Request for Proposal
17MCO529 LIBRARY RENOVATION CONSTRUCTION MANAGER AT RISK
Date Required: Thursday January 18, 2018
Time Required: 10:00am Local Time

INTRODUCTION:
Midland County, hereafter called County, invites sealed proposals from interested qualified Vendors, hereinafter called Vendors, to provide construction manager at risk for the downtown library renovation. The following pages provide general information about the requirements and specifications for the package.

This request for proposal ("RFP") is part of a competitive procurement process which provides qualified vendors with a fair opportunity for their commodities and services to be considered, and to provide information concerning their expertise and experience in providing similar services to other customers. The RFP process provides a competitive negotiation platform, wherein price or cost is not the sole determinative factor. This process, designed to best serve the interests of the County, allows the County the flexibility to negotiate with interested, qualified Vendors (following designation by the Commissioners Court, one at a time) to arrive at a mutually agreeable relationship.

SITE SURVEY:
A Mandatory Site Survey will be held at the Midland County Downtown Library. We will meet at the entrance at 9:00am on Thursday January 4, 2018 and will promptly begin the survey of the site.

Midland County Downtown Library
301 W. Missouri Ave
Midland, TX 79701

QUESTIONS:
If further information is required, please contact the Midland County Purchasing Department. All requests for information must be submitted in writing. Responses to all questions received will be sent to each Firm known to have copies of the Request for Qualifications. Requests for information may be faxed to 432-688-4914 or e-mailed to pur103@co.midland.tx.us. All questions should be submitted on or before 5:00pm on Tuesday January 9, 2018. Questions received after said date and time will not receive a response. Answers and clarifications which are considered to materially change the solicitation will be issued as written addenda to the original RFP and will be posted to the Midland County website at www.co.midland.tx.us. Solution providers are responsible for ensuring all answers to questions are reviewed prior to bid submittal and that all issued added are properly acknowledged with their submitted proposal response. Midland County will not be responsible for any verbal exchange between the vendor and an employee of Midland County.
COPIES AND RECEIPT:
Please submit one (1) original, three (3) copies, and an electronic copy on USB drive of the proposal. **An executed copy of the Proposal Affidavit SIGNED AND NOTARIZED (Page 8) must be included in each submission.** Please note that if no Proposal Affidavit is included, the response will be rejected. Midland County is exempt from all state and federal taxes. Tax exempt certificates are available upon request. Midland County is exempt from all state and federal taxes. Tax exempt certificates are available upon request.

All statements should be submitted in a sealed envelope, marked on the outside,

17MCOS29 CMAR LIBRARY RENOVATION

________________________

Company Name

Responses must be received by **10:00am Local Time on Friday January 12, 2018.** Late proposals will be rejected and returned without being opened. The clock in the Purchasing Agent’s office is the official time piece for this submission. If interested, Vendors may use mail or express systems to deliver their proposal to the Purchasing Department; they should insure that they are tendered to the carrier in plenty of time to reach the Purchasing Department by the time and date required. Facsimile transmitted proposals shall not be accepted.

SUBMISSION LOCATION: All bids which are mailed, shipped, delivered, etc. should be addressed as follows:

Midland County Purchasing Department  
Midland County Courthouse  
Attention: Kristy Engeldahl, Purchasing Agent  
500 N. Loraine Street, Suite 1101  
Midland, Texas  79701

DOCUMENTATION SUBMISSION:  
The respondent must submit all required documentation. Failure to provide requested information may result in rejection of the statement.

ALTERATION OF PROPOSAL:  
A proposal may be altered, modified or amended by a Vendor at any time, prior to the time and date set forth above as the submission deadline. Alterations, modifications or amendments to a proposal must be made in the offices of the Purchasing Department. Any interlineations, alteration or erasure made on a proposal before the submission deadline must be initialed by the signer of the proposal, guaranteeing authenticity. A proposal may not be altered, modified or amended after the submission deadline.

WITHDRAWAL:  
A proposal may not be withdrawn or canceled by the respondent for a period of sixty (60) days following the date designated for the receipt of proposals, and respondent so agrees upon submittal of their proposal.
CONFLICT OF INTEREST:
No public official shall have interest in this contract, in accordance with Vernon's Texas Codes annotated Local Government Code Title 5, Subtitle C, Chapter 171. Firm is required to sign affidavit form included in proposal documents.

SILENCE OF SPECIFICATIONS:
The apparent silence of these specifications as to any detail of the apparent omission from it of a detailed description concerning any point, shall be regarded as meaning that only the best commercial practices are to prevail. All interpretations of these specifications shall be made on the basis of this statement.

CONFIDENTIALITY:
Contents of the proposals will remain confidential until the contract is awarded. At that time the contents will be made public under the Texas Public Information Act; except for any portion of a proposal which has been clearly marked as a trade secret or proprietary data (the entire proposal may not be so marked). Proposals will be opened, and the name of the firm submitting the proposal read aloud, acknowledged, at 10:05am on Thursday January 18, 2018, in the Purchasing Department Conference Room located in the Midland County Courthouse, Suite 1101. All respondents or other interested parties are invited to attend the opening.

Vendors are hereby notified that the Owner strictly adheres to all statutes, court decisions, and opinions of the Texas Attorney General with respect to disclosure of public information.

ADDITIONAL INFORMATION AND DEMONSTRATION, NEGOTIATIONS:
Prior to award, selected Vendors may be asked to provide further information concerning their proposal, up to and including presentations/demonstrations. The Midland County Commissioners Court reserves the right to reject any and all proposals or waive formalities as deemed in the best interests of Midland County. The County may also enter into discussions and revisions of proposals after submission and before award for the purpose of obtaining the best and final offer, and to accept the proposal deemed most advantageous to Midland County.

This request for proposal (RFP) is part of a competitive procurement process which is designed to best serve the interests of the County in obtaining complicated commodities and/or services. It also provides interested Vendors with a fair opportunity for their goods and services to be considered. The RFP process is designed to be a competitive negotiation platform, where price is not required to be the sole determinative factor. Also, the County has the flexibility to negotiate with interested vendors (one at a time) to arrive at a mutually agreeable relationship. Negotiations will be arranged with vendors in a hierarchal order, starting with the vendor selected as the primary. If a contract cannot be negotiated, negotiations will, formally and in writing, end with that Vendor and proceed to move to the second vendor, and so forth until a contract is negotiated.
RIGHTS OF THE CONTRACTING AUTHORITY:
Midland County reserves the right to withdraw this RFP at any time and for any reason.
Midland County also has the right to terminate its selection process at any time and to reject all
responses, or all proposals. Receipt of the proposal materials by Midland County or submission
of a proposal to Midland County confers no rights upon the vendor nor obligates Midland
County in any manner.

All costs associated with the preparation or submittal of proposals shall be borne by the
vendor, and no cost shall be sustained by Midland County.

ORAL COMMITMENT:
Vendors should clearly understand that any verbal representations made or assumed to be
made during any discussions held between representatives of an vendor and any Midland
County personnel or official are not binding on Midland County.

WAIVER OF CLAIMS:
Submission of a proposal indicates Vendor’s acceptance of the evaluation technique and
Vendor’s recognition that some subjective judgments must be made by the County during the
determination of qualification.

SELECTION CRITERIA:
Price is a primary consideration, however, it is not the only consideration to be used in the
selection. The product and/or service to be provided is also of major importance. Midland
County will require that the successful vendor provide a representative for all County related
business, service, billing, installation, activation and termination of said service.

ORDINANCES AND PERMITS:
The Vendor agrees, during the performance of the work, to comply with all applicable Federal,
State, or local code and ordinances.

INVOICES:
Invoices are to be mailed to P.O. Box 421, Midland, Texas 79702 and should cite the applicable
Purchase Order Number. Any and all notices or other communications required or permitted
by any contract awarded as a result of this RFP shall be served on or given to Midland County,
in writing, by personal delivery to the Purchasing Agent of Midland County, Texas, or by deposit
with the United States Mail, postage prepaid, registered or certified mail, return receipt
requested, addressed to the Midland County Purchasing Agent 500 N. Loraine Suite 1101
Midland, TX 79701, or at such other address as may have been specified by written notice to
Vendor.

INSURANCE:
The awarded Vendor will maintain such insurance as will protect the Vendor and the County
from claims under the Workers' Compensation Acts, and any amendments thereof, and from
any other claims for damages from personal injury, including death, which may arise from
operations under this agreement, whether such operations be by themselves or by any sub-
Contractor, or anyone directly or indirectly employed by either of them. Current Certificate of such insurance shall be furnished to Midland County and shall show all applicable coverage(s).

**Other insurance requirements are:**
- General Liability with a $1,000,000 per occurrence limit and $2,000,000 general aggregate. Coverage will not exclude work performed by subcontractors.
- Commercial Automobile Liability with a limit of no less than $1,000,000. The coverage will also extend liability to hired and non-owned autos.
- Workers' Compensation with limit of $1,000,000 for Employers Liability.
- We also require a minimum umbrella (or follow form excess policy covering over general liability, auto liability and workers compensation) of no less than $2,000,000.
- Builders Risk coverage with a full replacement value. The policy will have both the Contractor and Midland County as named insureds. This will include coverage for Contractors and Subcontractors of All Tiers.
- Construction Manager Professional Liability Insurance (also known as Construction Managers Errors & Omissions Insurance, or Construction Management Firm E&O) in an amount of no less than $1,000,000. If coverage is written on a claims made form, the coverage shall be kept in force for no less than two years after the completion of the project. A standard general liability policy will be accepted only if specifically endorsed to include Construction Manager at Risk.

Midland County will require the selected Vendor to name Midland County as an additional for both the general liability and auto liability. A waiver of subrogation in favor of the County is required for the workers compensation. If the additional insured status or waiver of subrogation is not blanket, please send a copy of the actual endorsements prior to commencement of any work.

Midland County will require the selected Vendor to name Midland County as an additional named insured and provide a waiver of subrogation prior to making a contract.

