by Architect/Engineer prior to fabrication or installation of duct.
- B. Construct and install each duct system for the specific duct pressure classification indicated.
- C. Install ducts with fewest possible joints.
- D. Install fabricated fittings for changes in directions, changes in size and shape, and connections.
- E. Install couplings tight to duct wall surface with a minimum of projections into duct.
- F. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.

- J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
- K. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- L. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches.
- M. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire damper, sleeve, and fire-stopping sealant. Contractor shall be responsible to coordinate appropriately rated fire damper with supplier and engineer. All fire dampers shall be dynamically rated unless otherwise approved by Engineer and Authority Having Jurisdiction.

3.03 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- G. Ductwork mounted on roof or otherwise exposed to elements shall be supported with frames constructed of galvanized steel angles and channels, regardless of duct size. All fasteners should be galvanized. Supports should elevate ductwork above finished roof level by a minimum of 18 inches.

3.04 PROTECTION OF DUCTWORK ON SITE

- A. Ductwork stored on site as well as installed ductwork that is left open to construction activities shall be covered. Provide protective coverings on open ends of ductwork to prevent excessive accumulation of dust and debris on interior surfaces. Protection and storage of ductwork shall be in accordance to SMACNA's 'Duct Cleanliness for New Construction'.

3.05 RANGE HOOD EXHAUST DUCT INSTALLATIONS

- A. Install ducts to allow for thermal expansion of ductwork through 2000 deg F temperature range.
- B. Install ducts without dips or traps that may collect residues, unless traps have continuous or automatic residue removal.

- C. Install access openings at each change in direction and at 20-foot intervals in horizontal duct.; locate on sides of duct a minimum of 1-1/2 inches from bottom; and fit with grease-tight covers of same material as duct (or with UL listed access panel for grease duct application).
- D. Install access panels at each floor where routed up through multiple floors of building per the requirements of NFPA 96. Access panels shall be large enough to allow cleaning of ductwork. Provide additional access panel as required where duct access port is located within chase. Shaft panels shall be rated to match shaft wall rating. Align shaft access panel with grease access panel.
- E. Do not penetrate fire-rated assemblies.

3.06 SEAM AND JOINT SEALING

- A. Low Pressure Ductwork: Seal per SMACNA Seal Class "C". Sealant material shall be installed per manufacturer's recommendations.
- B. Seal externally insulated ducts before insulation installation.

3.07 HANGING AND SUPPORTING

- A. Install rigid round, rectangular, and flat-oval metal duct with support systems indicated in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.
- C. Support vertical ducts at a maximum interval of 16 feet and at each floor.

3.08 DUCT ACCESSORY INSTALLATION

- A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts.
- B. Install volume dampers at locations indicated and at all branch take-offs to air outlets and inlets.
- C. Provide fire dampers at locations indicated and where required by applicable codes. Install fire and smoke dampers according to manufacturer's UL-approved written instructions.
- D. Provide turning vanes in all mitered elbows and duct turns.
- E. Install duct access panels for access to inlet side of coils, equipment, control dampers, fire dampers, and smoke dampers.
- F. Final connections to air outlets and terminal units may be made with flexible duct. Install flexible ducts with metal collars or sleeves with draw bands. Length of flexible duct shall not exceed 36", path shall not exceed 0°.
- G. Provide flexible connections to motor driven equipment. Secure fabric to duct or fan collar with 3/16" rivets space not more than 5" on center. Provide thrust restraints so that connections are not in tension with equipment in operation.
- H. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.09 ADJUSTING

- A. Adjust volume-control dampers in ducts, outlets, and inlets to achieve design airflow. Refer to Division 23 Section "Testing, Adjusting, and Balancing" for detailed procedures.
- B. Adjust duct accessories for proper settings and actions.

3.10 CLEANING

- A. After completing system installation, inspect the system. Vacuum ducts before final acceptance to remove dust and debris.

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- B. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION

**SECTION 23 38 13
COMMERCIAL KITCHEN HOODS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes Type I commercial kitchen hoods.

1.03 DEFINITIONS

- A. Listed Hood: A hood, factory fabricated and tested for compliance with UL 710 by a testing agency acceptable to authorities having jurisdiction.
- B. Standard Hood: A hood, usually field fabricated, that complies with design, construction, and performance criteria of applicable national and local codes.
- C. Type I Hood: A hood designed for grease exhaust applications.

1.04 SUBMITTALS

- A. Product Data: For the following:
 - 1. Hoods.
 - 2. Filters/baffles.
 - 3. Fire-suppression systems.
 - 4. Lighting fixtures.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer.
 - 1. Show plan view, elevation view, sections, roughing-in dimensions, service requirements, duct connection sizes, and attachments to other work.
 - 2. Show cooking equipment plan and elevation to confirm minimum code-required overhang.
 - 3. Indicate performance, exhaust and makeup air airflow, and pressure loss at actual Project-site elevation.
 - 4. Show control cabinets.
 - 5. Show fire-protection cylinders, piping, actuation devices, and manual control devices.
 - 6. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 7. Wiring Diagrams: Power, signal, and control wiring.
 - 8. Piping Diagrams: Detail fire-suppression piping and components and differentiate between manufacturer-installed and field-installed piping. Include roughing-in requirements for drain connections. Show cooking equipment plan and elevation to illustrate fire-suppression nozzle locations.
- C. Operation and Maintenance Data: For kitchen hoods to include in emergency, operation, and maintenance manuals.
- D. See "Submittal Schedule" located at the end of Section 23 01 00 "General Requirements for Mechanical Systems."

1.05 COORDINATION

- A. Coordinate equipment layout and installation with adjacent Work, including lighting fixtures, HVAC equipment, plumbing, and fire-suppression system components.

1.06 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.01 HOOD MATERIALS

- A. Stainless-Steel Sheet: ASTM A 666, Type 304.
 - 1. Minimum Thickness: 0.037 inch.
 - 2. Finish: Comply with SSINA's "Finishes for Stainless Steel" for recommendations for applying and designating finishes. Finish shall be free from tool and die marks and stretch lines and shall have uniform, directionally textured, polished finish indicated, free of cross scratches. Grain shall run with long dimension of each piece.
 - 3. Concealed Stainless-Steel Surfaces: ASTM A 480/A 480M, No. 2B finish (bright, cold-rolled, unpolished finish).
 - 4. Exposed Surfaces: ASTM A 480/A 480M, No. 3 finish (intermediate polished surface).
 - 5. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.02 GENERAL HOOD FABRICATION REQUIREMENTS

- A. Welding: Use welding rod of same composition as metal being welded. Use methods that minimize distortion and develop strength and corrosion resistance of base metal. Make ductile welds free of mechanical imperfections such as gas holes, pits, or cracks.
 - 1. Welded Butt Joints: Full-penetration welds for full-joint length. Make joints flat, continuous, and homogenous with sheet metal without relying on straps under seams, filling in with solder, or spot welding.
 - 2. Grind exposed welded joints flush with adjoining material and polish to match adjoining surfaces.
 - 3. Where fasteners are welded to underside of equipment, finish reverse side of weld smooth and flush.
 - 4. Coat concealed stainless-steel welded joints with metallic-based paint to prevent corrosion.
 - 5. After zinc-coated steel is welded, clean welds and abraded areas and apply SSPC-Paint 20, high-zinc-dust-content, galvanizing repair paint to comply with ASTM A 780/A 780M.
- B. For metal butt joints, comply with SMACNA's "Kitchen Equipment Fabrication Guidelines."
- C. Where stainless steel is joined to a dissimilar metal, use stainless-steel welding material or fastening devices.
- D. Form metal with break bends that are not flaky, scaly, or cracked in appearance; where breaks mar uniform surface appearance of material, remove marks by grinding, polishing, and finishing.
- E. Sheared Metal Edges: Finish free of burrs, fins, and irregular projections.
- F. In food zones, as defined in NSF, fabricate surfaces free from exposed fasteners.
- G. Cap exposed fastener threads, including those inside cabinets, with stainless-steel lock washers and stainless-steel cap (acorn) nuts.
- H. Fabricate pipe slots on equipment with turned-up edges sized to accommodate service and utility lines and mechanical connections.
- I. Fabricate enclosures, including panels, housings, and skirts, to conceal service lines, operating components, and mechanical and electrical devices including those inside cabinets, unless otherwise indicated.
- J. Fabricate equipment edges and backsplashes according to SMACNA's "Kitchen Equipment Fabrication Guidelines."
- K. Fabricate enclosure panels to ceiling and wall as follows:
 - 1. Fabricate panels with same material as hood, and extend from ceiling to top of hood canopy and from canopy to wall.
 - 2. Wall Offset Spacer: Minimum of 3 inches.

2.03 TYPE I EXHAUST HOOD FABRICATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Captive-Aire Systems.
 - 2. Gaylord Industries, Inc.
 - 3. Greenheck.
- B. Weld all joints exposed to grease with continuous welds, and make filters/baffles or grease extractors and makeup air diffusers easily accessible for cleaning.
 - 1. Fabricate hoods according to NSF 2, "Food Equipment."
 - 2. Hoods shall be listed and labeled, according to UL 710, by a testing agency acceptable to authorities having jurisdiction.
 - 3. Hoods shall be designed, fabricated, and installed according to NFPA 96.
 - 4. Include access panels as required for access to fire dampers and fusible links.
 - 5. Duct Collars: Minimum 0.0598-inch-thick steel at least 3 inches long, continuously welded to top of hood and at corners.
 - 6. Makeup Air Fire Dampers: Labeled, according to UL 555, by a testing agency acceptable to authorities having jurisdiction.
 - a. Fire Rating: 1-1/2 hours.
 - b. Fusible Link: Replaceable, 165 deg F rated.
- C. Hood Configuration: Exhaust and makeup air.
 - 1. Makeup air shall be introduced through laminar-flow-type, perforated metal panels on front of hood canopy.
- D. Hood Style: Wall-mounted canopy.
- E. Filters/Baffles: Removable, aluminum, with spring-loaded fastening. Fabricate stainless steel for filter frame and removable collection cup and pitched trough. Exposed surfaces shall be pitched to drain to collection cup. Filters/baffles shall be tested according to UL 1046, "Grease Filters for Exhaust Ducts," by an NRTL acceptable to authorities having jurisdiction.
- F. Lighting Fixtures: Surface-mounted, LED fixtures and lamps with lenses sealed vapor tight. Wiring shall be installed in conduit on hood exterior. Number and location of fixtures shall provide a minimum of 70 fc at 30 inches above finished floor.
 - 1. Light switches shall be mounted on front panel of hood canopy.
 - 2. Lighting Fixtures: LED complying with UL 1598.
- G. Hood Controls: Hood mounting control cabinet, factory wired to control groups of adjacent hoods, and fabricated of stainless steel.
 - 1. Exhaust Fan: On-off switches shall start and stop the exhaust fan. Interlock exhaust fan with makeup air supply fan to operate simultaneously. Interlock exhaust fan with fire-suppression system to operate fan(s) during fire-suppression-agent release and to remain in operation until manually stopped. Include red pilot light to indicate fan operation. Motor starters shall comply with Division 26 Section.

2.04 WET-CHEMICAL FIRE-SUPPRESSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ansul Incorporated; a Tyco International Ltd. Company.
 - 2. Badger Fire Protection.
 - 3. Kidde Fire Systems.
 - 4. Pyro Chem.
- B. Description: Engineered distribution piping designed for automatic detection and release or manual release of fire-suppression agent by hood operator. Fire-suppression system shall be listed and labeled for complying with NFPA 17A, "Wet Chemical Extinguishing Systems," by a qualified testing agency acceptable to authorities having jurisdiction.
 - 1. Steel Pipe, NPS 2 and Smaller: ASTM A 53/A 53M, Type S, Grade A, Schedule 40, plain ends.

2. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300.
3. Piping, fusible links and release mechanism, tank containing the suppression agent, and controls shall be factory installed. Controls shall be in stainless-steel control cabinet mounted on hood. Furnish manual pull station for wall mounting. Exposed piping shall be covered with chrome-plated aluminum tubing. Exposed fittings shall be chrome plated.
4. Liquid Extinguishing Agent: Noncorrosive, low-pH liquid.
5. Furnish electric-operated gas shutoff valve; refer to Division 23 Section "Fuel Gas Piping."
6. Furnish electric-operated gas shutoff valve with clearly marked open and closed indicator for field installation.
7. Fire-suppression system controls shall be integrated with controls for fans, lights, and fuel supply and located in a single cabinet for each group of hoods immediately adjacent.
8. Wiring shall have color-coded, numbered terminal blocks and grounding bar. Spare terminals for fire alarm, optional wiring to start fan with fire alarm, red pilot light to indicate fan operation, and control switches shall all be factory wired in control cabinet with relays or starters. Include spare terminals for fire alarm, and wiring to start fan with fire alarm.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Complete field assembly of hoods where required.
 1. Make closed butt and contact joints that do not require filler.
 2. Grind field welds on stainless-steel equipment smooth, and polish to match adjacent finish. Comply with welding requirements in Part 2 "General Hood Fabrication Requirements" Article.
- B. Install hoods and associated services with clearances and access for maintaining, cleaning, and servicing hoods, filters/baffles, grease extractor, and fire-suppression systems according to manufacturer's written instructions and requirements of authorities having jurisdiction.
- C. Make cutouts in hoods where required to run service lines and to make final connections, and seal openings according to UL 1978.
- D. Securely anchor and attach items and accessories to walls, floors, or bases with stainless-steel fasteners, unless otherwise indicated.
- E. Install lamps, with maximum recommended wattage, in equipment with integral lighting.
- F. Set field-adjustable switches.

3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping with clearance to allow service and maintenance.
- C. Install reduced-pressure backflow preventer on washer-water supply. Backflow preventer is specified in Division 22 Section "Domestic Water Piping Specialties."
- D. Install washer-water drain piping full size of hood connection to an adjacent floor drain or floor sink.
- E. Connect ducts according to requirements in other Division 23 Sections. Install flexible connectors on makeup air supply duct. Weld exhaust-duct connections with continuous liquidtight joint.
- F. Install fire-suppression piping for remote-mounted suppression systems according to NFPA 17A, "Wet Chemical Extinguishing Systems."

3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- B. Perform tests and inspections.

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1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
1. Test each equipment item for proper operation. Repair or replace equipment that is defective, including units that operate below required capacity or that operate with excessive noise or vibration.
 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 3. Test water, drain, gas, and liquid-carrying components for leaks. Repair or replace leaking components.
 4. Perform hood performance tests required by authorities having jurisdiction.
 5. Perform fire-suppression system performance tests required by authorities having jurisdiction.
- D. Prepare test and inspection reports.

3.04 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial kitchen hoods. Refer to Division 1 Sections.

END OF SECTION

**SECTION 23 73 13
ROOFTOP AIR HANDLING UNITS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes packaged heating and cooling rooftop air handling units (RTU's).

1.03 SUBMITTALS

- A. Product Data: Include manufacturer's technical data for each model indicated, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For rooftop air conditioners to include in emergency, operation, and maintenance manuals.
- E. Warranties: Special warranties specified in this Section.

1.04 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of rooftop air conditioners and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."
- D. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- E. Comply with NFPA 54 for gas-fired furnace section.
- F. ARI Certification: Units shall be ARI certified and listed.
- G. ARI Compliance for Units with Capacities 135,000 Btuh and More: Rate rooftop air-conditioner capacity according to ARI 340/360, "Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment."
 - 1. Sound Power Level Ratings: Comply with ARI 270, "Sound Rating of Outdoor Unitary Equipment."

1.05 COORDINATION

- A. Coordinate size, location, and installation of rooftop air-conditioner manufacturer's roof curbs and equipment supports with roof installer.
- B. Coordinate structural support with structural engineer.

1.06 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of rooftop air conditioners that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.

2. Warranty Period for Heat Exchangers: Manufacturer's standard, but not less than five years from date of Substantial Completion.

1.07 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Fan Belts: One set for each belt-drive fan.
 2. Filters: One set of filters for each unit.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.
 1. Carrier Corp.
 2. Lennox Industries Inc.
 3. Daikin.
 4. Trane Company (The); North American Commercial Group.
 5. YORK International Corporation.
 6. AAON, Inc.

2.02 ROOFTOP AIR CONDITIONERS

- A. Description: Factory assembled and tested; designed for exterior installation; consisting of compressor, indoor and outside refrigerant coils, indoor fan and outside coil fan, refrigeration and temperature controls, filters, and dampers.
- B. Casing: Galvanized-steel construction with enamel paint finish, removable panels or access doors with neoprene gaskets for inspection and access to internal parts, minimum 1/2-inch- thick thermal insulation, knockouts for electrical and piping connections, exterior condensate drain connection, and lifting lugs.
- C. Indoor Fan:
 1. Forward curved, centrifugal, belt driven with adjustable motor sheaves, grease-lubricated ball bearings, and motor (RTU-1).
 2. Backward Curved, centrifugal, with blades mounted directly onto the rotor direct drive and electronically communicated motor (RTU-2 & RTU-3).
- D. Outside Coil Fan: Propeller type, directly driven by permanently lubricated motor.
- E. Refrigerant Coils: Aluminum-plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
- F. Condensate Drain Pan: Galvanized steel with corrosion resistant coating formed with pitch and drain connections per ASHRAE 62.
- G. Compressor(s): Number as scheduled hermetic scroll compressors with integral vibration isolators, internal overcurrent and overtemperature protection, internal pressure relief.
- H. Refrigeration System:
 1. Compressor(s).
 2. Outside coil and fan.
 3. Indoor coil and fan.
 4. Refrigerant dryers.
 5. High-pressure switches.
 6. Low-pressure switches.
 7. Thermostats for coil freeze-up protection during low-ambient temperature operation or loss of air.
 8. Independent refrigerant circuits.
 9. Charge of R-410a refrigerant.
 10. Timed Off Control: Automatic-reset control shuts compressor off after five minutes.
- I. Hot Gas Reheat

Cubby's Fremont Renovation

1. Unit shall be equipped with a two stage hot gas reheat coil with hot gas coming from the unit condenser.
 2. Hot gas reheat coil shall be a Micro Channel design. The aluminum tube shall be a micro channel design with high efficiency aluminum fins. Fins shall be brazed to the tubing for a direct bond. The capacity of the reheat coil shall allow for a 20°F temperature rise at all operating conditions.
 3. The hot gas reheat systems shall allow for independent control of the cooling coil leaving air temperature and the reheat coil leaving air temperature. The cooling coil and reheat coil leaving air temperature setpoints shall be adjustable through the unit controller. During the dehumidification cycle the unit shall be capable of 100% of the cooling capacity. The hot gas reheat coil shall provide discharge temperature control within +/- 2°F.
 4. Each coil shall be factory leak tested with high-pressure air under water.
- J. Filters: 2-inch- thick, fiberglass, pleated, throwaway filters in filter rack.
- K. Gas Furnace: Stainless steel burners and aluminized-steel heat exchangers for natural-gas with the following controls:
1. Redundant dual gas valve with manual shutoff.
 2. Direct-spark pilot ignition.
 3. Electronic flame sensor.
 4. Induced-draft blower.
 5. Flame rollout switch.
- L. Outdoor Air Intake: Return- and outside-air dampers with neoprene seals, outside-air filter, and hood.
1. Damper Motor: Spring return with adjustable minimum position.
 2. Relief Damper: Barometric relief damper with with neoprene seals with bird screen and hood.
- M. Power Connection: Provide for single connection of power to unit and control-circuit transformer with built-in circuit breaker. Provide unit mounted disconnect.
- N. Unit Controls: Solid-state control board and components contain at least the following features:
1. Indoor fan on/off delay.
 2. Default control to ensure proper operation after power interruption.
 3. Service relay output.
 4. Unit diagnostics and diagnostic code storage.
 5. Field-adjustable control parameters.
 6. Gas valve delay between first- and second-stage firing.
 7. Minimum run time.
 8. Night setback mode.
 9. Return-air temperature limit.
 10. Low-refrigerant pressure control.
- O. Temperature Control Interface: Unit shall have controls capable of interfacing with rooftop unit control system specified in Section 23 09 00.
- P. Roof Curb:
1. RTU-1: Vibration isolating roof curbs with 1" static deflection and integral sheet rock channels with two layers of sheet rock to reduce radiated sound.
 2. RTU-2 & RTU-3: Insulated plenum curb with opening for horizontal inlet and discharge.
- Q. Thermostat: Programmable, electronic; with heating setback and cooling setup with seven-day programming; and the following:
1. Touch sensitive keyboard.
 2. Automatic switching.
 3. Deg F readout.
 4. LED indicators.
 5. Hour/day programming.
 6. Manual override capability.

7. Time and operational mode readout.
 8. Status indicator.
 9. Battery backup.
 10. Subbase with manual system switch (on-heat-auto-cool) and fan switch (auto-on).
 11. Fan-proving switch to lock out unit if fan fails.
- R. Optional Accessories:
1. Copper condensate drain trap.
 2. Hail guards of steel, painted to match casing.

2.03 MOTORS

- A. General requirements for motors are specified in Division 23 Section "Basic Materials and Methods for HVAC."
- B. Motor Sizes: Minimum size as indicated; if not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install units level and plumb, maintaining manufacturer's recommended clearances.
- B. Curb Support: Install roof curb on roof structure, level and secure, according to ARI Guideline B. Install and secure rooftop air conditioners on curbs and coordinate roof penetrations and flashing with roof construction. Secure units to curb support with anchor bolts.
- C. Unit Support: Install unit level on structural curbs. Coordinate wall penetrations and flashing with roof construction.

3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to machine to allow service and maintenance.
 1. Gas Piping: Comply with applicable requirements in Division 22 Section "Fuel Gas Piping." Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.
- C. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
 1. Install ducts to termination in roof curb.
 2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
 3. Connect supply and return ducts to rooftop unit with flexible duct connectors.

3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field quality-control tests and inspections and prepare test reports:
 1. After installing rooftop air conditioners and after electrical circuitry has been energized, test units for compliance with requirements.
 2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove malfunctioning units, replace with new units, and retest as specified above.

3.04 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.

- B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
1. Inspect for visible damage.
 2. Verify that clearances have been provided for servicing.
 3. Verify that controls are connected and operable.
 4. Verify that filters are installed.
 5. Clean outside coil and inspect for construction debris.
 6. Clean furnace flue and inspect for construction debris.
 7. Connect and purge gas line.
 8. Adjust vibration isolators.
 9. Inspect operation of barometric dampers.
 10. Lubricate bearings on fan.
 11. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
 12. Adjust fan belts to proper alignment and tension.
 13. Start unit according to manufacturer's written instructions.
 - a. Start refrigeration system in summer only.
 - b. Complete startup sheets and attach copy with Contractor's startup report.
 14. Calibrate thermostats.
 15. Adjust and inspect high-temperature limits.
 16. Inspect outside-air dampers for proper stroke and interlock with return-air dampers.
 17. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.

3.05 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose, without additional cost.

3.06 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain rooftop air conditioners.

END OF SECTION

**SECTION 23 74 23
PACKAGED, DIRECT-FIRED, MAKEUP-AIR UNITS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Owner may contract directly with the Commissioning Authority (CxA) for this project. All Contractors shall cooperate with the CxA to complete all required commissioning. Specification Section 01 91 13 defines the Contractor's responsibilities with respect to the process. The Contractor shall review this section and shall include in their bids the work associated with the commissioning effort described.

1.02 SUMMARY

- A. This Section includes direct-fired, makeup air units and accessories.

1.03 SUBMITTALS

- A. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each unit.
- B. Shop Drawings: Show details of the following:
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.
- C. Maintenance Data: For direct-fired, makeup air units to include in maintenance manuals.
- D. Warranties: Special warranties specified in this Section.

1.04 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of direct-fired, makeup air units and are based on the specific system indicated. Other manufacturers' systems with equal performance characteristics may be considered.
- B. AGA Certification: Gas-fired units shall be certified and labeled.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with NFPA 70.
- E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2007, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- F. ASHRAE/IESNA 90.1-2007 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2007, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.05 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, executed by manufacturer agreeing to replace components of direct-fired, makeup air units that fail in materials or workmanship within specified warranty period.
- C. Warranty Period: Two years from date of Substantial Completion.

1.06 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Filters: One set for each unit.
 - 2. Fan Belts: One set for each unit.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Captive-Air Systems, Inc.
 - 2. Engineered Air.
 - 3. Greenheck.
 - 4. Hastings Industries; Division of Eric, Inc.
 - 5. Modine Mfg. Co.; Heating Div.
 - 6. Rapid Engineering, Inc.
 - 7. Reznor/Thomas & Betts.