**INDEMNIFICATION:**
The Vendor shall defend, indemnify and save whole and harmless the County and all its officers, agents and employees from and against any and all demands, claims, suits, or causes of action of any character, name, kind or description brought for, or on account of, arising out of or in connection with the Vendor’s performance or non-performance of any obligation of Vendor or any negligent act, misconduct or omission of the Vendor in the performance of its contractual obligations. The Vendor shall defend, indemnify, save, and hold harmless the County and its officers, agents, representatives and employees from and against any and all demands, claims, suits, or causes of action of any character, name, kind or description brought for, on account of, arising out of or in connection with Vendor's product or service.

**STATUS OF INDEPENDENT CONTRACTOR:**
Vendor shall be considered an independent contractor, for all purposes. Vendor will not at any time, directly or indirectly, act as an agent, servant, representative or employee of the County. Vendor will not take any action which is intended to create any commitments, duties, liabilities or obligations on behalf of the County, without prior written consent of the County.
PARTIAL INVALIDITY:
In the event any one or more of the provisions contained in this RFP or any contract resulting therefore, for any reason, be held to be invalid, illegal or unenforceable in any respect, such invalidity, illegality or unenforceability shall not affect any other provision of this RFP or any contract resulting therefore and this RFP or the contract resulting therefore shall be construed as if such invalid, illegal or unenforceable provision had never been contained herein.

CONTRACT TERMINATION:
Non-performance of the Vendor/Contractor in terms of specifications or noncompliance with terms of this contract shall be basis for termination of the contract by the County. Termination in whole or in part, by the County may be made at its option and without prejudice to any other remedy to which it may be entitled at law or in equity, or elsewhere under this contract, by giving (60) sixty days written notice to the Contractor/Vendor with the understanding that all work being performed under this contract shall cease upon the date specified in such notice. The County shall not pay for work, equipment, services or supplies which are unsatisfactory. Contractor/Vendor may be given reasonable opportunity prior to termination to correct any deficiency. This, however, shall in no way be construed as negating the basis for termination for non-performance. The right to terminate the notice thereof is controlled by these proposal specifications and is not subject to being altered by contract.

LAW GOVERNING:
The parties under contract shall be subject to all Federal laws and regulations, and all rules and regulations of the State of Texas. The laws of the State of Texas shall govern the interpretation and application of the contract; regardless of where any disagreement over its terms should arise or any case of action arise.

REMEDIES:
The successful vendor and Midland County agree that both parties have all rights, duties, and remedies available as stated in the Uniform Commercial Code.

VENUE:
It is hereby agreed that the contract will be made in Midland, Midland County, Texas, and any dispute arising as a result of it shall be governed by the laws of the State of Texas for the purpose of any law suit, and the parties agree that such lawsuit shall be brought in Midland County, Texas.

FUNDING CONTINGENCY:
Any contract awarded pursuant to this RFP shall be contingent on sufficient funding and authority being made available in each fiscal period by the appropriate officials of Midland County. If sufficient funding or authority is not made available, the contract shall become null and void.

ASSIGNMENT:
The Contractor shall not sell, assign transfer or convey this contract in whole or in part, without the prior written consent of the County.
BUSINESS CHANGE DISCLOSURE:
The vendor shall immediately disclose any knowledge of a business change (i.e., name change, change in ownership, etc.) that will take place during the duration of this contract.
REQUIRED FORM
COMPANY AFFIDAVIT

The affiant, ____________________________ states with respect to this submission to County:

I (we) hereby certify that if the contract is awarded to our firm that no member or members of the governing body, elected official or officials, employee or employees of said County, or any person representing or purporting to represent the County, or any family member including spouse, parents, or children of said group, has received or has been promised, directly or indirectly, any financial benefit, by way of fee, commission, finder's fee or any other financial benefit on account of the act of awarding and/or executing a contract.

I hereby certify that I have full authority to bind the company and that I have personally reviewed the information contained in the RFP and this submission, and all attachments and appendices, and do hereby attest to the accuracy of all information contained in this submission, including all attachments and exhibits.

I acknowledge that any misrepresentation will result in immediate disqualification from any consideration in the submission process.

I further recognize that County reserves the right to make its award for any reason considered advantageous to the County. The company selected may be without respect to price or other factors.

Signature ____________________________ Date ____________________________

Name ____________________________ Phone ____________________________

Title

Firm Name __________________________________________________________
Type of business organization (corporation, LLC, partnership, proprietorship)

Address

County, State, Zip

Notary Seal Below
SPECIFICATION

PURPOSE:
It is Midland County’s intent to hire a construction manager to renovate the downtown library per the project manual provided by Parkhill Smith & Cooper Architect Shane Danley.

SUBCONTRACTOR AND/OR SUPPLIER IDENTIFICATION:
Should the Bidder subcontract any work, the Bidder shall indicate below the name of each subcontractor and/or supplier the bidder will use in the performance of the contract. The Bidder shall specify the work to be performed by the subcontractor or the materials to be provided by the supplier. Any changes in subcontractor and/or supplier listed below shall require prior approval by the Purchasing Office.

Vendors shall also verify that the Vendor can and will deliver the performance and payment bonds referred to below. In the event that a Vendor cannot make this verification, this may be grounds to reject the Vendor.

The Construction Manager-At-Risk shall deliver performance and payment bonds – in amounts whose penal sums shall be equal to the Project Budget – executed with a surety company authorized to do business in the State of Texas not later than the 10th calendar day after the date the Construction Manager-At-Risk executes the contract or provides the guaranteed maximum price.

SCOPE OF PROJECT:
The scope of work includes demolition of existing interior walls, electrical, plumbing and mechanical elements. With a few exceptions, the work will be confined to the 1st floor of the building. Existing mechanical units will remain and be modified to accommodate the new program spaces. There will be minimal work to the site. Site work is to include installation of new curb ramps, concrete flatwork, and new entry structure. New construction of the interior to include renovated/expanded restrooms, new restrooms, study-rooms, meeting rooms, staff offices and workrooms is included in this project. This work includes new drywall partitions, interior and exterior storefront, acoustical and specialty ceilings, carpet, paint, vinyl wall covering, tile and specialty items. Scope of the interior work will also include new mechanical ductwork, plumbing, lighting, electrical, audio visual and technology. The first floor will have the most renovations and the second floor will require sprinkler system install, some electrical and some ductwork.

Drawings will be available from our Architect at Parkhill Smith & Cooper, the contact information is below:

Shane C. Danley
Architect
Parkhill Smith & Cooper
sdanley@team-psc.com
432-697-1447
Work is to be performed exactly as specified in the project manual (see ATTACHMENT A). Where this is not possible or the vendor feels that it is not consistent with good practice, a change order must be prepared, describing the proposed change in writing and approved by the project manager. Copies of these approved changed must be filed with the Purchasing Agent, the contracting officer. All applicable permits and requirements, to include licensing, necessities are the responsibility of the contractor. All safety requirements and provisions will be followed.

The timeline for this construction is to begin mid-to-late March and end mid-November.

REFERENCES:
Please provide at least 3 references for commercial projects, preferably any local/state government clients that the firm has provided design-build needs.

EVALUATION PROCESS:
The County will award to the bidder that submits a bid which represents the “best value” to the County. The best value shall not be based solely upon price but the bid which receives the highest cumulative score for each of the evaluation factors delineated herein.
CRITERIA:

Introduction (Executive Summary): 1 page maximum

Tab 1 Previous Related Experience: (30 points, maximum)
- Indicate experience with publicly funded facilities of same approximate size and type as the anticipated project.
- Indicate safety record on previous projects.
- Indicate whether Vendor has had construction contracts terminated prior to completion or whether a bonding company surety has had to pay funds under a bond of the Vendor.

Tab 2 Identity and Location of Vendor: (5 points, maximum)
- Indicate the exact legal name of Vendor, its type of legal organization, its State of organization, its mailing address, the office/business location of the Vendor from which the Project will be managed; and, address Vendor’s availability to the Project and the County and the response time.

Tab 3 Project Schedule: (30 points, maximum)
- Indicate whether or not the vendor will be able to complete this project in the proposed timeline of mid-to-late March 2018 through mid-November 2018. If not, please indicate why and when vendor could complete the project.

Tab 4 References: (Include name, address, and phone number of contact): (5 points, maximum)
- Indicate (3 minimum) general references who can attest to the Vendor’s ability, performance, and safety record.
- Indicate (3 minimum) contractor references who can attest to the Vendor’s abilities in handling construction management.

Tab 5 Cost: (30 points, maximum)
- Indicate the Vendor’s proposed fee for Construction Manager-at-Risk services and its price for fulfilling the general conditions of the construction contract.
- Indicate the guaranteed maximum price of construction of said building, including the foundation, electrical and plumbing stub-in.
- Indicate any contingency cost you would include in your budget/guaranteed maximum price;
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SHANE CULLIE DAVENPORT  
23571  
12/20/17
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Not Used
DESIGN PROFESSIONAL RESPONSIBILITY

The specification sections authenticated by my seal and signature are limited to the following:

DIVISION 21 - FIRE SUPPRESSION

21 13 00.20 Fire Protection Piping
21 13 13 Wet-Pipe Sprinkler System

DIVISION 22 – PLUMBING

22 11 00 Facility Water Distribution
22 13 16 Sanitary Waste and Vent Piping
22 40 00 Plumbing Fixtures

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING

23 05 00 General Mechanical Requirements
23 05 00.20 Basic Mechanical Materials and Methods
23 05 29.10 Hangers and Supports
23 05 53 Mechanical Identification
23 05 93 Testing, Adjusting and Balancing
23 07 05 HVAC and Plumbing Insulation
23 31 00 HVAC Ducts and Casings
23 33 00 Air Duct Accessories
23 34 00 HVAC Fans
23 37 00 Air Outlets and Inlets
23 82 39 Unit Heaters

[Signature and Seal]

12/19/17
DESIGN PROFESSIONAL RESPONSIBILITY

The specification sections authenticated by my seal and signature are limited to the following:

DIVISION 26 - ELECTRICAL

26 05 00 Basic Electrical Methods
26 05 05 Selective Demolition for Electrical
26 05 13 Building Wire and Cable
26 05 19 Equipment Wiring Systems
26 05 26 Grounding and Bonding
26 05 29 Supporting Devices
26 05 33 Conduit
26 05 33.16 Boxes
26 05 53 Electrical Identification
26 24 16 Panelboards
26 27 26 Wiring Devices
26 28 16.16 Enclosed Switches
26 51 00 Interior Lighting
The specification sections authenticated by my seal and signature are limited to the following:

**DIVISION 31 - EARTHWORK**

31 23 16.13  Trenching and Backfilling

**DIVISION 33 - UTILITIES**

33 12 00  Water Utilities
33 13 00  Disinfecting of Water Utility Distribution
The number of calendar days indicated on the Proposal Form – Document 00410, is the contract time allowed to complete the project from Notice to Proceed to Substantial Completion, taking into account the normal weather occurrence as shown in the Table below. Weather occurrences exceeding those listed in the table will be taken into consideration when evaluating a request for extension in contract time.

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This table is based on information from NOAA and measured at the Midland International Airport, Midland, Texas.

Means, normals and averages are based on records covering a period of 5 years from 2010-2014.
SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   2. Work by Owner.
   3. Owner furnished products.
   4. Contractor use of site and premises.
   5. Owner occupancy.

B. Related Requirements:
   1. Other Division 01 Specification Sections apply to Work of this Section.
   2. Section 01 30 00 "Administrative Requirements" for project information management.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Identification: Midland County Public Library Renovation.
B. Location: Midland, TX.
C. Without force or effect, Work of Project consists of renovation of Midland County Downtown Public Library including relocation of entrance to building, covered entry portico, new HVAC distribution, new Lighting, new power distribution, and new finishes throughout.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01 20 00 - PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Contingency allowance.
   2. Inspection and testing allowances.
   3. Schedule of Values.
   4. Application for Payment.
   5. Change Procedures.
   6. Alternates.

B. Related Requirements:
   1. Other Division 01 Specification Sections apply to Work of this Section.
   2. Section 01 30 00 "Administrative Requirements" for project information management.
   3. Section 01 33 00 "Submittal Procedures" for Schedule of Values.
   4. Section 01 60 00 "Product Requirements" for product substitutions.

1.2 CONTINGENCY ALLOWANCE

A. Include stipulated sum of $250,000 for use upon Owner's instruction.

B. Costs Included in Contingency Allowance: Contractor's costs for products, equipment, delivery, installation, labor, insurance, payroll, applicable taxes, and equipment rental; handling at site, including unloading, uncrating, and storage; protection of products from elements and from damage; finishing costs.

C. Costs Not Included in Contingency Allowance, but included in Contract Sum/Price: Bonds, insurance, overhead, profit, and other expenses contemplated for stated allowance amounts.

D. Funds will be drawn from Contingency Allowance only by Change Order.

E. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.3 INSPECTION AND TESTING ALLOWANCES

A. Costs Included in Allowances: Cost of engaging an inspection or testing firm, execution of inspection or tests, and reporting results.

B. Costs Not Included in Allowance but Included in Contract Sum/Price:
   1. Incidental labor and facilities required to assist inspection or testing firm.
   2. Costs of testing laboratory services required by Contractor separate from Contract Document requirements.
   3. Costs of retesting upon failure of previous tests as determined by Architect.

C. Payment Procedures:
   1. Submit inspection or testing firm's invoice with next application for payment.
   2. Pay invoice on approval by Architect.

D. Inspection and Testing Allowances: Include stipulated sum of $2,000.00 for payment of testing laboratory services.

E. Funds will be drawn from Inspection and Testing Allowances only by Change Order.
F. At closeout of Contract, funds remaining in Inspection and Testing Allowances will be credited to Owner by Change Order.

1.4 SCHEDULE OF VALUES

A. Submit typed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet.
B. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
C. Format: Utilize Table of Contents of this Project Manual. Identify each line item with number and title of major specification Section, separating labor and material for each line item. Identify site mobilization, general conditions, bonds and insurance as separate line items.
D. Include in each line item amount of Allowances specified in this Section.
E. Include separately from each line item, a directly proportional amount of Contractor's overhead and profit.
F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.5 APPLICATIONS FOR PAYMENT

A. Submit notarized application on AIA Form G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet.
B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
C. Payment Period: As defined in Owner-Contractor agreement.
D. Include one copy of waiver of liens from each subcontractor.

1.6 CHANGE PROCEDURES

A. Architect will advise of minor changes in Work not involving an adjustment to Contract Sum/Price or Contract Time as authorized by Owner/Contractor Agreement by issuing Architect’s Supplemental Instructions on Architect’s Standard Supplemental Instruction form.
B. Architect may issue a Construction Change Request which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications and a change in Contract Time for executing change. Contractor will prepare and submit an estimate within 7 days.
C. Contractor may propose a change by submitting request for change to Architect. Include reason for change and effect on Contract Sum/Price, Contract Time, and subcontractors. Document requested substitutions in accordance with Section 01 60 00 "Product Requirements."
D. Stipulated Sum/Price Change Order: Based on Proposal Request and Contractor's fixed price quotation or Contractor's request for a Change Order as approved by Architect.
F. Time and Material Change Order
   1. Submit itemized account and supporting data after completion of change, within time limits indicated in Conditions of the Contract.
3. Maintain detailed records of work done on Time and Material basis.
4. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in Work.

G. Change Order Forms: AIA G701 Change Order.

H. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in Conditions of the Contract.

I. Change Order: Furnish an itemized breakdown, in form acceptable to Architect of costs and supporting information including but not limited to quantities and material prices. Tier subcontracted work performed at labor rates, employer payments, and rental rates. Itemize breakdown detail shall be same for subcontractor work. Provide complete supporting information for profit and overhead or markups used when requested. Consider the following items a part of overhead or Contractor’s and sub-contractor’s mark-up and do not include as separate cost item: Labor for Superintendents, Assistant Superintendents, home office personnel, timekeepers and maintenance mechanics at any level of contracting; individual pieces of equipment, hand tools or instruments having a new value of $500.00 or less, whether or not consumed by use; on site and main offices; modification to record Contract Documents nor guarantee period costs.

1.7 ALTERNATES

A. Alternates quoted on Proposal Forms will be reviewed and accepted or rejected by Owner. Accepted Alternates will be identified in Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work as required.

C. Schedule of Alternates:

   1. Alternate No. 1: Existing Paint Exterior Stucco Walls. As indicated in Construction Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Project Information Management.
   2. Coordination.
   3. Preconstruction meeting.
   4. Request for information.
   5. Progress meetings.
   6. Cutting and patching.
   7. Alteration project procedures.

B. Related Sections:
   1. Other Division 01 Specification Sections apply to Work of this Section.

1.2 PROJECT INFORMATION MANAGEMENT

A. Project Website:
   1. Use Newforma Info Exchange; https://projects.team-psc.com/UserWeb/Login to send and receive project information.
   2. Contact Architect to setup a user name and password information.
   3. If this project is not listed when logged in, contact Architect to add this project to your account.

B. Project information includes, but is not limited to, the following:
   1. Product Submittals.
   2. Requests for Information (RFI).
   3. Applications for Payment.
   4. Schedules.
   5. Construction Change Requests (CCRs).
   7. Construction Document Files.
      a. Weather Days.
      b. Electronic File Requests.
      c. Correspondence.
      d. Test Reports.
      e. Meeting Minutes.
      f. Field Reports.

1.3 COORDINATION

A. Coordinate scheduling, submittals, and Work to assure efficient and orderly sequence of installation of construction elements.

B. Verify that utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.

E. Large Apparatus: Any large apparatus which is to be installed in any space and is too large to permit access through windows, doorways, or shafts shall be provided before enclosing structure is completed.

F. Items which require electrical connections shall be coordinated with Division 26 Electrical for:
   1. Voltage.
   2. Phase.
   3. Ampacity.
   4. Number and size of wires.
   5. Wiring diagrams.
   6. Starter size, details, and location.
   7. Control devices and details.

G. Coordinate completion and clean-up of Work of separate Sections in preparation for Substantial Completion.

H. After Owner occupancy of premises, coordinate access to site with Owner for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

I. Control datum for survey is that shown on Drawings.

1.4 PRECONSTRUCTION MEETING

A. Architect will schedule a meeting after Notice to Proceed.

B. Attendance Required:
   1. Owner.
   3. Contractor.
   4. Major subcontractors.

C. Agenda:
   1. Submission of executed bonds and insurance certificates.
   3. Submission of list of subcontractors, list of products, Schedule of Values, and progress schedule.
   5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, Request for Information (RFI), and Contract closeout procedures.
   6. Review Notice to Proceed (NTP) and Substantial Completion Dates.

D. Scheduling:
   a. Use of premises by Owner and Contractor.
   b. Owner's requirements.
   c. Construction facilities and controls provided by Owner.
   d. Temporary utilities provided by Owner.
   e. Security and housekeeping procedures.
   f. Construction progress meetings.
   g. Procedures for testing.
h. Procedures for maintaining record documents.

i. Requirements for start-up of equipment.

j. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within 3 days after meeting to participants with 2 copies to Architect and those affected by decisions made.

1.5 REQUEST FOR INFORMATION

A. Request for information (RFI) requests from subcontractors or material suppliers will not be considered.

B. Information indicated on RFI shall be complete before submission. If Architect determines that request can be answered with information provided, Architect will assign an RFI tracking number. Requests determined by Architect not to be an RFI will be returned to Contractor electronically and deleted from Architect's electronic tracking software without being assigned an RFI tracking number. A transmittal document returning the denied RFI request will be provided with a response indicating action to be taken by Contractor.

C. RFIs may contain more than 1 item when items are related issues. Otherwise, only 1 item shall be addressed on each RFI request.

D. Allow 7 days for Architect's response to each RFI.

E. Response to RFI will be issued to Contractor and Owner per Section 01 33 00 "Submittal Procedures."

F. Responses from Architect are not changes unless issued with a change per Section 01 20 000 "Price and Payment Procedure."

1.6 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of Work at minimum bi-monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
   1. Owner.
   2. Job superintendent.
   3. Major subcontractors.
   4. Suppliers.
   5. Architect.

D. Agenda:
   1. Review minutes of previous meetings.
   2. Review of Work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems which impede planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Review of off-site fabrication and delivery schedules.
   7. Maintenance of progress schedule.
   8. Corrective measures to regain projected schedules.
   9. Planned progress during succeeding work period.
   10. Coordination of projected progress.
   11. Maintenance of quality and work standards.
   12. Effect of proposed changes on progress schedule and coordination.
   13. Other business relating to Work.
E. Record minutes, and distribute copies within 3 days to Architect, participants, and those affected by decisions made.