2.02 PACKAGED UNITS

- A. Factory-assembled, prewired, self-contained unit consisting of casing, supply fan, controls, filters, and gas burner with profile plate.
 - 1. General Construction: Outdoor unit.

2.03 CASING AND COMPONENTS

- A. Casing: Minimum 0.052-inch- thick, galvanized-steel panels, formed to ensure rigidity and fastened with sheet metal screws or pop rivets; supported by galvanized-steel channels or structural channel supports; with access panels for burner and fan motor assemblies from both sides of unit; and with lifting lugs.
- B. Access Panels: Lift-out or hinged.
- C. Insulation: Factory-applied, neoprene-faced, glass-fiber insulation, 1 inch thick, applied on complete unit.
- D. Finish: Heat-resistant, baked enamel.
- E. Weatherproofing: Factory applied to casing.
- F. Filters: Removable 2-inch- thick, glass-fiber, disposable filters in metal frames.
- G. Base rail suitable for mounting to existing support rail system.
- H. Intake Dampers: Motorized, low leak damper to open when unit is energized.

2.04 FUEL BURNING SYSTEM

- A. Burners: Capable of modulating turndown ratio of 25:1, including electric-modulating main gas valve, motorized shutdown valve, main and pilot gas regulators, pilot electric gas valve, manual shutoff valve, and pilot adjustment valve.
- B. Fuel: Natural gas.
- C. Pilot: Electrically ignited by spark rod through high-voltage-ignition transformer.
- D. Safety Controls: Factory-installed sensors verify correct airflow before energizing pilot and sense pilot ignition before activating main gas valve.
- E. Manual-Reset, Low- and High-Limit Controls: Maintain supply-air temperature between set points and shut fan down if temperatures are exceeded.
- F. Purge-Period Timer: Automatically delays burner ignition and bypasses low-limit control.

2.05 MECHANICAL COOLING

- A. DX system with cooling coil, condensing units, refrigerant piping, controls and accessories.
- B. System shall be completely integral to make-up air unit and not require external piping.

2.06 FAN

- A. Description: Rated according to AMCA 210; statically and dynamically balanced, galvanized-steel, centrifugal fan mounted on solid-steel shaft with heavy-duty, self-aligning, prelubricated ball bearings and V-belt drive with matching motor sheaves and belts.

2.07 CONTROLS

- A. Factory-wire connection for power supply and field-wire unit to remote control panel.
- B. Interlocks: Start unit when exhaust fan is running. Operate burner when flow switch located in exhaust duct proves airflow.
- C. Fan Discharge Thermostat: Controls modulating gas valve to maintain supply-air temperature.
- D. Damper Control: Open intake damper when unit is energized.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install units according to manufacturer's written instructions.
- B. Install gas-fired units according to AGA Z223.1.
- C. Install roof-mounted units on curbs.

3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
 - 1. Install piping adjacent to machine to allow service and maintenance.
 - 2. Gas Piping: Comply with applicable requirements in Division 23 Section "Fuel Gas Piping." Connect gas piping with shutoff valve and union and with sufficient clearance for burner removal and service. Provide AGA-approved flexible connectors.
 - 3. Duct Connections: Comply with applicable requirements in Division 23 Section "Metal Ducts & Accessories" for flexible connectors.

3.03 START-UP

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Verify that equipment is installed and connected according to manufacturer's written instructions.
- B. Complete installation and startup checks according to manufacturer's written instructions.
- C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
- D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.04 ADJUSTING

- A. Adjust initial temperature set points.
- B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.05 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain direct-fired, makeup air units.
 - 1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
 - 2. Review data in maintenance manuals.
 - 3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION

DIVISION 26 - ELECTRICAL

**SECTION 26 01 00
GENERAL ELECTRICAL REQUIREMENTS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes general electrical requirements and shall apply to all phases of the work specified, indicated on the drawings or required to provide for complete installation of electrical systems.

1.03 WARRANTIES

- A. All materials, workmanship and equipment shall be warranted against defects or against injury from proper and usual wear for a period of one year after the date of substantial completion. Certain equipment shall be warranted beginning at the time of final acceptance or for longer periods of time as specified in those sections of the Project Manual. Any item which becomes defective within the warranty period shall be repaired or replaced, at no additional cost to the Owner.
- B. All manufactures warranties shall run to the benefit of the Owner. No manufacturer's warranties shall be voided or impaired.
- C. Warranty shall include repair of faulty workmanship.

1.04 ALTERNATES

- A. Alternates, if required, shall be as described in the "Alternates" section of this specification, as described on the proposal form or as indicated on the drawings.

1.05 INTERPRETATION OF DOCUMENTS

- A. Any questions regarding the meaning of any portion of the contract documents shall be submitted to the Architect/Engineer for interpretation. Addenda or supplemental information will publish definitive interpretations or clarification. Verbal interpretation not issued by addendum or supplemental information shall not be considered part of the contract documents.
- B. The Architect/Engineer shall be the sole judge of interpretations of discrepancies within the contract documents.
- C. If ambiguities should appear in the contract documents, the Contractor shall request clarification from the Architect/Engineer before proceeding with the work. If the Contractor fails to make such request, no excuse will thereafter be entertained for failure to carry out the work in a manner satisfactory to the Architect/Engineer. Should a conflict occur within the contract documents, the Contractor is deemed to have estimated the more expensive way of doing the work unless a written clarification from the Architect/Engineer was requested and obtained before submission of proposed methods or materials.

1.06 DEFINITIONS ABBREVIATIONS

- A. The following shall apply throughout the contract documents
 1. Code All applicable national state and local codes
 2. Furnish Supply and deliver to site ready for installation
 3. Indicated Noted, scheduled or specified
 4. Provide Furnish, install and connect complete and ready for final use by Owner
 5. ADA Americans with Disabilities Act
 6. ANSI American National Standards Institute
 7. ASTM American Society for Testing and Materials
 8. FM Factory Mutual System
 9. IRI HSB Industrial Risk Insurers
 10. NEC National Electric Code (NFPA 70)
 11. NEMA National Electrical Manufacturers Association

- 12. NFPA National Fire Protection Association
- 13. UL Underwriters Laboratories Inc.

1.07 CODES AND STANDARDS

- A. All work shall be performed by competent craftsmen skilled in the trade involved and shall be done in a manner consistent with normal industry standards.
- B. All work shall conform to the currently adopted edition of the National Electric Code (NEC), Local Building Code, and all other applicable state and local codes or standards.
- C. Where there is a conflict between the code and the contract documents, the code shall have precedence only when it is more stringent than the contract documents. Items that are allowed by the code but are less stringent than those specified shall not be substituted.

1.08 PERMITS

- A. Contractor shall become familiar and comply with all requirements regarding permits, fees, licenses, etc. All permits, licenses, inspections and arrangements required for the work shall be obtained by Contractor's effort and expense. All utilities shall be installed in accordance with the local rules and regulations and all charges shall be paid by the Contractor. Capital facilities fees will be paid by Owner.

1.09 SUBMITTALS

- A. Division 1 section "Submittals" shall be adhered to if more stringent than this section.
- B. Shop drawings shall be submitted to Architect/Engineer for review when required by other sections of this specification and for all equipment scheduled or specified on drawings.
 - 1. A letter of transmittal shall accompany each submittal. Submittals shall be numbered consecutively and list products covered.
 - 2. Unless otherwise noted, submit a minimum of six (6) copies of shop drawing and product data for review.
- C. Shop Drawings
 - 1. Shop drawings include fabrication and installation drawings, diagrams, schedules of other data specifically prepared for the project. Include dimensions and notations showing compliance with specified standards.
 - 2. Drawing sheet size shall be at least 8 ½" x 11" and no longer than 30" x 42". For sheets larger than 11" x 17", submit one sheet of reproducible media and one blue-line or photocopy print. Architect/Engineer action will be returned on reproducible media.
- D. Product Data
 - 1. Product data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, rough-in diagrams, wiring diagrams and performance curves.
 - 2. Each copy shall clearly indicate conformance with specified capacities, characteristics, dimensions and details. Mark all equipment with same item number as used on drawings. Mark each copy to clearly indicate applicable choices and options.
- E. Architect/Engineer will review or take appropriate action for submittals. Review is only to determine general conformance with design shown in contract documents.
- F. Architect/Engineer review of submittals shall not relieve contractor of responsibility for deviation from requirements of the contract documents or from errors or omissions within submittals.
- G. No portion of the work requiring submittals shall be commenced until the Architect/Engineer has reviewed the submittal.
- H. Electronic Floor Plan Drawings in AutoCAD 2002 format may be requested for use in preparation of shop drawings. Morrissey Engineering reserves the right to reject requests for electronic drawings. Electronic files shall be prepaid at \$50/sheet. Submit written request to Morrissey Engineering or email request to info@morrisseyengineering.com. Indicate the project name, and floor plan sheets requested. The use of these drawings is intended solely for preparation of drawings required by this specification. Copyright law prohibits any other use.

The user of the electronic files assumes full responsibility for the accuracy and scale of the drawings.

- I. See "Submittal Schedule" at the end of Section 26 01 00 – General Electrical Requirements.

1.10 OPERATION AND MAINTENANCE MANUALS

- A. Assemble three (3) complete sets of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
 1. Operation Data:
 - a. Emergency instructions and procedures.
 - b. System, subsystem, and equipment descriptions, including operating standards.
 - c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
 - d. Description of controls and sequence of operations.
 - e. Piping and wiring diagrams.
 2. Maintenance Data:
 - a. Manufacturer's information, including list of spare parts.
 - b. Name, address, and telephone number of installer or supplier.
 - c. Maintenance procedures.
 - d. Maintenance and service schedules for preventive and routine maintenance.
 - e. Maintenance record forms.
 - f. Sources of spare parts and maintenance materials.
 - g. Copies of maintenance service agreements.
 - h. Copies of warranties and bonds.
- B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.11 PROJECT RECORD DOCUMENTS

- A. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
 1. Mark Record Prints to show the actual installation where installation varies from that shown originally.
 2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 3. Mark important additional information that was either shown schematically or omitted from original Drawings.
 4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
 5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
- B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
- C. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All materials and equipment used in the construction of the project shall be new unused and undamaged unless otherwise specified. Materials and equipment shall be of latest design standards of manufacturer specified.
- B. Materials and equipment are limited by the requirements of the contract documents. Material and equipment shall be provided in accordance with the following:
 - 1. Basis of Design Products: Basis of Design Products are those products around which the project was designed in terms of capacity, performance, physical size and quality. Basis of Design Products shall be provided unless substitutions are made in accordance with this specification.
 - 2. Substitutions: Substitutions are product of manufacturers other than listed as Basis of Design. Substitutions shall meet each of the following requirements and shall be subject to prior approval. Submissions requesting prior approval shall be received by the engineer no less than ten (10) days prior to project bid date.
 - a. The product shall be manufactured by one of the acceptable manufacturers listed in the contract documents.
 - b. The product shall meet or exceed the requirements of the contract documents in terms of quality, performance, suitability, appearance and characteristics.
 - c. The contractor providing the substitution shall bear the total cost of all changes due to substitutions. These may include but are not limited to redesign costs and increased work by other contractors or the Owner.
 - d. The Architect/Engineer shall be the sole judge of the suitability of the substitution items.
- C. Verify installation details and requirements for materials and equipment furnished by others and installed under this contract.

PART 3 - EXECUTION

3.01 DEMONSTRATION AND TRAINING

- A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. Provide 4 hours training in up to two separate sessions.
 - 1. Provide instructors experienced in operation and maintenance procedures.
 - 2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
 - 3. Schedule training with Owner and Architect/Engineer with at least seven days' advance notice.

3.02 STARTING AND ADJUSTING

- A. Start and test all equipment and operating components to confirm proper operation. Test and adjust all systems to achieve designed capacity and performance.
- B. Provide three (3) copies of all test report to the Architect/Engineer for review prior to date of substantial completion.
- C. All equipment and systems discrepancies shall be corrected prior to final acceptance.

3.03 TEMPORARY POWER AND LIGHTING

- A. Electric Power Service: Provide temporary electric power from local utility with metering and with payment of use charges.
- B. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and construction equipment.
- C. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.

ELECTRICAL SUBMITTAL SCHEDULE

Refer to individual specification sections for additional requirements and detail on each submittal.