PART 2 - PRODUCTS

2.1 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Motors: Specific motor type is specified in individual specification sections.
B. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.
C. Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
B. Verify that existing substrate is capable of structural attachment of new Work being applied or attached.
C. Examine and verify specific conditions described in individual specification sections.
D. Verify that utility services are available, of correct characteristics, and in correct location.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.
B. Seal cracks or openings of substrate prior to applying next material or substance.
C. Apply any manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching.
B. Submit request in advance of cutting or altering elements which affects:
   1. Structural integrity of element.
   2. Integrity of weather-exposed or moisture-resistant elements.
   3. Efficiency, maintenance, or safety of element.
   5. Work of Owner or separate contractor.
C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
   1. Fit several parts together, to integrate with other Work.
   2. Uncover Work to install or correct ill-timed Work.
   3. Remove and replace defective and non-conforming Work.
   4. Remove samples of installed Work for testing.
   5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
D. Execute work by methods which will avoid damage to other Work, and provide proper surfaces to receive patching and finishing.

E. Cut rigid materials using masonry saw or core drill.

F. Restore Work with new products in accordance with requirements of Contract Documents.

G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

I. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection. For an assembly, refinish entire unit.

J. Identify any hazardous substance or condition exposed during Work to Architect for decision or remedy.

3.4 ALTERATION PROJECT PROCEDURES

A. Materials: As specified in product Sections; match existing products and work for patching and extending work.

B. Employ skilled and experienced installer to perform cutting and patching.

C. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.

D. Remove, cut, and patch work in a manner to minimize damage and to provide a means of restoring products and finishes to original condition unless otherwise specified.

E. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.

F. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work to match existing adjacent work in texture and appearance.

G. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and submit recommendation to Architect for review.

H. Where a change of plane of 1/4 inch or more occurs, submit recommendation for providing a smooth transition for Architect review.

I. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.

J. Finish surfaces as specified in individual product Sections.

END OF SECTION
SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Submittal procedures.
   2. Resubmittal requirements.
   3. Construction progress schedules.
   4. Shop drawings.
   5. Product data.
   6. Samples.
   7. Design data.
   8. Test reports.
   9. Certificates.
   10. Manufacturers' instructions.
   11. Manufacturers' field reports.

B. Related Sections:
   1. Other Division 01 Specification Sections apply to Work of this Section.
   2. Section 01 20 00 "Price and Payment Procedures" for Schedule of Values; Inspecting and Testing Allowances.
   3. Section 01 30 00 "Administrative Requirements" for project information management.
   4. Section 01 40 00 "Quality Requirements" for Manufacturers' field services and reports; Testing Laboratory Services.
   5. Section 01 70 00 "Execution and Closeout Requirements" for Contract warranty, manufacturer's certificates and closeout submittals.

1.2 SUBMITTAL PROCEDURES

A. Submit to Architect for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Produce copies and distribute in accordance with this Article.

C. Use project website to submit record documents as described in Section 01 70 00 "Execution and Closeout Requirements."

D. Transmit each submittal separately with Contractor's standard transmittal letter including Contractor's name, address, and phone number. Each submittal shall contain only one Specification Section.

E. Sequentially number transmittal forms using Section number or Contractors other sequential numbering system.

F. Identify Project, Contractor, subcontractor, or supplier; pertinent drawing sheet and detail number(s), and Specification Section number appropriate to submittal.

G. Apply Contractor's stamp, signed or initialed certifying that review, verification of products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with requirements of Work and Contract Documents.

H. Schedule submittals to expedite Project, and deliver to Architect. Coordinate submission of related items.
I. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.

J. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work. Information, comments, field verifications, responses or other notations marked on submittals by Contractor shall be done in blue or green colors only.

K. Allow space on submittals for Contractor and Architect's review stamps.

L. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

M. Submittals not requested will not be recognized or processed.

N. Format:
   1. Submit all submittals digitally using .PDF file extension. Each submittal shall be a single .PDF file including transmittal letter. Multiple files for same submittal will not be accepted.
   2. Submittals in any other format, including .ZIP files, will be rejected.
   3. Hard copies will not be accepted.
   4. To ensure each page is legible, .PDF pages of drawings shall be same size/scale as a hard copy. Where applicable, scale symbols should be provided to indicate scale. Illegible submittals will be rejected.
   5. Uploaded submittals to project website.

O. Submittal procedures described in this Article applies to construction progress schedule, products list, shop drawings, product data, samples (actual samples and digital files of same), design data, test reports, certificates, manufacturer's instructions and field reports, erection drawings, and any other type of submittal submitted to Architect.

1.3 RESUBMITTAL REQUIREMENTS

A. Revise and resubmit submittals, as required, and resubmit to meet requirements as specified and as noted on submittal reviews.

B. Mark as RESUBMITTAL.

C. Re-use original transmittal number and supplement with sequential alphabetical or numeric suffix for each re-submittal.

1.4 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial progress schedule for Architect's review within 15 days after date established in Notice to Proceed.

B. Revise and resubmit as required.

C. Submit revised schedule with each Application for Payment, identifying changes since previous version.

D. Submit a horizontal bar chart with separate line for each section of Work, identifying first work day of each week.

E. Indicate product/material manufacturer's lead-time for delivery to site. Include as a separate line for each product/material.

F. Revisions to Schedules:
   1. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
   2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
   3. Prepare narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect.
1.5 SHOP DRAWINGS

A. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
B. Printable Image Size: Minimum 8-1/2 x 11 inches and maximum 30 x 42 inches.
C. Draw details to a minimum scale of 1/2 inches equal to 1 foot.
D. Draw site plans to same scale indicated on contract drawings.
E. Draw other plans to a minimum scale of 1/8 inch equal to 1 foot.
F. Construction Documents (electronic or paper format) issued by Architect cannot be used in any shape, form or fashion in creation and development of shop drawings, except that electronic files containing floor plans or site plans which have been purchased from Architect may be used as backgrounds for Contractor, subcontractors, sub-subcontractors, and material suppliers in shop drawing process.
G. Electronic Files:
   1. Electronic AutoCAD drawing files are available for purchase from Architect upon request. Cost of files are indicated below plus applicable taxes.
      a. 1 - 3 sheets $100.00 per sheet
      b. 4 - 6 sheets $400.00 flat fee
      c. 7 - 9 sheets $500.00 flat fee
   2. Contractor or his subcontractors and sub-subcontractors may purchase an electronic file. An electronic file will be provided in software release currently used by Architect. File will be provided via project website.
   3. Electronic Revit model files are available for purchase from Architect upon request. Cost of model files are $150.00 each plus applicable taxes. Only Contractor or his subcontractors and sub-subcontractors may purchase an electronic file. An electronic file will be provided in software release currently used by Architect. File will be provided via project website.
   4. Prior to delivery of file, purchaser shall sign an Electronic File Transfer Release Form. Payment for an electronic file shall occur upon delivery of file to purchaser.
   5. Electronic file shall be used only for production of information required by this project and shall not be used in any other form (in whole or part).
   6. In creation and publication of shop drawings, under no circumstances shall Design Professional's seal or title block of drawing be reproduced. Shop drawings must be original works from Contractor subcontractors, sub-subcontractors and material suppliers.

1.6 PRODUCT DATA

A. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.
B. Include recommendations for application and use, and reference to compliance with specified standards of trade associations and testing agencies.
C. Include notation of special coordination requirements for interfacing with adjacent work and building utilities where applicable.
D. After review, distribute in accordance with Article titled SUBMITTAL PROCEDURES above and provide copies for Record Documents described in Section 01 70 00 "Execution and Closeout Requirements."
1.7 SAMPLES

A. Submit samples to illustrate functional and aesthetic characteristics of product, with integral parts and attachment devices. Accompany physical sample with color digital image (photo or scanned .PDF) of sample. Coordinate sample submittals for interfacing work.
B. Unless otherwise specified, submit samples of finishes from manufacturers' full range of standard colors, textures, and patterns, for Architect's selection.
C. Where variations in color, pattern or texture are inherent in material or product, submit multiple samples to indicate approximate range or variations.
D. Include full Project information and identification of manufacturer, model number, type, style and color on each sample.
E. Submit number of samples specified in individual Specification Sections; one of which will be retained by Architect.
F. Reviewed samples which may remain as part of Work are indicated in individual Specification Sections.
G. Samples will not be used for testing purposes unless specifically stated in individual Specification Sections.

1.8 DESIGN DATA

A. Submit for Architect's knowledge as contract administrator or for Owner.
B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.9 TEST REPORTS

A. Submit for Architect's knowledge as contract administrator or for Owner.
B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.10 CERTIFICATES

A. When specified in individual Specification Sections, submit certification by manufacturer, installation/application subcontractor, or Contractor to Architect.
B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
C. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

1.11 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual Specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing.
B. Identify conflicts between manufacturers' instructions and Contract Documents.
C. Indicate special procedures, conditions requiring special attention and special environmental criteria required for application or installation.
1.12 MANUFACTURER'S FIELD REPORTS

   A. Submit reports for Architect's benefit as contract administrator or for Owner.
   B. Submit report within 30 days of observation to Architect for information.
   C. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.13 ERECTION DRAWINGS

   A. Submit drawings for Architect's benefit as contract administrator or for Owner.
   B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.
   C. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Quality control and control of installation.
   2. Tolerances.
   3. References.
   4. Testing and Inspection services.
   5. Manufacturers' field services.
   6. Examination.
   7. Preparation.

B. Related Requirements:
   1. Other Division 01 Specification Sections apply to Work of this Section.
   2. Section 01 30 00 "Administrative Requirements" for project information management.
   3. Section 01 33 00 "Submittal Procedures" for Submission of Manufacturers' Instructions and Certificates.
   4. Section 01 60 00 "Product Requirements" for Requirements for material and product quality.

1.2 QUALITY CONTROL AND CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as a minimum quality for Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce workmanship of specified quality.

F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.