Section	Section Name	Product Data	Shop Dwgs	Test Reports / Quality Control	Warranty	Extra Materials	O&M Data	Record Docs	Demonstration / Training
260100	General Electrical Requirements	√	√						
260500	Basic Electrical Materials and Methc	√	√						
260600	Grounding and Bonding	√							
262416	Panelboards	√	√		√		√		
262726	Wiring Devices	√	√				√		
262816	Disconnect Switches and Circuit Bre	√			√		√		
264313	Surge Protective Devices (SPD's)	√			√		√		
265100	Lighting	√	√		√		√		
265200	Lighting Control	√	√		√		√		√

END OF SECTION

**SECTION 26 05 00
BASIC ELECTRICAL MATERIALS AND METHODS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following basic electrical materials and methods and shall apply to all phases of the work specified, indicated on the drawings or required to provide for complete installation of electrical systems.
 - 1. Conduits.
 - 2. Building wire and connectors.
 - 3. Supporting devices for electrical components.
 - 4. Outlet boxes.
 - 5. Electrical identification.
 - 6. Electrical demolition.
 - 7. Cutting and patching for electrical construction.
 - 8. Fire Stopping.
 - 9. Touchup painting.

1.03 MATERIAL QUALITY ASSURANCE

- A. Electrical components, devices, and accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

1.04 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
 - 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing of electrical materials and equipment with other trades.
- C. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.
- D. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- E. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.
- F. Motors, equipment, controls, etc. shall be furnished, mounted and connected according to the following schedule unless otherwise noted (E =Electrical Contractor, M =Mechanical Contractor):
- G.

Item	Furnished By	Set in place or mounted by	Power wiring and connection by	Control Wiring and connection by
1) Equipment Motors	M	M	E	M
2) Disconnect switches, thermal overload switches, manual operating switches				
a) Furnished as part of factory wired mechanical equipment	M	M	E	--
b) Loose mounted	E	E	E	--
3) Transformers				

Cubby's Fremont Renovation

a) Serving 120 Volt and higher loads	E	E	E	--
b) Serving 24 Volt control power	M(1)	M	E	M
4) Contactors	E	E	E	E
5) Line voltage thermostats and time clocks.	E[M]	E	E	E
6) Low voltage controls and thermostats	M	M	M	M (2)
7) Motorized valves, and float controls for tanks and sumps	M	M	E	M
8) Motorized control valves, damper motors, solenoid valves, etc.				
a) Line Voltage	M	M	E	M
b) Low Voltage	M	M	M	M
9) Electric wall and unit heaters	E	E	E	E
10) Fire and smoke detectors including relays for fan shutdown	E	E	E	E(3)

H. Notes:

1. When control power is not available, mechanical contractor shall provide control transformers as required to power all valves, dampers, etc.
2. Conduit rough-in for thermostats by electrical contractor.
3. Wiring from alarm contacts to alarm system by Electrical; control function wiring by Mechanical.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Each contractor shall make provisions for delivery and safe storage of materials. Materials shall be delivered in a timely manner to expedite the work.
- B. Protect stored piping, supplies and equipment from cold, moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

PART 2 - PRODUCTS

2.01 CONDUITS

- A. Electrical metallic tubing (EMT): ANSI C80.3 and UL 797, zinc-coated steel with steel or die cast, set-screw or compression type fittings.
 1. Color coded exterior for system identification:
 - a. Power – Silver.
 - b. Security – Orange.
 - c. Communications – Blue.
- B. Flexible metal conduit (FMC): UL 1, Zinc-coated steel.
- C. Intermediate metal conduit (IMC): ANSI C80.6 and UL 1242, zinc-coated steel, with threaded fittings.
- D. Liquidtight flexible metal conduit (LFMC): Flexible steel conduit with PVC jacket and complying with UL 360.
- E. Rigid nonmetallic conduit (RNC): NEMA TC 2 and UL 651, EPC-40 (schedule 40) PVC, with NEMA TC3 fittings.
- F. Installation location shall determine conduit type permitted.
 1. For indoor installations:
 - a. Exposed: EMT.
 - b. Concealed: EMT.
 - c. Connection to vibrating equipment: FMC; except in wet or damp locations, use LFMC.
 - d. Boxes and enclosures: NEMA 250, Type 1, unless otherwise indicated.
 2. Use the following conduits for outdoor installations:
 - a. Exposed: IMC.
 - b. Underground: RNC.
 - c. Boxes and enclosures: NEMA 250, Type 3R or Type 4.

3. At motors:
 - a. Connect motors and equipment subject to vibration, noise transmission, or movement with FMC of 72-inch maximum length.
 - b. Damp locations: LFMC.
- G. Conduit fittings: Specifically designed for the conduit type with which used. Comply with NEMA FB 1 and UL 514B.

2.02 CONDUCTORS

- A. Conductors and conductor insulation: Comply with NEMA WC 70.
- B. Conductors, No. 10 AWG and Smaller: Solid or stranded copper.
- C. Conductors, larger than No. 10 AWG: Stranded copper.
- D. Insulation: thermoplastic, rated at 75 deg C minimum.
 1. Feeders: Type THHN/THWN insulated conductors in conduit.
 2. Underground Feeders and Branch Circuits: Type THWN in conduit.
 3. Branch Circuits: Type THHN/THWN insulated conductors in conduit.
 4. Circuits over 100 feet from GFCI devices and all circuits from line isolation panels: Low-leakage XHHW in conduit.
- E. Wire connectors and splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.
- F. Unless otherwise indicated on the drawings, circuits are to be 20 amps with #12 AWG wire.
- G. A green ground shall be installed with all branch and feeder circuits. Unless otherwise indicated on the drawings, ground wires are to be #12 AWG.
- H. Provide a dedicated neutral conductor for each 120V and 277V branch circuit unless otherwise indicated on drawings.

2.03 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal items for use outdoors or in damp locations: Hot-dip galvanized steel.
- C. Slotted-steel channel supports: Flange edges turned toward web, and 9/16-inch- diameter slotted holes at a maximum of 2 inches o.c., in webs.
- D. Conduit and cable supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
 1. In general, use the following support methods for outdoor conduit installations:
 - a. Individual exposed conduit: 1" and smaller; 2 hole straps.
 - b. Individual exposed conduit: 1-1/4" and larger; Minerallac.
 - c. Paired individual exposed conduit: Minerallac.
 - d. Rack exposed conduit: Unistrut with strut straps.
 - e. Concealed in concrete pour: Approved iron tie wire.
 2. In general, use the following support methods for indoor conduit installations:
 - a. Individual exposed conduit: 1" and smaller; 2 hole straps.
 - b. Individual exposed conduit: 1-1/4" and larger; Minerallac.
 - c. Individual lighting and power above lay-in ceilings: Dedicated ceiling wire with Caddy clips.
 - d. Racked exposed or concealed conduit: Unistrut with strut straps.
- E. Pipe sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- F. Expansion anchors: Carbon-steel wedge or sleeve type.
- G. Toggle bolts: All-steel springhead type.
- H. Powder-driven threaded studs: Heat-treated steel.

2.04 BOXES

- A. Hollow wall and ceiling spaces: Outlet boxes for concealed applications shall be 4" square with single or multiple gang plaster ring in round or square configuration to match the device or fixture being installed. Depth of ring shall be selected so that face of ring is recessed back from face of finished surface by approximately 1/8".

- B. Masonry walls: Outlet boxes in masonry walls shall be 4" square with single or multiple gang masonry rings with square edges. Masonry boxes may also be used where 4" square boxes are impractical. Slush boxes in place to prevent movement within walls. Flush mounted boxes and conduit are to be used unless otherwise indicated.
- C. Interior junction boxes: Interior junction boxes shall be 4" square minimum with knock outs as required. Larger boxes may be required and shall be sized per NEC. Provide a flat steel coverplate.
- D. Specialty junction boxes larger than 4 11/16": Junction and pull boxes shall be sized per NEC and arranged to facilitate pulling or splicing. Boxes shall be steel without knock outs, with hinged or screw on cover plates.

2.05 ELECTRICAL IDENTIFICATION

- A. Underground warning tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:
 - 1. Not less than 6 inches wide by 4 mils thick.
 - 2. Compounded for permanent direct-burial service.
 - 3. Embedded continuous metallic strip or core.
 - 4. Printed legend that indicates type of underground line.
- B. Tape markers for wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- C. Engraved-plastic labels, signs, and instruction plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch minimum thickness for signs up to 20 sq. in. and 1/8-inch minimum thickness for larger sizes. Engraved legend in black letters on white background.

2.06 ACCESS DOORS

- A. Prime coated 14 gauge steel, flush, with screw driver operated cam lock. Frame to accommodate construction type; size as indicated.

PART 3 - EXECUTION

3.01 UTILITY COORDINATION

- A. Utility locations indicated on drawings are approximate and the most accurate information available at the time of design. Prior to equipment and conduit installation, the contractor shall coordinate exact installation details and modify work plan accordingly to meet utility requirements. Correspond with utility company prior to any site development that may impact the installation such as irrigation installation, concrete or asphalt installation, landscaping, etc.
- B. Contact utility locating services prior to digging.

3.02 ELECTRICAL EQUIPMENT INSTALLATION

- A. Quality of workmanship: A neat and workmanlike installation shall be provided as defined in the National Electrical Installation Standards (NEIS) established by the National Electrical Contractors Association (NECA). NEIS standards shall be followed for all work including that which is concealed by construction.
- B. Neatness and craftsmanship shall be a priority. Installations shall be subject to regular observations performed by the Engineer or the Engineer's Representative. If an installation is deemed unsatisfactory by the Engineer or the Engineer's Representative due to quality of workmanship, code conflicts or deviations from the Construction Drawings or Specifications, the Contractor shall remedy the installation to the satisfaction of the Engineer.
- C. Inspect installed components for damage and faulty work, including the following:
 - 1. Conduits.
 - 2. Building wire and connectors.
 - 3. Supporting devices for electrical components.
 - 4. Electrical identification.
 - 5. Concrete bases.
 - 6. Cutting and patching for electrical construction.
 - 7. Touchup painting.

- D. Headroom maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- E. Materials and components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- F. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- G. Right of way: Give to conduits and piping systems installed at a required slope.

3.03 CONDUIT AND CABLE INSTALLATION

- A. Conceal conduit and cables, unless otherwise indicated, within finished walls, ceilings, and floors.
- B. Install conduit and cables at least 6 inches away from parallel runs of flues or hot-water pipes. Locate horizontal conduit runs above water piping.
- C. Use temporary conduit caps to prevent foreign matter from entering.
- D. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
- E. Use conduit and cable fittings compatible with conduit and cables and suitable for use and location.
- F. Conduits may be installed embedded in concrete under the following conditions:
 - 1. Contractor shall receive approval from a structural engineer if conduit is to be located in structural concrete.
 - 2. Leave at least 2-inch concrete cover.
 - 3. Do not displace more than 1/3 of the concrete thickness of the slab. For example, if the slab thickness is 3", maximum conduit size is to be 1" OD.
 - 4. Secure conduit to reinforcing rods to prevent sagging or shifting during concrete placement.
 - 5. Where multiple conduits are run in an area, space conduit laterally to prevent voids in concrete. Fan out conduit runs for a minimum spacing of no less than 3 times the diameter of the larger conduit in a group. Do not place conduits within 12" of supporting beams, walls and columns.
 - 6. Install conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
 - 7. Where floor finish is to be exposed concrete, avoid excessive underfloor conduits and maximize cover over conduits to avoid floor cracking.
 - 8. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
- G. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows where elbows can be installed parallel; otherwise, provide field bends for exposed parallel conduits.
- H. Install pull wires in empty conduits. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.
- I. Install interior telephone and signal system conduits in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.
- J. Install exterior telephone and signal system conduits in maximum lengths of 500 feet and with a minimal number of 90-degree bends.
- K. Utilize sweep elbows for all telephone and signal system conduits 2" and larger.
- L. All conduits routed through unfinished spaces shall be routed as high as allowable to avoid future conflicts with build out.
- M. All conduits routed exposed in finished spaces shall be painted to match the surroundings. Unless otherwise required by Code, this shall include fire alarm, communication, or other color-specific conduits.
- N. Route conduits parallel to building structural members in a neat and orderly manner.

3.04 CONDUIT SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple conduit hangers and riser clamps to support conduits. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Size supports for multiple conduits so capacity can be increased by a 25 percent minimum in the future.
- D. Install 1/4-inch diameter or larger threaded steel hanger rods, unless otherwise indicated.
- E. Simultaneously install vertical conductor supports with conductors.
- F. Separately support cast boxes that are threaded to conduits and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to conduits on opposite sides of the box and support the conduit with an approved fastener not more than 24 inches from the box.
- G. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength. Use factory hardware for all connections and assemblies including 45 and 90 degree attachment hardware.
- H. Install sleeves for cable and conduit penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and conduit penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- I. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
 - 1. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
 - 2. New concrete: Concrete inserts with machine screws and bolts.
 - 3. Light steel: Sheet-metal screws.
 - 4. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.05 WIRING INSTALLATION

- A. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- B. Install wiring at outlets with at least 12 inches of slack conductor at each outlet.
- C. Connect outlet and component connections to wiring systems and to ground. Tighten electrical connectors and terminals, according to manufacturer's published torque-tightening values.

3.06 POSITION OF DEVICE OUTLETS

- A. Outlets shall be installed at the height indicated below unless otherwise noted. All heights of outlets are measured from finished floor to centerline of device. Heights may be adjusted as necessary to clear wall mounted cabinets, fin tube convectors, unit heaters, etc. Where installed in masonry walls, mounting heights may be adjusted to correspond to block coursing. In no case shall outlets be mounted below 15" or switches above 48":
 - 1. Wall switches 44".
 - 2. Receptacle outlet (general) 16".
 - 3. Receptacle outlet serving countertops 4" above counter or top of backsplash unless otherwise noted.
 - 4. Exterior receptacles 24"
 - 5. Communications outlet Match adjacent outlets.
 - 6. Communication system call station 44".
 - 7. Exit lights 4" between top of door frame and bottom of exit light where possible.

3.07 ELECTRICAL IDENTIFICATION

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- E. Install warning markers directly above power and communication lines during trench backfilling for underground power, control, signal, and communication lines. Locate marker 6 to 8 inches below finished grade unless required otherwise by NEC. Markers shall be continuous and detectable with a metal detector from above ground after backfilling. Provide one strip of marker for each 16 inches of width if multiple lines are installed in a common trench or concrete envelope.
- F. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
 - 1. Phase A: Black.
 - 2. Phase B: Red.
 - 3. Phase C: Blue.
 - 4. Neutral: White.
 - 5. Ground: Green.

3.08 FIRESTOPPING

- A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly and to resist passage of smoke and other gases. Products designed to achieve a fire or smoke resistance rating shall not be used in locations where such ratings are not required by AHJ. Coordinate location requirements with other disciplines and AHJ prior to installation.
 - 1. Limit air leakage to 5.0cfm per square foot tested in accordance with UL 1479.
 - 2. Materials labeled by a qualified testing agency acceptable to AHJ.
 - 3. Comply with manufacturer's written installation instructions and published drawings
 - 4. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - a. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - b. Contractor's name, address, and phone number.
 - c. Designation of applicable testing and inspecting agency.
 - d. Date of installation.
 - e. Manufacturer's name.
 - f. Installer's name.
- B. All firestopping assemblies shall be from one manufacturer. Match manufacturer used by other trades or as directed by general contractor.
- C. Where electrical outlets are to be installed in fire rated walls, provide FlameSafe FSP1077 putty pads or equal to maintain adequate fire rating.
- D. Where lighting fixtures or other electrical devices are to be installed in fire rated ceilings, provide Tenmat Fire Rated Light Covers or equal to maintain adequate fire rating.

3.09 DEMOLITION

- A. Disconnect, demolish, and remove construction indicated in specifications and drawings.
- B. The Owner shall have first salvage rights to all fixtures, devices and equipment removed. Present removed materials to owner's representative. Materials not retained by owner's representative shall be removed from project site.
- C. If equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.

- D. Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.
- E. Remove all accessible conduit unless otherwise noted.
- F. Remove branch circuit conductors and low voltage cable in area of demolition not reused in new work or planned for future use. Where left for future use, label wire at both ends and at each junction box.
- G. Power to existing areas not being remodeled shall be maintained at all times except for short term outages necessary for reconnection of existing circuits. Coordinate and schedule outages with owner.
- H. Coordinate demolition with the work of other trades. Provide temporary power as required to allow the work of other trades to proceed or as required to allow the owner to occupy the space.
- I. See architectural plans to determine project phasing requirements. Electrical circuits serving areas not under construction shall remain active until those areas are turned over to the contractor for construction.
- J. Work abandoned in place: Cut and remove underground conduit a minimum of 2 inches beyond face of adjacent construction. Cap and patch surface to match existing finish.

3.10 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

3.11 CONSTRUCTION LAYOUT

- A. Layout work in advance of installation using data and measurements from the site, the appropriate architectural and structural drawings and shop drawings.
- B. Confirm adequate clearance for installation, operation, maintenance and code required clearance including items installed by other contractors.
- C. If layout to provide clearance is not possible, promptly notify Architect/Engineer for clarification.

3.12 DATA AND MEASUREMENTS

- A. The data given herein and on the drawings is as accurate as could be secured. The existence and location of construction as indicated is not guaranteed. Before beginning work investigate and verify the existence and location of items affecting work. Obtain exact locations, measurements, levels, etc., at the site and adapt work to actual conditions.
- B. Only Architectural drawings, Structural drawings, and site measurements may be utilized in calculations. Mechanical and electrical drawings are diagrammatic or schematic.

3.13 COMMISSIONING

- A. Participate in the commissioning process under the direction of the commissioning authority. Representative with expertise and authority to act on contractor's behalf shall perform commissioning activities including, but not limited to, the following:
 - 1. Coordinate and integrate commissioning process activities with construction schedule.
 - 2. Attend meetings held on a regular basis at intervals determined by commissioning authority.
 - 3. Supply product documentation.
 - 4. Complete construction checklists provided by commissioning authority.
 - 5. Review and accept commissioning process test procedures provided by the Commissioning Authority.
 - 6. Complete commissioning process test procedures and functional testing.
 - 7. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
 - 8. Cooperate with the commissioning authority for resolution of logged issues.

3.14 REFINISHING AND TOUCHUP PAINTING

- A. Refinish and touch up paint.
 - 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.

2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.15 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

**SECTION 26 06 00
GROUNDING AND BONDING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.

1.03 SUBMITTALS

- A. Field quality-control test reports.
- B. Operation and Maintenance Data: For grounding, include the following in emergency, operation, and maintenance manuals:
 - 1. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NFPA 70B.
 - a. Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.
 - b. Include recommended testing intervals.

1.04 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.01 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. See riser diagram.
- C. Grounding Bus Bars:
 - 1. Rectangular bars of annealed copper with pre-drilled hole pattern, per details on the drawings; with insulators.

2.02 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
 - 2. Bus Bars: Compression type, two hole.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.03 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, 5/8" diameter by 120 inches.

- B. Ufer Ground (Concrete-Encased Grounding Electrode): #3/0 bare copper in 25' of concrete footing.

PART 3 - EXECUTION

3.01 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, No. 3/0 AWG minimum.
 - 1. Bury at least 24 inches (600 mm) below grade.
- C. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors
 - 3. Connections to Ground Rods: Bolted connectors.
 - 4. Connections to Conduits: Insulated grounding bushings
 - 5. Connections to Busbars: Bolted connections.

3.02 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Install two parallel ground rods if resistance to ground by a single, ground-rod electrode exceeds 25 ohms.
- C. Drive ground rods until tops are 12 inches (300 mm) below finished grade in undisturbed earth.
- D. Ground-Rod Connections: Install bolted connectors for underground connections and connections to rods.
- E. Lightning Arrester Grounding Conductors: Separate from other grounding conductors.
- F. Secondary Neutral and Transformer Enclosure: Interconnect and connect to grounding conductor.
- G. Protect grounding conductors running on surface of wood poles with molding extended from grade level up to and through communication service and transformer spaces.

3.03 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. All feeders and branch circuits, including:
 - a. Feeders and branch circuits.
 - b. Lighting circuits.
 - c. Receptacle circuits.
 - d. Single-phase motor and appliance branch circuits.
 - e. Three-phase motor and appliance branch circuits.
 - f. Flexible raceway runs.

3.04 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.
- D. Bonding for Metal Enclosed Panelboards: Provide insulated grounding bushings and #4 AWG jumper on conduit that does not terminate in panelboard enclosure bottom plate.
- E. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- F. Ufer Ground (Concrete-Encased Grounding Electrode): Install according to NFPA 70, using a minimum of 25' of bare copper conductor not smaller than No. 3/0 in concrete footing.
1. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
- E. Grounding system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.
- G. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 Insert value ohms.

- H. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect/Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION

**SECTION 26 24 16
PANELBOARDS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes load centers and panelboards, overcurrent protective devices and associated auxiliary equipment rated 600V and less for the following types:
 - 1. Lighting and appliance branch-circuit panelboards.
 - 2. Distribution panelboards.
- B. Related Sections include the following:
 - 1. Division 26 Section "General Electrical Requirements."
 - 2. Division 26 Section "Basic Electrical Materials and Methods."
 - 3. Division 26 Section "Grounding and Bonding."
 - 4. Division 26 Section "Surge Protective Devices (SPDs)."

1.03 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Panel designation (same as on drawings).
 - c. Bus configuration, current, and voltage ratings.
 - d. Short-circuit current rating of panelboards and overcurrent protective devices.
 - e. [UL listing for series rating of installed devices.]
 - f. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices, and auxiliary components.
 - g. SPD devices when integrated into equipment.
 - h. Accessories (ground bar, contactor, door lock, etc.)
 - i. Mounting (flush or surface).
 - 2. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
- C. Maintenance Data: For panelboards and components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Contract Closeout," include the following:
 - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.04 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.05 EXTRA MATERIALS

- A. Keys: Four spares of each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
 - a. Eaton Corp.; Cutler-Hammer Products.
 - b. GE/ABB.
 - c. Siemens Energy & Automation, Inc.
 - d. Square D Co.

2.02 FABRICATION AND FEATURES

- A. Enclosures: Surface mounted cabinets. NEMA PB 1, Type 1, to meet environmental conditions at installed location.
- B. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
- C. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
- D. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.
- E. Bus: Tin-plated aluminum.
- F. Main and Neutral Lugs: Mechanical type suitable for use with conductor material.
- G. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
- H. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.
- I. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.
- J. Delete paragraph below if not required. Panel skirt intended for cosmetic purposes to hide conduits, do not use panel skirt as wireway.
- K. Select lug option, maintain similar lug style accepted above.
- L. Feed-through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

2.03 PANELBOARD SHORT-CIRCUIT RATING

- A. UL label indicating series-connected rating with integral or remote upstream devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating.

2.04 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Select one of the options in the paragraph below. Bolt-on breakers are most common. Plug-in breakers are more common in residential load centers.
- B. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- C. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.
- D. Load center construction shall not be acceptable.

2.05 DISTRIBUTION PANELBOARDS

- A. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; keyed alike.
- B. Branch overcurrent protective devices shall be one of the following:
 - 1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
 3. Fused switches.
- C. Lighting and appliance branch-circuit panelboard construction shall not be acceptable.

2.06 SURGE PROTECTIVE DEVICE (SPD)

- A. Panelboard configured to physically accommodate integration of a SPD.
- B. Panelboard phase, neutral, and ground busses configured to accommodate an integral SPD with leads for each mode no longer than 12.]
- C. Retain paragraph and subparagraphs below if project includes fused coordination panelboards. Fused coordination panelboards are typically utilized to provide code required coordination on life safety systems.

2.07 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. Electronic Trip Unit Circuit Breakers for breaker frame sizes 800 A and larger: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 3. GFCI Circuit Breakers: Single- and two-pole configurations with compliance to NEC code sections 210.8 and 230.95 for trip sensitivity.
- B. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.
 1. Lugs: Mechanical style, suitable for number, size, trip ratings, and material of conductors.
 2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.]
 4. Shunt Trip: 120V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.]
- C. Retain paragraph below for fusible distribution panelboards.

2.08 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Mounting Heights:
 1. General: Top of trim 74 inches above finished floor, unless otherwise indicated.
- C. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- D. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- E. Install filler plates in unused spaces.

- F. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

3.02 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods"
- B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.03 CONNECTIONS

- A. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.
- B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

3.04 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:
 - 1. Measure as directed during period of normal system loading.
 - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data-processing, computing, transmitting, and receiving equipment.
 - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
 - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.05 ADJUSTING

- A. Set field-adjustable switches and circuit-breaker trip ranges.

3.06 CLEANING

- A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION

**SECTION 26 27 26
WIRING DEVICES**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes receptacles, connectors, switches, and finish plates.