G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing in place.
1.4 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.
B. Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by Code.
C. Obtain copy of standards when required by specification section.
D. Neither contractual relationship, duties nor responsibilities of parties in Contract nor those of the Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.5 TESTING AND INSPECTION SERVICES

A. Owner will appoint, employ, and pay for specified services of an independent firm to perform inspection and testing.
B. The independent firm will perform inspections, tests, and other services specified in individual specification Sections and as required by the Architect or the Owner.
C. Testing, inspections and source quality control may occur on or off project site. Perform off-site testing as required by Architect or Owner.
D. Submit independent testing laboratory firm’s reports to Architect. Reports to include observations and results of tests and will indicate compliance or non-compliance with Contract Documents.
E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, provide safe access to project site, and provide assistance by incidental labor as requested.
   1. Notify, Architect and independent firm 48 hours prior to expected time for operations requiring services.
   2. Pay for additional samples and tests required for Contractor's use.
F. Employment of independent testing agency or laboratory does not relieve Contractor from performing Work to contract requirements.
G. Re-testing and/or re-inspection required because of non-conformance to specified requirements will be charged to Contractor by deducting re-testing and/or re-inspection charges from Contract Sum/Price.

1.6 MANUFACTURERS’ FIELD SERVICES

A. When specified in individual specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, and start-up of equipment, test, adjust, and balance of equipment as applicable, and to initiate instructions when necessary.
B. Submit qualifications of observer to Architect 30 days in advance of required observations. Observer subject to approval of Architect.
C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
D. Refer to Section 01 33 00 "Submittal Procedures," Manufacturer's Field Reports Article.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.
C. Examine and verify specific conditions described in individual specification sections.
D. Verify utility services are available, of correct characteristics, and in correct locations.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.
B. Seal cracks or openings of substrate prior to applying next material or substance.
C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Related Requirements:
   1. Other Division 01 Specification Sections apply to Work of this Section.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
   7. ACI - American Concrete Institute; (Formerly: ACI International); www.aci.org.
   8. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
   9. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
21. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
22. ARI - American Refrigeration Institute; (See AHRI).
23. ASCE - American Society of Civil Engineers; www.asce.org.
24. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
27. ASSE - American Society of Safety Engineers (The); www.asse.org.
37. BIA - Brick Industry Association (The); www.gobrick.com.
40. CEA - Consumer Electronics Association; www.ce.org.
41. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
42. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
44. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
47. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
49. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
50. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
51. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
52. CSI - Construction Specifications Institute (The); www.csinet.org.
53. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
54. CWC - Composite Wood Council; (See CPA).
56. DHI - Door and Hardware Institute; www.dhi.org.
57. ECA - Electronic Components Association; (See ECIA).
58. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
60. EIA - Electronic Industries Alliance; (See TIA).
63. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
64. ESTA - Entertainment Services and Technology Association; (See PLASA).
71. GA - Gypsum Association; www.gypsum.org.
73. GS - Green Seal; www.greenseal.org.
74. HI - Hydraulic Institute; www.pumps.org.
75. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
76. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
80. IAS - International Accreditation Service; www.iasonline.org.
81. IAS - International Approval Services; (See CSA).
82. ICBO - International Conference of Building Officials; (See ICC).
84. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
85. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
86. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
88. IEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
89. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
90. IESNA - Illuminating Engineering Society of North America; (See IES).
91. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
93. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
94. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
95. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
96. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
98. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
99. ITU - International Telecommunication Union; www.itu.int/home.
100. LMA - Laminating Materials Association; (See CPA).
102. MCA - Metal Construction Association; www.metalconstruction.org.
110. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
113. NCMA - National Concrete Masonry Association; www.ncma.org.
118. NETA - InterNational Electrical Testing Association; www.netaworld.org.
120. NFPA - NFPA International; (See NFPA).
123. NLGA - National Lumber Grades Authority; www.nlga.org.
124. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
125. NRCA - National Roofing Contractors Association; www.nrca.net.
129. NSSGA - National Stone, Sand & Gravel Association; www.sssga.org.
130. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
132. PCI - Precast/Prestressed Concrete Institute; www PCI.
133. PDI - Plumbing & Drainage Institute; www.pdionline.org.
134. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
139. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
140. SDI - Steel Deck Institute; www.sdi.org.
141. SDI - Steel Door Institute; www.steeldoor.org.
142. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
144. SJI - Steel Joist Institute; www.steeljoist.org.
145. SMA - Screen Manufacturers Association; www.smainfo.org.
146. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
152. STI - Steel Tank Institute; www.steeltank.com.
B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.

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

2. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
3. EPA - Environmental Protection Agency; www.epa.gov.
4. OSHA - Occupational Safety & Health Administration; www.osha.gov.
5. SD - Department of State; www.state.gov.

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

2. USAB - United States Access Board; www.access-board.gov.
3. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

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

1. TAS; Architectural Barriers Texas Accessibility Standards; www.tdlr.texas.gov/ab/abtas.htm.
2. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservation.tamu.edu.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Temporary Utilities:
      a. Electricity.
      b. Lighting.
      c. Heating.
      d. Cooling.
      e. Ventilation.
      f. Communication services.
      g. Water.
      h. Sanitary.
   2. Construction Facilities:
      a. Field offices and sheds.
      b. Vehicular access.
      c. Parking.
      d. Progress cleaning.
      e. Project identification.
      f. Traffic regulation.
   3. Temporary Controls:
      a. Barriers.
      b. Enclosures.
      c. Water control.
      d. Dust control.
      e. Erosion and sediment control.
      f. Noise control.
      g. Pest and rodent control.
      h. Pollution control.
      i. Protection of Work.
   4. Removal of utilities, facilities, and controls.

B. Related Requirements:
   1. Other Divisions 01 Specification Sections apply to Work of this Section.
   2. Section 01 70 00 "Execution and Closeout Requirements" for final cleaning.

1.2 TEMPORARY ELECTRICITY

A. Connect to existing power service.
B. Owner will pay cost of energy used. Exercise measures to conserve energy.
C. Provide power outlets for construction operations, with branch wiring and distribution boxes as required.
D. Provide flexible power cords as required.
E. Provide main temporary service disconnect and overcurrent protection at convenient location in conformance with National Electric Code.
F. Permanent convenience receptacles may be utilized during construction.
G. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.
   1. Provide 20 ampere duplex outlets, single phase circuits for power tools for every 2000 sq ft of active work area and at specific locations as required.
   2. Provide 20 ampere, single phase branch circuits for lighting.

1.3 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES
A. Existing building lighting may be utilized during construction. Owner will pay cost of energy used. Exercise measures to conserve energy.
B. Provide branch wiring from power source to distribution boxes with lighting conductors.
C. Maintain lighting and provide routine repairs.

1.4 TEMPORARY HEAT
A. Utilize Owner's existing heat plant, extend and supplement with Contractor provided temporary heat devices as required to maintain specified conditions for construction operations.
B. Owner will pay cost of energy used. Exercise measures to conserve energy.
C. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.
D. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.5 TEMPORARY COOLING
A. Utilize Owner's existing cooling plant, extend and supplement with Contractor provided temporary cooling devices as required to maintain specified conditions for construction operations.
B. Owner will pay cost of energy used. Exercise measures to conserve energy.
C. Prior to operation of permanent equipment for temporary cooling purposes, verify installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.
D. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.6 TEMPORARY VENTILATION
A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
B. Utilize existing fan units as required to maintain clean air for construction operations.
C. Owner will pay cost of energy used. Exercise measures to conserve energy.

1.7 TEMPORARY COMMUNICATION SERVICES
A. Provide, maintain, and pay for telephone service to field office at time of project mobilization.
B. Owner's communication systems shall not be used unless otherwise approved by Owner.
C. As a minimum, provide cellular mobile telephone service for on-site superintendent and home office telephone service.

1.8 TEMPORARY WATER SERVICE

A. Connect to existing water source for construction operations. Extend and supplement with temporary devices as needed to maintain specified conditions for construction operations.
B. Owner will pay cost of water used.
C. Exercise measures to conserve water.
D. Provide temporary pipe insulation to prevent freezing.

1.9 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures.
B. Existing facilities shall not be used.

1.10 FIELD OFFICES AND SHEDS

A. Office:
   1. Weather tight, with lighting, electrical outlets, heating, cooling and ventilating equipment.
   2. Provide temporary communications services specified in this Section.
B. Locate offices and sheds a minimum distance of 30 feet from existing structure[s].
C. Maintenance And Cleaning: Maintain approach walks free of mud, water, and snow.
D. Removal: At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

1.11 EMPLOYEE RESIDENTIAL OCCUPANCY

A. Not allowed on Owner's property.

1.12 VEHICULAR ACCESS

A. Provide and maintain access to fire hydrants and control valves free of obstructions.

1.13 PARKING

A. Use of existing parking facilities by construction personnel is permitted.
B. Do not allow heavy or tracked vehicles or construction equipment in parking areas.
C. Maintenance:
   1. Maintain traffic and parking areas in sound condition.
   2. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.
D. Removal, Repair:
   1. Remove temporary materials and construction before Substantial Completion.
   2. Repair existing facilities damaged by use, to original condition.

1.14 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing space.
C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
D. Remove waste materials, debris, and rubbish from site and dispose off-site at intervals as required to maintain clean site.

1.15 PROJECT IDENTIFICATION

A. Project Identification Sign:
   1. Size: Provide one 8 ft. wide x 4 ft. high.
   3. Background Paint: Exterior quality, two coats; sign background of color as selected.
   5. Design: Architect design and colors.
   6. Content
      a. Project title, as indicated on Contract Documents.
      b. Owner’s name and logo.
      c. Commissioner’s Court members.
      e. Name of Prime Contractor.

B. Design sign and structure to withstand 90 miles/hr wind velocity.

C. Installation:
   1. Install project identification sign within 15 days after date fixed by Notice to Proceed.
   2. Erect at location directed by Owner.
   3. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
   4. Install sign surface plumb and level, with butt joints. Anchor securely.
   5. Paint exposed surfaces of sign supports and framing.

D. No other signs are allowed without Owner's permission except those required by law.

E. Maintenance: Maintain signs and supports clean, repair deterioration and damage.

F. Removal: Remove signs, framing, supports, and foundations at completion of Project and restore area.

1.16 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
   1. Allow for Owner's use of site.