1.03 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. DL: Damp location as defined in NFPA 70, Article 100.
- C. WP: Weatherproof for wet locations as defined in NFPA 70, Article 100.

1.04 SUBMITTALS

- A. Product Data: For each product specified.

1.05 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- B. Comply with NEMA WD 1.
- C. Comply with NFPA 70.

1.06 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Wiring Devices
 - a. Bryant Electric, Inc.
 - b. Cooper Wiring Devices.
 - c. Hubbell, Inc.; Wiring Devices Div.
 - d. Leviton Manufacturing Co., Inc.
 - e. Pass & Seymour/Legrand; Wiring Devices Div.

2.02 RECEPTACLES

- A. Description: Impact-resistant nylon face with finger groove, thermoplastic back body, and one-piece triple-wipe power contacts. Side and back wired, back wire terminals use screw pressure plates.
- B. Duplex Straight-Blade Receptacles: Specification grade; 20 ampere, 125 volt rated.
 - 1. Equal to: Pass & Seymour #5362.
- C. Simplex Straight-Blade Receptacles: Specification grade; 20 ampere, 125 volt rated.
 - 1. Equal to: Pass & Seymour #5351.
- D. GFCI Receptacles: Design units for installation in a 2-3/4-inch deep outlet box without an adapter.
 - 1. Equal to: Pass & Seymour #2095.

2.03 CORD AND PLUG SETS

- A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with type SOW-A jacket. Green-insulated grounding conductor, and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.04 SWITCHES

- A. Snap Switches: Specification grade; 20 ampere, 120/277 volt rated; side and back wired; quiet type.
 1. Poles: Provide switches in single-pole, double-pole, three-way, and four-way configurations as indicated on the drawings.

2.05 WALL PLATES

- A. Single and combination types match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Select one of five subparagraphs below. Coordinate with Division 9 Section "Painting."
 3. Material for Finished Spaces: 0.04-inch thick, Type 302, satin-finished stainless steel.
 - a. Ceiling mounted wall plates to match ceiling color.
 4. Material for Unfinished Spaces: Galvanized steel.
 5. Weatherproof while-in-use plates in wet locations (WP): Self-closing white non-metallic flat flush cover integral to one-piece non-metallic backbox for full recess mounting in building exterior, the integrity of which is not affected when the attachment plug cap is inserted. Equal to Arlington Industries Low Profile In-Box, select box and trim types to coordinate with building materials at installed location.

2.06 FINISHES

- A. Color:
 1. Gray, unless otherwise indicated for normal circuits.
 - a. Ceiling mounted devices to match ceiling color.

2.07 CIRCUIT LABELS FOR RECEPTACLES

- A. Brother PC clear adhesive with Arial #14 black lettering for normal circuits.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install devices and assemblies plumb and secure.
- B. Install wall plates when painting is complete.
- C. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates.
- D. Protect devices and assemblies during painting.
- E. Provide a GFCI receptacle for each device indicated on the drawings. Do not connect GFCI receptacles to protect downstream devices.

3.02 IDENTIFICATION

- A. Comply with Division 26 Section "Basic Electrical Materials and Methods."
 1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.
 2. Receptacles: Identify serving panelboard and circuit number on faceplate of all receptacles.
 3. Conductors Serving Receptacles: Identify serving panelboard and circuit number. Use durable wire markers or tags within outlet boxes.

3.03 CONNECTIONS

- A. Connect wiring device grounding terminal to outlet box with bonding jumper.
- B. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.

- C. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values.

3.04 FIELD QUALITY CONTROL

- A. Test wiring devices for proper polarity and ground continuity.
- B. Test GFCI operation with fault simulations according to manufacturer's written instructions.
- C. Replace damaged or defective components.

3.05 CLEANING

- A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION

**SECTION 26 28 16
DISCONNECT SWITCHES AND CIRCUIT BREAKERS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes enclosed individually mounted switches and circuit breakers used for the following:
 - 1. Service disconnect switches.
 - 2. Feeder and equipment disconnect switches.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 26 Section "Wiring Devices" for attachment plugs and receptacles, and snap switches used for disconnect switches.

1.03 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes. Include data for overcurrent protective device coordination:
 - 1. Descriptive data and time-current curves.
 - 2. Let-through current curves for overcurrent protective devices with current-limiting characteristics.
 - 3. Coordination charts and tables and related data.
- C. Shop Drawings: For each switch, circuit breaker, and related equipment.
 - 1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices and accessories, equipment features, and ratings. Include the following:
 - a. Enclosure types and details.
 - b. Bus materials, configuration, current, and voltage ratings.
 - c. Short-circuit current rating of switches and circuit breakers.
 - d. Descriptive documentation of options or accessories such as auxiliary devices, controls, interlocks, etc.
 - e. UL listing for series rating of installed devices.
 - f. Features, characteristics, ratings, and factory settings of overcurrent protective devices and auxiliary components.
 - g. Fuse product data for fusible devices.
 - 2. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
- D. Field test results indicating and interpreting test results.
- E. Maintenance Data: For switches and circuit breakers to include in operation and maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Contract Closeout," include the following:
 - 1. Routine maintenance requirements for switches, circuit breakers, and all installed components.
 - 2. Manufacturer's written instructions for testing and adjusting switches and overcurrent protective devices.
 - 3. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain switches and circuit breakers from one source and by a single manufacturer.
- B. Comply with NFPA 70 for components and installation.
- C. Listing and Labeling: Provide switches and circuit breakers specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide switches and circuit breakers by one of the following:
 - 1. Enclosed Disconnect Switches, Enclosed Molded Case Switches, and Enclosed Molded Case Circuit Breakers:
 - a. GE/ABB.
 - b. Siemens Energy & Automation, Inc.
 - c. Square D Co.
 - d. Eaton Corp.; Cutler-Hammer Products.

2.02 ENCLOSURES

- A. Enclosure: NEMA KS 1, Type 1, unless otherwise specified or required to meet environmental conditions of installed location.
 - 1. Outdoor Locations: Type 3R.

2.03 ENCLOSED DISCONNECT SWITCHES

- A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD Heavy Duty, with lockable handle.
- B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD Heavy Duty, clips to accommodate specified fuses, enclosure consistent with environment where located, handle lockable with 2 padlocks, and interlocked with cover in CLOSED position.
- C. Features and Accessories:
 - 1. Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.

2.04 FUSES

- A. Fuses shall be dual element time delay Bussman Low Peak Class RK-1 or approved equivalent.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. All disconnect switches shall be fused type unless otherwise indicated on the drawings.
- B. Install switches and circuit breakers in locations as indicated, according to manufacturer's written instructions.
- C. Install switches and circuit breakers level and plumb.
- D. Install wiring between switches and circuit breakers, control, accessories, and indication devices.
- E. Connect switches, circuit breakers, and components to wiring system and to ground as indicated and instructed by manufacturer.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

3.02 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods."

DISCONNECT SWITCHES AND CIRCUIT

- B. Switch and Circuit-Breaker Nameplates: Label each switch and circuit breaker with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.03 FIELD QUALITY CONTROL

- A. Testing: After installing switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.5 for disconnect switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
- B. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.04 ADJUSTING

- A. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

3.05 CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

END OF SECTION

**SECTION 26 43 13
SURGE PROTECTIVE DEVICES (SPD'S)**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes permanently installed, factory or field mounted, 1kV or less surge protective device (SPD) equipment.

1.03 DEFINITIONS

- A. Type 1 SPD: Referred to as secondary surge arrestors prior to the 2008 NEC. These devices are designed for installation on the line side of the service entrance disconnect and must have integrated overcurrent protection.
- B. Type 2 SPD: Referred to as hardwired transient voltage surge suppressors (TVSS) prior to the 2008 NEC. These devices are designed for installation at any location on the load side of the service disconnect. External overcurrent protection is allowed.
- C. Type 4 SPD: SPD components intended to be part of a complete SPD.
- D. VPR: Voltage protection rating.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating weights, electrical characteristics, furnished specialties, and accessories.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For SPD devices to include in emergency, operation, and maintenance manuals.

1.06 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.
- B. Comply with IEEE C62.41.2 and test devices according to IEEE C62.45.
- C. Comply with UL 1283 2nd Edition.
- D. Comply with UL 1449 3rd Edition.
- E. Comply with NFPA 70, 2008 Edition.

1.07 PROJECT CONDITIONS

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed electrical service interruptions.
 - 2. Do not proceed with interruption of electrical service without Owner's written permission.
- B. Service Conditions: Rate SPDs for continuous operation under the following conditions unless otherwise indicated:
 - 1. Maximum Continuous Operating Voltage: Not less than 125 percent of nominal system operating voltage.
 - 2. Operating Temperature: 30 to 120 deg F.
 - 3. Humidity: 0 to 85 percent, noncondensing.
 - 4. Altitude: Less than 20,000 feet above sea level.

1.08 COORDINATION

- A. Coordinate location of field-mounted SPDs to allow adequate clearances for maintenance.

1.09 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Designed for integration into selected switchgear/switchboard/panelboard manufacturer's equipment.
 - 1. Panel arrangement allowing maximum lead length to phase, neutral, and ground bus connection points of 8".
- B. Subject to compliance with requirements, provide product by one of the following:
 - 1. Advanced Protection Technologies, Inc. (APT).
 - 2. Cutler-Hammer; Eaton Business Unit.
 - 3. GE/ABB Zenith.
 - 4. Innovative Technology; Eaton Business Unit.
 - 5. LEA International.
 - 6. Liebert; Emerson Network Power Business Unit.
 - 7. Siemens.
 - 8. Surgelologic/Square D; Schneider Electric Business Unit.
- C. SPD for Service Entrance Equipment Location (Primary Protection)
 - 1. UL listed to UL 1449 3rd Edition
 - 2. Type 1 (installed downstream of main breaker) or Type 2.
 - 3. 20kA nominal discharge (In).
 - 4. Short-circuit current rating (SCCR) complying with UL 1449, and matching or exceeding the connected equipment short-circuit rating.
 - 5. 7 modes of protection (L-N, L-G, N-G).
 - 6. Peak surge current rating: 200kA per phase.
 - 7. VPR: Not to exceed 700V for 208Y/120V systems, 1200V for 480Y/277V systems.
 - 8. System voltage: match service entrance equipment.
 - 9. EMI/RFI noise rejection filter: Noise attenuation of 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method.
 - 10. LED indicator lights for power and protection status.
 - 11. Audible alarm, with silencing switch, to indicate when protection has failed.
 - 12. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
 - 13. Six-digit transient-event counter set to totalize transient surges.
- D. SPDs for Non-Service Entrance Equipment Locations (Secondary Protection)
 - 1. UL listed to UL 1449 3rd Edition
 - 2. Type 1 (installed downstream of main breaker) or Type 2.
 - 3. 20kA nominal discharge (In).
 - 4. Short-circuit current rating (SCCR) complying with UL 1449, and matching or exceeding the connected equipment short-circuit rating and.
 - 5. 7 modes of protection (L-N, L-G, N-G).
 - 6. Peak surge current rating: 100kA per phase.
 - 7. VPR: Not to exceed 700V for 208Y/120V systems, 1200V for 480Y/277V systems.
 - 8. System voltage: match connected equipment.
 - 9. EMI/RFI noise rejection filter: Noise attenuation of 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method.
 - 10. LED indicator lights for power and protection status.
 - 11. Audible alarm, with silencing switch, to indicate when protection has failed.

12. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
13. [Six-digit transient-event counter set to totalize transient surges.]

2.02 ENCLOSURES

- A. Indoor Enclosures: NEMA 250 [Type 1] [Type 12].

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install SPD devices at service entrance on load side of main disconnect, with ground lead bonded to service entrance ground.
- B. Install SPD devices for panelboards and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
 1. Comply with manufacturer's written recommendation for conductor and circuit-breaker size for connecting SPD devices to distribution system.
- C. Tests and Inspections:
 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, "Surge Arresters, Low-Voltage Surge Protection Devices" Section. Certify compliance with test parameters.
 2. After installing SPD devices but before electrical circuitry has been energized, test for compliance with requirements.
 3. Complete startup checks according to manufacturer's written instructions.
 4. Coordinate with commissioning agent. Supply requested product documentation.
- D. SPD device will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.02 STARTUP SERVICE

- A. Do not energize or connect service entrance equipment to their sources until SPDs are installed and connected.
- B. Do not perform insulation resistance tests of the distribution wiring equipment with the SPD installed. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.

3.03 DEMONSTRATION

- A. Train Owner's maintenance personnel to maintain SPD devices.

END OF SECTION

**SECTION 26 51 00
LIGHTING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. See 26 05 00 "Basic Electrical Materials and Methods" for electrical materials and methods.
- C. See 26 27 26 "Wiring Devices" for manual light switches and device finishes.
- D. See 26 52 00 "Lighting Control" for lighting control devices.

1.02 SUMMARY

- A. This Section includes luminaires, lamps, ballasts, drivers, emergency lighting units, emergency battery packs, emergency lighting inverters, exit signs, luminaire supports, poles, and accessories.

1.03 SUBMITTALS

- A. Product Data: For each luminaire type arranged in order of type designation. Include data on features, accessories, and the following:
 - 1. Physical description including dimensions, construction, and finish.
 - 2. Lamp and ballast data indicating rated life, output, CCT, CRI, and energy use.
 - 3. LED and driver data indicating rated life, output (delivered), CCT, CRI, and energy use.
 - 4. Photometric report including IES files.
 - 5. Emergency lighting units, including batteries and chargers.
- B. Product Data: For each pole type arranged in order of type designation. Include data on features, accessories, and the following:
 - 1. Include data on construction details, profiles, EPA, cable entrances, materials, finishes, dimensions, weight, rated design load, and ultimate strength of individual components.
 - 2. Anchor bolts.
- C. Product Data: For each type and rating of emergency lighting inverter.
 - 1. Include features, performance, electrical ratings, operating characteristics, furnished options, and accessories.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, ventilation requirements, method of field assembly, and components.
 - 3. Include system one-line diagram, internal and interconnecting wiring; and diagrams for power, signal, and control wiring.
- D. Shop Drawings: For non-standard or custom luminaires. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
- E. Maintenance Data: For luminaires to include in maintenance manuals specified in Division 1.
- F. Samples for Initial Selection: For each luminaire requested by architect or engineer.
 - 1. Include Samples of luminaires and accessories involving color and finish selection.

1.04 QUALITY ASSURANCE

- A. Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- B. Comply with NFPA 70 and 101.
- C. Emergency lighting units, inverters, exit signs, and batteries: Comply with UL 924.
- D. Exterior Lighting: Comply with UL 1598 and listed for wet location.

- E. Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

1.05 COORDINATION

- A. Luminaires, Mounting Hardware, and Trim: Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- B. Coordinate layout and installation of devices with other construction including structural members, underground utilities, above-grade utilities, site design, and building elements.
- C. Coordinate layout and installation of emergency lighting inverters with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels. Label with engraved nameplates.

1.06 WARRANTY

- A. Include labor allowance required for replacement on-site at no extra cost to the Owner within 1-year construction warranty. Transfer remainder of the manufacturer's warranty including ballast manufacturer's labor stipend to owner after 1-year construction warranty.
- B. Ballast and Driver Warranty: 5-year replacement warranty.
- C. Emergency Battery Warranty: 3-year pro-rated warranty.
- D. LED System Warranty: 5-year replacement warranty.
- E. Special Warranty: Manufacturer agrees to repair or replace components of pole(s) and luminaires that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within a 5-year warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs from special warranty period.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Luminaires and Poles: Subject to compliance with requirements, provide one of the products indicated for each designation in the Luminaire and Site Luminaire Schedules on the drawings.
- B. Emergency Lighting Inverters: Subject to compliance with requirements, provide one of the products indicated for each designation on the drawings.

2.02 LUMINAIRE AND LUMINAIRE COMPONENTS, GENERAL

- A. Metal Parts: Free from burrs, sharp corners, and edges.
- B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit re-lamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during re-lamping and when secured in operating position.
- D. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated.
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
 - 4. Laminated Silver Metallized Film: 90 percent.
- E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or annealed crystal glass, unless otherwise indicated.
 - 1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
 - 2. Lens Thickness: 0.125 inch (3 mm) minimum, unless greater thickness is indicated.
- F. Finishes: Manufacturer's standard, unless otherwise indicated.

1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
2. Metallic Finish: Corrosion resistant.

2.03 LED LIGHT SOURCES

- A. LED Light Source Requirements:
 1. Rated life (L70): Minimum 50,000 hours as defined by IES LM80 and TM21.
 2. Color Rendering Index (CRI): 80 CRI minimum.
 3. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.
- B. LED Driver Requirements:
 1. 0-10V Dimming
 2. Total Harmonic Distortion Rating: Less than 20 percent.
 3. Ambient temperature rating: -40° to +55° C
 4. Power Factor (100% output): >0.95
 5. Flickering: LED drivers shall conform to IEEE P1789 standards. Alternatively, manufacturers must demonstrate conformance with product literature and testing which demonstrates this performance. Submit % flicker in 1% increments for full range of dimming starting at 500 mA for full output reading. Systems that do not meet IEEE P1789 will not be considered.

2.04 EXIT SIGNS

- A. General Requirements:
 1. Comply with NFPA 101, UL924, and local AHJ for sign colors, visibility, luminance, and lettering size.
 2. Sign Colors and Lettering Size: Comply with authorities having jurisdiction.
- B. Internally Lighted Signs (AC type or Battery type):
 1. Light Source: Light-emitting diodes with 70,000 hour minimum rated lamp life.
 2. Battery type - Integral automatic charger in a self-contained power pack.

2.05 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with Division 26 Section "Basic Electrical Materials and Methods," for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Twin-Stem Hangers: Two, 1/2-inch (12-mm) steel tubes with single canopy arranged to mount a single luminaire. Finish same as luminaire.
- C. Rod Hangers: 3/8-inch minimum diameter, cadmium-plated, threaded steel rod.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with NECA 1.
- B. Luminaires: Set level, plumb, and square with ceiling and walls. Secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each luminaire.
- C. Align luminaires for optimum directional alignment of light distribution.
- D. Remote Mounting of Ballasts or Drivers: Distance between the ballast/driver and fixture shall not exceed that recommended by manufacturer. Verify wire size and maximum distance between ballast/driver and luminaire with manufacturer.
- E. Support for luminaires in or on Grid-Type Suspended Ceilings:
 1. Utilize grid for support where ceiling system is appropriate rated. Contractor to coordinate luminaire weights with ceiling contractor.
 2. At all other locations install a minimum of two ceiling support system rods or wires for each luminaire. Locate not more than 6 inches (150 mm) from luminaire corners.
 3. Support Clips: Fasten to luminaires and to ceiling grid members at or near each luminaire corner.

4. Luminaires of Sizes Less Than Ceiling Grid: Arrange as indicated on reflected ceiling plans or center in acoustical panel, and support luminaires independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
- F. Burn-In: Continuously illuminate (burn-in) lamps per manufacturer's recommendations. Continuously illuminate LED light sources for 100 hours prior to substantial completion.

3.02 CONNECTIONS

- A. Ground equipment: Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.
- B. Ground Metal Poles and Support Structures: Comply with requirements in Section 26 06 00 "Grounding and Bonding."
 1. Install grounding electrode for each pole unless otherwise indicated.
 2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
- C. Ground Nonmetallic Poles and Support Structures: Comply with requirements in Section 26 06 00 "Grounding and Bonding."
 1. Install grounding electrode for each pole.
 2. Install grounding conductor and conductor protector.
 3. Ground metallic components of pole accessories and foundation.

3.03 FIELD QUALITY CONTROL

- A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.
- B. Provide instruments to make and record test results.
- C. Test as follows:
 1. Verify normal operation of each luminaire after installation.
 2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.
 3. Verify normal transfer to battery source and retransfer to normal.
- D. Malfunctioning Luminaires and Components: Replace or repair, then retest. Repeat procedure until units operate properly.
- E. Perform a load-duration test for inverters at rated voltage and rated output current to verify the correct functional operation of the unit under full-load stable operating conditions for the minimum time limits required by UL 924. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

3.04 CLEANING AND ADJUSTING

- A. Clean luminaires internally and externally after installation. Use methods and materials recommended by manufacturer.
- B. Perform startup service for inverters. Engage a factory-authorized service representative if recommended by manufacturer or required for warranty. Train Owner's maintenance personnel to adjust, operate, and maintain emergency lighting inverters, and to use and reprogram microprocessor-based control, monitoring, and display functions.

END OF SECTION

**SECTION 26 52 00
LIGHTING CONTROL**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. See 26 05 00 "Basic Electrical Materials and Methods" for electrical materials and methods.
- C. See 26 27 26 "Wiring Devices" for manual light switches and device finishes.
- D. See 26 51 00 "Lighting" for luminaires, lamps, ballasts, drivers, emergency lighting units, emergency battery packs, emergency lighting inverters, exit signs, luminaire supports, and poles.

1.02 SUMMARY

- A. This Section includes lighting control panels, lighting control, devices and accessories.

1.03 SUBMITTALS

- A. Product Data: For each lighting control panel and device.
 - 1. Include features, performance, electrical ratings, operating characteristics, furnished options, and accessories.
 - 2. Dimensions of devices.
 - 3. Lighting control one line diagrams.
- B. Occupancy Sensor Layout Drawings: Scaled floor plans with lighting control manufacturer's layout of occupancy sensors. Sensor layout and quantity shall completely cover each area indicated, show coverage patterns for each sensor.
- C. Maintenance Data: For lighting control devices to include in maintenance manuals specified in Division 1.

1.04 QUALITY ASSURANCE

- A. Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- B. Comply with NFPA 70, NFPA 101, and UL924.

1.05 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace devices that fail in materials or workmanship within two years from date of substantial completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Lighting Control Equipment: Subject to compliance with requirements, provide lighting control equipment from one of the following manufacturers, all equipment should be from one consistent manufacturer:
 - 1. Acuity Controls (Sensor Switch / nLight)
 - 2. Hubbell Control Solutions
 - 3. WattStopper

2.02 OCCUPANCY SENSORS

- A. Low Voltage Ceiling Sensors:
 - 1. Passive Dual Technology: Infrared and microphonic sensors integrated into one housing.
 - 2. Performance and Coverage: Passive Infrared (PIR) shall engage sensor and PIR or microphonic shall detect continued occupancy. 360 degree field of view. Minimum coverage of 20 foot radius at 9' mounting height, with sensor centered in coverage area. Provide accessory power packs and connect to power sensor.
 - 3. Mounting: Sensor shall flush horizontal mount tight to ceiling surface. Sensors that protrude from ceiling or utilize drop-down mounting brackets shall not be acceptable.

4. Load Rating: Provide accessory power packs with relay; connect to switch load. Relay in power packs shall be rated 20A for ballast loads.
 5. Sensor Switch CM PDT 10 or approved equivalent. Provide associated power packs with sensor power supply and load switching relay.
 6. Finish: White unless noted otherwise.
- B. Line Voltage Single Pole Wall Box Sensors:
1. Passive Dual Technology: Infrared and microphonic sensors integrated into one housing.
 2. Performance and Coverage: Passive Infrared (PIR) shall engage sensor and PIR or microphonic shall detect continued occupancy. 180 degree field of view. Capable of sensing small motion up to 20' at 4' mounting height.
 3. On Modes
 - a. Automatic on - Sensor turns load on based on sensing occupancy of monitored area.
 - b. Manual on - sensor requires pressing the pushbutton on sensor face to turn load on.
 - c. Reduced turn on - sensor automatically turns load on with detection of large motion, automatically switches minor motion detection on after load is initially powered on.
 4. Switch Off Modes
 - a. Predictive off mode - occupant can turn lights off manually or lights automatically turn off after time out period. If lights are manually turned off, the sensor shall revert to automatic on after sensor sees no motion during time out period.
 - b. Permanent off mode - pressing the switch turns the lights off, lights will not turn on until switch is pressed again.
 - c. Switch disable - prevents user from manually turning lights off.
 5. Mounting: Sensor shall mount in wall box with decorator style faceplate.
 6. Load Rating: Switch integral in sensor housing
 - a. Rated for 800 watt ballast or incandescent load at 120V
 - b. Rated for 1200 watt ballast load at 277V
 - c. Rated for ¼ horsepower motor load at 120V
 7. Sensor Switch WSX PDT or approved equivalent.
 8. Finish: Coordinate finish of devices with section 26 27 26 "Wiring Devices".