B. Provide protection for the following items designated to remain. Replace damaged items condition to original condition.
   1. Trees.

C. Protect site improvements including but not limited to pavements, walkways and drainage structures from damage. Replace damaged site improvements to original condition.

D. Protect non-owned vehicular traffic and stored materials from damage.
1.17 TEMPORARY ENCLOSURES

A. Exterior Enclosures
   1. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating, cooling, ventilation and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.18 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification Sections.
B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.
C. Provide protective coverings at openings in walls, roof, and soffits.
D. Protect finished walkways, drives, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

1.19 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary above grade utilities, equipment, facilities, and materials as soon as permanent facilities can be utilized.
B. Backfill excavations as specified in other sections and grade site as indicated.
C. Clean and repair damage caused by installation or use of temporary work.
D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.
E. Remove the following when no longer needed:
   1. Office.
   2. Storage sheds.
   3. Enclosures.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Products.
   2. Product delivery, storage and handling.
   3. Product options.
   4. Substitutions.

B. Related Sections:
   1. Other Division 01 Specification Sections apply to Work of this Section.
   2. Section 01 30 00 "Administrative Requirements" for project information management.
   3. Section 01 40 00 "Quality Requirements" for product quality monitoring.
   4. Section 01 42 00 "References."

1.2 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming Work and does not include machinery and equipment used for preparation, fabrication, conveying and erection of Work. When allowed by Contract Documents, products may include used and/or existing materials or components.

B. Hazardous Materials: Products or material containing hazardous materials or substances, including but not limited to asbestos or polychlorinated biphenyl (PCB) shall not be included in Work.

C. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.

D. Provide interchangeable components of same manufacturer, for similar components.

E. Materials required to match existing work and not otherwise specified, shall be equal to existing work in quality, color and finish. Workmanship and installation shall be comparable to adjacent existing work. Architect shall be authority in determination of acceptable work.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery:
   1. Deliver materials, products and equipment to site in manufacturer's original, unopened containers or packaging, with identifying labels intact and legible.
   2. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
   3. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
   4. Arrange deliveries in accord with construction schedule and in ample time to facilitate inspection prior to installation to avoid unnecessary delays in construction process.
B. Storage:
1. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible.
2. Store sensitive products in weather-tight, climate controlled enclosures.
3. For exterior storage of fabricated products, place on supports, above ground, sloped to drain water.
4. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation or potential degradation of Products.
6. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
7. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.
8. Materials, products and equipment may be stored off site in a bonded and insured warehouse approved by Architect and Owner. Pay all costs incurred for off-site storage facilities. Products properly stored in off-site storage facilities may be included in progress pay requests with written approval of Architect.

C. Handling: Handle materials, products and equipment in a manner prescribed by manufacturer or specified to protect from damage during storage and installation.

1.4 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with this Section.

1.5 SUBSTITUTIONS

A. Instructions to Proposers specify time restrictions for submitting requests for Substitutions during proposal period to requirements specified in this Section.
B. Substitutions (after proposal period) may be considered when a product becomes unavailable through no fault of Contractor.
C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
D. A request constitutes a representation that Proposer:
   1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
   2. Will provide same warranty for Substitution as for specified product.
   3. Will coordinate installation and make changes to other Work which may be required for Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension which may subsequently become apparent.
   5. Will reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to Contract Documents.
F. Substitution Submittal Procedure:
1. Submit request for Substitution for consideration. Limit each request to one proposed Substitution.
2. Requests shall include name of material or equipment to be substituted and a description of proposed substitution including drawings, performance and test data, and other information necessary for an evaluation.
3. Submit item by item (line by line) comparison of each item listed in specification compiled and submitted comparing specified material/product with proposed substitution.
4. Submit statement setting forth changes in other material, equipment or other portions of Work including changes in work of other contracts that incorporation of proposed substitution would require shall be included.
5. Submit shop drawings, product data, and certified test results for proposed product equivalence.
6. Architect will notify Contractor, in writing, of decision to accept or reject request.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Closeout procedures.
2. Final cleaning.
3. Starting of systems.
4. Demonstration and instructions.
5. Testing, adjusting and balancing.
6. Protecting installed construction.
8. Project record documents.
9. Operation and maintenance data.
12. Spare parts and maintenance products.

B. Related Requirements:
1. Other Division 01 Specification Sections apply to Work of this Section.
2. Section 01 30 00 "Administrative Requirements" for project information management.
3. Division 23 Section "Testing, Adjusting, and Balancing" for testing, adjusting and balancing services.

1.2 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect's review.

B. Provide submittals to Architect required by authority having jurisdiction.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

D. Closeout documents will be submitted electronically in OCR (Optical Character Recognition)/PDF format.

E. At Owner's request, Contractor shall provide a hard copy of Closeout Documents in 3-ring binders.

1.3 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.

D. Replace filters of operating equipment.
E. Clean site; sweep paved areas, rake clean landscaped surfaces.
F. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.4 STARTING OF SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.
B. Notify Architect seven days prior to start-up of each item.
C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.
E. Verify wiring and support components for equipment are complete and tested.
F. Execute start-up under supervision of applicable Contractors' personnel in accordance with manufacturers' instructions.
G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
H. Submit a written report in accordance with Section 01 33 00 - Submittal Procedures that equipment or system has been properly installed and is functioning correctly.

1.5 TESTING, ADJUSTING, AND BALANCING

A. Testing, adjusting and balancing will be performed in accordance with requirements specified in Division 23 Section - Testing, Adjusting, and Balancing.
B. Independent firm will perform services specified in Division 23 Section - Testing, Adjusting, and Balancing.
C. Reports will be submitted by independent firm to Architect indicating observations and results of tests and indicating compliance or non-compliance with requirements of Contract Documents.

1.6 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual specification sections.
B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
E. Prohibit traffic from landscaped areas.

1.7 HAZARDOUS MATERIALS AFFIDAVITS

A. Provide notarized affidavits declaring that hazardous materials were not incorporated into or delivered to site.
B. Hazardous materials include asbestos, lead polychlorinated biphenyl (PCB), prohibited termite eradication chemicals or any substance of any proportion determined or suspected by an agency of federal or state government to create a health hazard.
C. Provide table of contents listing affidavits in alphabetical order.
D. Prepare cover page with printed title “AFFIDAVITS OF NON-INCORPORATED HAZARDOUS MATERIALS”, Title of Project, Project Address, Owner’s Name, Address and Phone and date of Construction Completion.
E. Provide one complete set of aforementioned information in OCR (Optical Character Recognition)/PDF format.
F. Submit prior to Application for Final Payment.

1.8 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of record documents; record actual revisions to Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to Contract.
   5. Reviewed Shop Drawings, Product Data, and Samples.
   7. Manufacturer's instruction for assembly, installation, and adjusting.
B. Ensure entries are complete and accurate, enabling future reference by Owner.
C. Store record documents separate from documents used for construction.
D. Record information concurrent with construction progress, not less than weekly.
E. Specifications: Legibly mark and record at each product section description of products installed, including following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda, Change Orders, RFI responses, and other modifications.
      For Addenda, Change Orders, and RFI responses, cut out and tape to pages in appropriate location, referencing source of change.
F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract drawings.
   6. Changes made by Addenda, Change Order, RFI responses, and other modifications.
      For Addenda, Change Orders, and RFI responses, cut out and tape to pages in appropriate location, referencing source of change.
   7. Submit in OCR (Optical Character Recognition)/PDF format.
   8. Submit MSDS on products used in construction of Project.
   9. Submit MSDS electronically in 8-1/2 x 11 inch format text pages.
   10. Prepare cover page with printed title “MATERIAL SAFETY DATA SHEETS (MSDS)”, Title of Project, Project Address, Owner’s Name, Address and Phone, and Date of Construction Completion.
   11. Internally subdivide contents with page dividers, organized into CSI format shown in Project Manual.
   12. Prepare a table of contents, listing each of Division headings and listing each material/product under each heading by manufacturer and material/product name.
   13. Submit complete set of aforementioned information in OCR (Optical Character Recognition)/PDF format.
14. Submit information with Application for Final Payment and include MSDS for materials/products delivered or installed in Project.
15. Failure to submit updated electronic MSDS documents will cause Application for Final Payment to be held by Architect (not submitted to Owner for processing) until such time updated electronic MSDS documents are received and reviewed for compliance by Architect.

G. Submit documents to Architect with claim for final Application for Payment.

1.9 OPERATION AND MAINTENANCE DATA

A. Submit data electronically in 8-1/2 x 11 inch text pages, OCR (Optical Character Recognition)/PDF format.
B. Prepare cover page with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project.
C. Internally subdivide contents with page dividers, logically organized as described below:
   1. Contents: Prepare Table of Contents for each file (if multiple files), with each product or system description identified, in three parts as follows:
      a. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
      b. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify:
         1) Significant design criteria.
         2) List of equipment.
         3) Parts list for each component.
         4) Operating instructions.
         5) Maintenance instructions for equipment and systems.
         6) Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
      c. Part 3: Project documents and certificates, including:
         1) Shop drawings and product data.
         2) Air and water balance reports.
         3) Certificates.
         4) Scanned copies of warranties and bonds IN OCR (Optical Character Recognition)/PDF format.
D. Submit one complete set of aforementioned information in OCR (Optical Character Recognition)/PDF format.
E. Submit documents with Application for Final Payment.

1.10 MANUAL FOR MATERIALS AND FINISHES

A. Submit in OCR (Optical Character Recognition)/PDF format of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return electronic file with comments.
B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
C. Submit one electronic copy of completed volumes 15 days prior to final inspection. Draft copy to be reviewed and returned after final inspection, with Architect comments. Revise content of electronic document set as required prior to final submission.
D. Submit electronic documents of revised final volumes in final form within 10 days after final inspection.
E. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations.
F. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
H. Additional Requirements: As specified in individual product specification sections.
I. Include listing in Table of Contents for design data, with fly sheet.

1.11 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit in OCR (Optical Character Recognition)/PDF format of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return with comments.
B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit electronic documents within ten days after acceptance.
C. Submit electronic copy of completed volume(s) 15 days prior to final inspection. Draft copy to be reviewed and returned after final inspection, with Architect comments. Revise content of electronic document set as required prior to final submission.
D. Submit electronic documents in OCR (Optical Character Recognition)/PDF format of revised final volumes in final form within 10 days after final inspection.
E. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
F. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; by label machine.
G. Include color coded wiring diagrams as installed.
H. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and special operating instructions.
I. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
J. Include servicing and lubrication schedule, and list of lubricants required.
K. Include manufacturer's printed operation and maintenance instructions.
L. Include sequence of operation by controls manufacturer.
M. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
N. Include control diagrams by controls manufacturer as installed.
O. Include Contractor's coordination drawings, with color coded piping diagrams as installed.
P. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
Q. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
R. Include test and balancing reports as specified in Section 01 40 00 - Quality Requirements.
S. Additional Requirements: As specified in individual product specification sections.
T. Include listing in Table of Contents for design data, with dividers.
1.12 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification sections.
B. Deliver to and place in location as directed by Owner; obtain receipt prior to final payment.
C. Submit receipts signed by Owner or letter stating Contractor has delivered extra products to Owner.

1.13 PRODUCT WARRANTIES AND PRODUCT BONDS

A. Obtain warranties and bonds executed by responsible subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.
C. Verify documents are in proper form, contain full information, and are notarized.
D. Co-execute submittals when required.
E. Include Table of Contents.
F. Submit one complete set of aforementioned information in OCR (Optical Character Recognition)/PDF format for review.
G. Submit prior to Application for Final Payment.
H. Time Of Submittals:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
   2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes demolition and removal of selected portions of building or structure.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 01 10 00 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
   3. Section 01 70 00 "Execution" for cutting and patching procedures.

1.2 MATERIALS OWNERSHIP

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

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

1.3 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property. Indicate proposed locations and construction of barriers.

1.4 FIELD CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

D. Storage or sale of removed items or materials on-site is not permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.
C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Disconnect, demolish, and remove plumbing, and HVAC systems, equipment, and components indicated to be removed.
      a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
      b. Equipment to Be Removed: Disconnect and cap services and remove equipment.
      c. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
      d. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
B. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 SELECTIVE DEMOLITION, GENERAL

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

3.4 CLEANING

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

END OF SECTION
SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood blocking and nailers.
   2. Plywood backing panels.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 06 16 00 "Sheathing" for sheathing, subflooring, and underlayment.

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
C. Exposed Framing: Framing not concealed by other construction.
D. OSB: Oriented strand board.
E. Timber: Lumber of 5 inches nominal size or greater in least dimension.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservation treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
   3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
   4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

A. 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 ALSC Board of Review.
B. Evaluation Reports: For the following, from ICC-ES:
   1. Wood-preservative-treated wood.
   2. Fire-retardant-treated wood.
   3. Engineered wood products.
   4. Shear panels.
5. Power-driven fasteners.
6. Post-installed anchors.
7. Metal framing anchors.

1.5 QUALITY ASSURANCE
A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS
2.1 WOOD PRODUCTS, GENERAL
A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Dress lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER
A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
D. Application: Treat all rough carpentry unless otherwise indicated.
1. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
   1. Treatment shall not promote corrosion of metal fasteners.
   2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
   1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

E. Application: Treat all rough carpentry unless otherwise indicated.
   1. Framing for raised platforms.
   2. Concealed blocking.
   3. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.

C. Concealed Boards: 15 percent maximum moisture content and any of the following species and grades:
   1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
   2. Eastern softwoods; No. 2 Common grade; NeLMA.
   3. Northern species; No. 2 Common grade; NLGA.
   4. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.
2.6 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
B. Nails, Brads, and Staples: ASTM F 1667.
C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 ICC-ES AC193 as appropriate for the substrate.
   2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
C. Provide blocking as indicated and as required to support facing materials, fixtures, specialty items, and trim.
D. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   2. ICC-ES evaluation report for fastener.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
3.3 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION
SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wall sheathing.
   2. Parapet sheathing.
B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 06 10 00 "Rough Carpentry" for plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.4 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 WALL SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. CertainTeed Corporation; GlasRoc.
      b. Georgia-Pacific Building Products; Dens-Glass Gold.
      c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
      d. Temple-Inland Building Products by Georgia-Pacific; GreenGlass Exterior Sheathing.
      e. United States Gypsum Co.; Securock.
   2. Type and Thickness: Regular, 1/2 inch thick.
2.2 PARAPET SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. CertainTeed Corporation; GlasRoc.
      b. Georgia-Pacific Building Products; Dens-Glass Gold.
      c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
      d. Temple-Inland Building Products by Georgia-Pacific; GreenGlass Exterior Sheathing.
      e. United States Gypsum Co.; Securock.
   2. Type and Thickness: Regular, 1/2 inch thick.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. For parapet and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
B. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
   1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
   2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
   1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
C. Securely attach to substrate by fastening as indicated, complying with the following:
   1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
   2. ICC-ES evaluation report for fastener.
D. Coordinate wall parapet sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.
   1. Fasten gypsum sheathing to cold-formed metal framing with screws.
   2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
   3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.
   1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
   2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
   1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
   2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

E. Seal sheathing joints according to sheathing manufacturer's written instructions.
   1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION
SECTION 06 41 16 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Plastic-laminate-faced architectural cabinets.
   2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets that are not concealed within other construction.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 06 10 00 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.

1.2 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: For plastic-laminate-faced architectural cabinets.
   1. Include plans, elevations, sections, and attachment details.
   2. Show large-scale details.
   3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.
   5. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples: For each exposed product and for each color and texture specified, in manufacturer's or fabricator's standard size.

D. Samples for Verification: For the following:
   1. Plastic Laminates: 12 by 12 inches, for each type, color, pattern, and surface finish required.
      a. Provide one sample applied to core material with specified edge material applied to one edge.
   2. Corner Pieces:
      a. Cabinet-front frame joints between stiles and rails and at exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
      b. Miter joints for standing trim.
   3. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.
1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.
B. Product Certificates: For each type of product.
C. Quality Standard Compliance Certificates: AWI Quality Certification Program.
D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
B. Installer Qualifications: AWI's Quality Certification Program accredited participant.
C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Build mockups of typical architectural cabinets as shown on Drawings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
B. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 17 and 50 percent during the remainder of the construction period.
C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.
D. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.
PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of cabinets indicated for construction, finishes, installation, and other requirements.
   1. Provide inspections of fabrication and installation together with labels and certificates from AWI certification program indicating that woodwork complies with requirements of grades specified.
B. Grade: Premium.
C. Type of Construction: Frameless.
D. Door and Drawer-Front Style: Flush overlay.
E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Nevamar; a Panolam Industries International, Inc. brand; Armored Protection
F. Laminate Cladding for Exposed Surfaces:
   1. Horizontal Surfaces: Grade HGS.
   2. Postformed Surfaces: Grade HGP.
   3. Vertical Surfaces: Grade HGS.
   4. Edges: Grade HGS.
   5. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
G. Materials for Semiexposed Surfaces:
   1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
   2. Drawer Sides and Backs: Solid-hardwood lumber.
   3. Drawer Bottoms: Hardwood plywood.
H. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.
I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
   1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
K. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   1. As indicated by laminate manufacturer's designations.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
   1. Wood Moisture Content: 5 to 10 percent.
B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
C. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.

1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
3. Straw-Based Particleboard: ANSI A208.1, Grade M-2, except for density.
   a. Products: Subject to compliance with requirements, provide one of the following:
      1) Environ Biocomposites Manufacturing LLC; Biofiber Wheat.
      2) Panel Source International, Inc.; Purekor Ag Fiber Particleboard.
      3) Sorm Incorporated; Primeboard Premium Wheat.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Kiln-dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
2. For items indicated to receive a stained or natural finish, use organic resin chemical formulation.
3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking shop certified by testing and inspecting agency.
4. Mill lumber before treatment and implement procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of architectural cabinets.

C. Fire-Retardant Particleboard: Made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.

1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
2. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.

3. Products: Subject to compliance with requirements, provide one of the following:
   a. Flakeboard Company Limited; Duraflake FR.
   b. SierraPine; Encore FR.

D. Fire-Retardant Fiberboard: MDF panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

1. Products: Subject to compliance with requirements, provide one of the following:
   b. SierraPine; Medite FR.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 08 71 00 "Door Hardware."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Accuride International.
   b. Blum, Julius & Co., Inc.
   c. CompX International, Inc.

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.

C. Back-Mounted Pulls: BHMA A156.9, B02011.

D. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

F. Shelf Rests: BHMA A156.9, B04013; metal.

G. Drawer Slides: BHMA A156.9.

H. Door Locks: BHMA A156.11, E07121.

I. Drawer Locks: BHMA A156.11, E07041.

J. Door and Drawer Silencers: BHMA A156.16, L03011.

K. Grommets for Cable Passage: 2-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.


L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Stainless Steel: BHMA 630.

M. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 MISCELLANEOUS MATERIALS

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

C. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.6 FABRICATION

A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Notify Architect seven days in advance of the dates and times architectural cabinet fabrication will be complete.
   2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

D. Install glass to comply with applicable requirements in Section 08 80 00 "Glazing" and in GANA's "Glazing Manual."
   1. For glass in frames, secure glass with removable stops.
   2. For exposed glass edges, polish and grind smooth.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.

E. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
F. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION
SECTION 07 41 13.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1  SUMMARY

A. Section includes standing-seam metal roof panels.
B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2  ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
C. Samples: For each type of metal panel indicated.

1.3  INFORMATIONAL SUBMITTALS

A. Product test reports.

1.4  CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5  QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1  PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
   1. Wind Loads: As indicated on Drawings.
   2. Deflection Limits: For wind loads, no greater than 1/180 of the span.
B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:
   1. Test-Pressure Difference: 1.57 lbf/sq. ft.
C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:
   1. Test-Pressure Difference: 2.86 lbf/sq. ft.
D. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.
E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
   1. Uplift Rating: UL 60.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
   1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.