2.03 PHOTOCELLS

- A. Low Voltage Ceiling Photocell:
1. Sensing daylight and electrical lighting levels, the sensor adjusts the indoor electrical lighting levels. As daylight increases, the lights are dimmed via 0-10v output to luminaires.
 2. Set-point and trim levels shall be field configurable.
 3. Mounting: Sensor shall flush horizontal mount tight to ceiling surface. Sensors that protrude from ceiling or utilize drop-down mounting brackets shall not be acceptable.
 4. Load Rating: Provide accessory power packs with relay; connect to switch load. Relay in power packs shall be rated 20A for ballast loads.
 5. Sensor Switch CM PC ADC or approved equivalent. Provide associated power packs with sensor power supply and load switching relay.
 6. Finish: White unless noted otherwise.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with NECA 1.
- B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- C. Occupancy Sensors: Provide required power packs with sensor power supply and load switching relay. Connect power packs per manufacturer's instructions. Adjust settings of occupancy sensors, tailor to configuration and use of room served.
- D. Lighting Control System Cabling:
1. 0-10v Dimming Devices: Provide #14 control wiring to luminaires controlled by device.

2. Provide J-Hook style supports for low voltage cabling above accessible ceilings. Where exposed structure occurs run low voltage cabling concealed in conduit.
 3. Provide plenum rated pre-terminated low voltage cabling as manufactured by lighting control manufacturer. Provide lengths necessary for installation, cables shall be as short as practical with a minimum 10' cable length.
- E. After Substantial Completion, but not more than 60 days after Final Acceptance, re-adjust occupancy sensors for Owner's actual pattern of use.

3.02 FIELD QUALITY CONTROL

- A. Test to verify normal operation of each lighting control device.
- B. Repair or replace all malfunctioning lighting controls then re-test devices. Repeat procedure until all devices operate properly.
- C. Prepare test and inspection reports.

3.03 PROGRAMMING AND DEMONSTRATION

- A. Provide all startup and programming required for operation of relay panel systems. Coordinate programming requirements with the Owner and Electrical Engineer 30 days prior to commissioning to allow for an adjustable program to be installed at the time of system commissioning. The system programmer shall correspond with the Electrical Engineer two weeks prior to discuss programming requirements.
- B. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
- C. For daylighting controls, adjust set points and dead band controls to suit Owner's operations. Set low end trim to 10% light output so luminaires never turn off completely due to presence of daylight.
- D. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.
- E. When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

END OF SECTION

**SECTION 26 81 00
FIRE ALARM**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes detectors and devices.

1.03 DEFINITIONS

- A. LED: Light-emitting diode.
- B. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 - 1. Drawings: Prepare project specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed media.
 - 2. Wiring Diagrams: Detail wiring and differentiate between manufacturer-installed and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified.
- C. Submissions to Authorities Having Jurisdiction: Submit to authorities having jurisdiction. Include copies of annotated Contract Drawings as needed to depict component locations to facilitate review. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Engineer for review.
- D. Certificate of Completion: Comply with NFPA 72.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is an authorized representative of the FACP manufacturer for both installation and maintenance of units required for this Project.
- B. Manufacturer Qualifications: A firm experienced in manufacturing systems similar to those indicated for this Project and with a record of successful in-service performance.
- C. Source Limitations: Obtain fire alarm system components through one source from a single manufacturer.
- D. Compliance with Local Requirements: Comply with applicable building code, local ordinances and regulations, and requirements of authorities having jurisdiction.
- E. Comply with NFPA 72.

1.10 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 3. Smoke, Fire, and Flame Detectors: Quantity equal to 10 percent of amount of each type installed, but not less than 1 unit of each type.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cerberus Pyrotronics.
 - 2. Notifier; Div. of Pittway Corp.
 - 3. Simplex Time Recorder Co.
 - 4. Edwards Systems Technology; Unit of General Signal.
 - 5. Fire Lite Alarms, Inc.

6. Fire Control Instruments
7. Silent Knight

2.02 OTHER DETECTORS

- A. Duct Smoke Detector: Photoelectric type.
 1. Sampling Tube: Design and dimensions as recommended by the manufacturer for the specific duct size, air velocity, and installation conditions where applied.
 2. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.
 3. Remote alarm LED Indicator: Provide for each duct smoke detector which is not readily visible such as above suspended ceilings. Furnish a label to indicate whether the detector is in the supply or return ductwork.

2.03 WIRE

- A. NFPA 70, Types FPL, FPLR, or FPLP, as recommended by manufacturer.
- B. Solid wire shall be used for all signal circuits, sized as recommended by the manufacturer.

PART 3 - EXECUTION

3.01 WIRING INSTALLATION

- A. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by the manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- B. Cable Taps: Use numbered terminal strips in junction, pull and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- C. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.
- D. Install in conduit.

3.02 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals according to Division 26 Section "Basic Electrical Materials and Methods."
- B. Install instructions frame in a location visible from the FACP.
- C. Paint power-supply breaker red and lock. Label "FIRE ALARM."

3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and connections and to supervise pretesting, testing, and adjustment of the system. Report results in writing.
- B. Final Test Notice: Provide a minimum of 10 days' notice in writing when the system is ready for final acceptance testing.
- C. Minimum System Tests: Test the system according to procedures outlined in NFPA 72. Minimum required tests are as follows:
 1. Verify the absence of unwanted voltages between circuit conductors and ground.
 2. Test all conductors for short circuits using an insulation-testing device.
 3. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on record drawings.

4. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.
 5. Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
 6. Test each initiating and indicating device for alarm operation and proper response at the control unit. Test smoke detectors with actual products of combustion.
 7. Test the system for all specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones.
 8. Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.
- D. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets Specifications and complies with applicable standards.

3.04 CLEANING AND ADJUSTING

- A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marred finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

3.05 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:
1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, adjusting, and maintaining equipment and schedules. Provide a minimum of 4 hours' training.
 2. Schedule training with Owner with at least seven days' advance notice.

3.06 ON-SITE ASSISTANCE

- A. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, controls, and sensitivities to suit actual occupied conditions. Provide up to two requested visits to Project site for this purpose.

END OF SECTION

DIVISIONS 27 AND 28 – NOT USED

DIVISION 31 – NOT USED

DIVISION 32 – EXTERIOR IMPROVEMENTS

**SECTION 32 17 23
PAVEMENT MARKINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Painted pavement markings.

1.02 REFERENCE STANDARDS

- A. AASHTO MP 24 - Standard Specification for Waterborne White and Yellow Traffic Paints 2015 (Reapproved 2020).

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work of this section with adjoining work.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by affected installers.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate traffic management plan with barricades, cones, and temporary markings.
- C. Product Data: Manufacturer's data sheets on each product to be used.

1.05 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.

1.06 SEQUENCING

- A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of markings.

PART 2 PRODUCTS

2.01 PAINTED PAVEMENT MARKINGS

- A. Painted Pavement Markings: As indicated on drawings.
 - 1. Marking Paint: In accordance with AASHTO MP 24.
 - a. Parking Lots: White.
 - b. Symbols and Text: White.
 - c. Wheelchair Symbols: Provide blue and white.
 - d. Existing Precast Curb Stop: Yellow.
 - 2. Obliterating Paint: Type I, in accordance with AASHTO MP 24.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Identify existing markings for removal.
- B. Verification of Conditions: Verify that pavement is dry and ready for installation.
- C. Notify Architect of unsatisfactory conditions before proceeding.

3.02 PREPARATION

- A. Place barricades, warning signs, and flags as necessary to alert approaching traffic.
- B. Clean surfaces prior to installation.
 - 1. Remove dust, dirt, and other debris.
 - 2. Remove rubber deposits, existing paint markings, and other coatings.
- C. Apply paint stencils by type and color at necessary intervals.

3.03 INSTALLATION

- A. General:
 - 1. Position pavement markings as indicated on drawings.
 - 2. Field location adjustments require approval of Architect.
- B. Painted Pavement Markings:
 - 1. Apply in accordance with manufacturer's instructions.
 - 2. Obliterating Paint: Apply as necessary to cover existing markings completely.
 - 3. Marking Paint: Apply uniformly, with sharp edges.
 - a. Applications: One coat.
 - b. Wet Film Thickness: 0.015 inch, minimum.
 - c. Stencils: Lay flat against pavement, align with striping, remove after application.

3.04 PROTECTION

- A. Prevent approaching traffic from crossing newly applied pavement markings.
- B. Replace damaged or removed markings at no additional cost to Owner.

END OF SECTION

**SECTION 32 31 13
CHAIN LINK FENCES AND GATES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Posts, rails, and frames.
- B. Wire fabric.
- C. Concrete.
- D. Manual gates with related hardware.
- E. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete anchorage for posts.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric 2011a (Reapproved 2022).
- D. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.
- E. ASTM F567 - Standard Practice for Installation of Chain-Link Fence 2014a (Reapproved 2019).
- F. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework 2018 (Reapproved 2022).
- G. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures 2018 (Reapproved 2022).
- H. CLFMI CLF-PM0610 - Product Manual 2017.
- I. CLFMI CLF-SFR0111 - Security Fencing Recommendations 2014.
- J. FS RR-F-191/1D - Fencing, Wire and Post Metal (Chain-Link Fence Fabric) 1990.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.
- C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components. See CLFMI CLF-SFR0111 for planning and design recommendations.

PART 2 PRODUCTS

2.01 COMPONENTS

- A. Line Posts: 1.9 inch diameter.
- B. Corner and Terminal Posts: 2.38 inch diameter.
- C. Gate Frame: 1.66 inch diameter for welded fabrication.
- D. Fabric: 2 inch diamond mesh interwoven wire, 6 gauge, 0.1920 inch thick, top selvage knuckle end closed, bottom selvage twisted tight.
- E. Fabric with Pre-Inserted Slats: 2 inch diamond mesh interwoven wire, 6 gauge, 0.1920 inch thick, top selvage knuckle end closed, bottom selvage twisted tight.
 - 1. Privacy Slats: High-density polyethylene (HDPE), woven into fabric.

- F. Tension Wire: 6 gauge, 0.1920 inch thick steel, single strand.
- G. Tension Band: 3/4 inch thick steel.
- H. Tie Wire: Aluminum alloy steel wire.
- I. Floor Flange Fittings: galvanized.

2.02 MATERIALS

- 1. ASTM A1011/A1011M, Designation SS; hot-rolled steel strip, cold formed to pipe configuration, longitudinally welded construction, minimum yield strength of 50 ksi; zinc coating complying with ASTM F1043 and ASTM F1083.
 - 2. Line Posts: Type I round in accordance with FS RR-F-191/1D.
 - 3. Terminal, Corner, Rail, Brace, and Gate Posts: Type I round in accordance with FS RR-F-191/1D.
 - 4. Comply with CLFMI CLF-PM0610.
- B. Wire Fabric:
 - 1. ASTM A392 zinc coated steel chain link fabric.
 - 2. Comply with CLFMI CLF-PM0610.
 - C. Concrete:
 - 1. Type specified in Section 03 30 00.

2.03 MANUAL GATES AND RELATED HARDWARE

- A. Hardware for Double Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; drop bolt on inactive leaf engaging socket stop set in concrete, active leaf latched to inactive leaf preventing raising of drop bolt, padlock hasp; keepers to hold gate in fully open position.
- B. Hinges: Finished to match fence components.
- C. Latches: Finished to match fence components.

2.04 ACCESSORIES

- A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.
- B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

2.05 FINISHES

- A. Components (Other than Fabric): Galvanized in accordance with ASTM A123/A123M, at 1.7 ounces per square foot.
- B. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.
- C. Accessories: Same finish as framing.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify that areas are clear of obstructions or debris.

3.02 INSTALLATION

- A. Install framework, fabric, accessories and gates in accordance with ASTM F567.
- B. Place fabric on outside of posts and rails.
- C. Set intermediate posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.
- D. Set intermediate, terminal, and gate posts plumb in metal floor flange fittings bolted to the concrete floor to match fencing.
- E. Line Post Footing Depth Below Finish Grade: ASTM F567.
- F. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567.
- G. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.

- H. Provide top rail through line post tops and splice with 6 inch long rail sleeves.
- I. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.
- J. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- K. Install bottom tension wire stretched taut between terminal posts.
- L. Do not attach the hinged side of gate to building wall; provide gate posts.
- M. Install hardware and gate with fabric to match fence.

3.03 CLEANING

- A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.
- B. Clean fence with mild household detergent and clean water rinse well.

END OF SECTION



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architecture
landscape architecture
interior design
construction management



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End of Specifications

Cubby's Renovation - Fremont

450 South Broad Street
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Project Manual Combined Contract

BCDM Project Number: 5459-00
January 27, 2023