B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Advanced Architectural Products.
      b. Advanced Building Products Inc.
      c. AEP Span; A BlueScope Steel Company.
      d. Architectural Building Components.
      e. Architectural Metal Systems.
      f. ATAS International, Inc.
      g. Berridge Manufacturing Company.
      h. CENTRIA Architectural Systems.
      i. Dimensional Metals, Inc.
      j. Englert, Inc.
      k. Fabral.
      l. Firestone Building Products.
      m. Firestone Metal Products, LLC.
      n. Flexospan Steel Buildings, Inc.
      o. Garland Company, Inc. (The).
      p. IMETCO.
      q. MBCI: a division of NCI Group, Inc.
      r. McElroy Metal, Inc.
      s. Merchant & Evans Inc.
      t. Metal Sales Manufacturing Corporation.
      u. Metal-Fab Manufacturing, LLC.
      w. Petersen Aluminum Corporation.
      x. Ryerson Tull, Inc.
      y. Ultra Seam Incorporated.
      z. Union Corrugating Company.
2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 coating designation; structural quality. Pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.
   a. Nominal Thickness: 0.028 inch.
   c. Color: As selected by Architect from manufacturer's full range.
3. Panel Fasteners: Self-tapping screws designed to withstand design loads.
4. Panel Height: 2.0 inches.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
   1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
   2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
   3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Gutters and Downspouts: Formed from same material as roof panels according to SMACNA's "Architectural Sheet Metal Manual." Finish to match metal roof panels roof fascia and rake trim.

E. Roof Curbs: Fabricated from same material as roof panels, 0.048-inch nominal thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of 0.060-inch nominal thickness, angle, C, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.

F. Panel Fasteners: Self-tapping screws designed to withstand design loads.

G. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
   1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch wide and 1/8 inch thick.
   2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.
2.4 FINISHES

A. Panels and Accessories:
   1. Two-Coat Fluoropolymer: Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.
   2. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 METAL PANEL INSTALLATION

A. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
   1. Install clips to supports with self-tapping fasteners.
   2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
   3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
   4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
   5. Watertight Installation:
      a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
      b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
      c. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
3.3 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION
SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes hollow-metal work.
B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

1.2 DEFINITIONS

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

1.3 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, core descriptions, and finishes.
B. Shop Drawings: Include the following:
   1. Elevations of each door type.
   2. Details of doors, including vertical and horizontal-edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.
   8. Details of moldings, removable stops, and glazing.
   9. Details of conduit and preparations for power, signal, and control systems.
C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
   1. Provide additional protection to prevent damage to factory-finished units.
B. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2.
   1. Physical Performance: Level B according to SDI A250.4.
   2. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
      c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch.
      d. Edge Construction: Model 2, Seamless.
      e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.

3. Frames:
   a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
   b. Construction: Face welded.


2.3 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

   1. Physical Performance: Level A according to SDI A250.4.
   2. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
      c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
      d. Edge Construction: Model 2, Seamless.
      e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion. Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.

3. Frames:
   a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
   b. Construction: Face welded.

2.4 FRAME ANCHORS

A. Jamb Anchors:
   1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
   2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
   3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
   4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
   1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.5 MATERIALS

A. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
B. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
D. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
E. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
F. Glazing: Comply with requirements in Section 08 80 00 "Glazing."
G. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.6 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
B. Hollow-Metal Doors:
   2. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
   3. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
4. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

2. Provide countersunk, flat or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.

5. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
      1) Two anchors per jamb up to 60 inches high.
      2) Three anchors per jamb from 60 to 90 inches high.
      3) Four anchors per jamb from 90 to 120 inches high.
      4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
   b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      1) Three anchors per jamb up to 60 inches high.
      2) Four anchors per jamb from 60 to 90 inches high.
      3) Five anchors per jamb from 90 to 96 inches high.
      4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
   c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

6. Door Silencers: Drill stops to receive door silencers where specified in Section 08 71 00. Keep holes clear during construction.

D. Fabricate concealed stiffeners and edge channels from either cold or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with buttered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.

2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.

3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

4. Provide loose stops and moldings on inside of hollow-metal work.
5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.7 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

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

2. **Floor Anchors:** Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

3. **Metal-Stud Partitions:** Solidly pack mineral-fiber insulation inside frames.

4. **In-Place Concrete or Masonry Construction:** Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

5. **Installation Tolerances:** Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
   a. **Squareness:** Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. **Alignment:** Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. **Twist:** Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. **Plumbness:** Plus or minus 1/16 inch, measured at jambs at floor.

C. **Hollow-Metal Doors:** Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. **Non-Fire-Rated Steel Doors:**
      a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
      b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
      c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
      d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

D. **Glazing:** Comply with installation requirements in Section 08 80 00 “Glazing” and with hollow-metal manufacturer's written instructions.
   1. Secure stops with countersunk flat or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 **ADJUSTING AND CLEANING**

A. **Final Adjustments:** Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. **Prime-Coat Touchup:** Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. **Metallic-Coated Surface Touchup:** Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. **Touchup Painting:** Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

**END OF SECTION**
SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solid-core doors with wood-veneer faces.
   2. Factory finishing flush wood doors.
   3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 08 80 00 "Glazing" for glass view panels in flush wood doors.
   3. Section 09 91 13 "Exterior Painting" Section 09 91 23 "Interior Painting" Section 09 93 00 "Staining and Transparent Finishing" for field finishing doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
   1. Dimensions and locations of blocking.
   2. Dimensions and locations of mortises and holes for hardware.
   3. Dimensions and locations of cutouts.
   4. Undercuts.
   5. Requirements for veneer matching.
   6. Doors to be factory finished and finish requirements.
   7. Fire-protection ratings for fire-rated doors.

C. Samples for Initial Selection: For factory-finished doors.

D. Samples for Verification:
   1. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
      a. Provide Samples for each species of veneer and solid lumber required.
      b. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door ontop and bottom rail with opening number used on Shop Drawings.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 17 and 50 percent during remainder of construction period.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Algoma Hardwoods, Inc.
2. Ampco.
3. Chappell Door Co.
4. Eggers Industries.
5. General Veneer Manufacturing Co.
7. Haley Brothers, Inc.
8. Ipik Door Company.
10. Marlite.
11. Marshfield Door Systems, Inc.
12. Mohawk Doors; a Masonite company.
15. Vancouver Door Company.
16. VT Industries, Inc.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WTs "Architectural Woodwork Standards."
   1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
   2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

B. Particleboard-Core Doors:
   1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no urea-formaldehyde.
   2. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

C. Structural-Composite-Lumber-Core Doors:
      a. Screw Withdrawal, Face: 700 lbf.
      b. Screw Withdrawal, Edge: 400 lbf.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors SCTF:
   1. Grade: Premium, with Grade AA faces.
   2. Species: Select white maple.
   3. Cut: Plain sliced (flat sliced).
   4. Pair and Set Match: Provide for doors hung in same opening.
   5. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
6. Exposed Vertical Edges: Same species as faces or a compatible species - edge Type A.
7. Core: Particleboard.
8. Construction: Seven plies, either bonded or nonbonded construction.

2.4 LIGHT FRAMES AND LOUVERS

A. Louvers for Fire-Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire-protection rating of 1-1/2 hours and less.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
   1. Comply with NFPA 80 requirements for fire-rated doors.
B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
   1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
C. Openings: Factory cut and trim openings through doors.
   1. Light Openings: Trim openings with moldings of material and profile indicated.

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
   1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
B. Factory finish doors that are indicated to receive transparent finish.
C. Transparent Finish:
   1. Grade: Premium.
   2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 5, conversion varnish.
   3. Staining: As selected by Architect from manufacturer's full range.
   4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
   5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.
   1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
   2. Reject doors with defects.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 INSTALLATION

A. Hardware: For installation, see Section 08 71 00 "Door Hardware."
B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.
B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION
SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior and interior storefront framing.
   2. Exterior and interior manual-swing entrance doors.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
   1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
   2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
      a. Joinery, including concealed welds.
      b. Anchorage.
      c. Expansion provisions.
      d. Glazing.
      e. Flashing and drainage.
   3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
   1. Joinery, including concealed welds.
   2. Anchorage.
   5. Flashing and drainage.

E. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.

2. Failure also includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.
   d. Loosening or weakening of fasteners, attachments, and other components.
   e. Failure of operating units.

B. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Exterior Fixed Framing and Glass Area:
   a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.

2. Exterior Entrance Doors:
   a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.

C. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.

D. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
   a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
   b. Low Exterior Ambient-Air Temperature: 0 deg F.
   c. Interior Ambient-Air Temperature: 75 deg F.

2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Arcadia, Inc.
2. Arch Aluminum & Glass Co., Inc.
3. CMI Architectural.
5. EFCO Corporation.
7. Leed Himmel Industries, Inc.
8. Oldcastle BuildingEnvelope.
10. TRACO.
11. Tubelite.
12. United States Aluminum.
13. YKK AP America Inc.

B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
2. Finish: Clear anodic finish Color anodic finish Baked-enamel or powder-coat finish High-performance organic finish.
3. Fabrication Method: Field-fabricated stick system.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Materials:
1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   a. Sheet and Plate: ASTM B 209.
   b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
   c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
   d. Structural Profiles: ASTM B 308/B 308M.
2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
   a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
   b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
   c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
   1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
      a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
   2. Door Design: Medium stile; 3-1/2-inch nominal width.
      a. Provide nonremovable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Specified in Section 08 71 00 "Door Hardware."

2.6 GLAZING

A. Glazing: Comply with Section 08 80 00 "Glazing."
B. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L.
C. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.7 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
   2. Reinforce members as required to receive fastener threads.
   3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
C. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
D. Concealed Flashing: Manufacturer’s standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
E. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.
B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
C. Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fitted joints with ends coped or mitered.
   3. Physical and thermal isolation of glazing from framing members.
   4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   5. Provisions for field replacement of glazing from exterior.
   6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
F. Storefront Framing: Fabricate components for assembly using shear-block system screw-spline system head-and-sill-receptor system with shear blocks at intermediate horizontal members Insert system.
G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
   1. At exterior doors, provide compression weather stripping at fixed stops.
H. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
I. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
J. At exterior doors, provide weather sweeps applied to door bottoms.
K. Entrance Door Hardware Installation: Factory install entrance door hardware. Disassemble as needed for shipping.
L. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 INSTALLATION

A. General:
   1. Comply with manufacturer's written instructions.
   2. Do not install damaged components.
   3. Fit joints to produce hairline joints free of burrs and distortion.
   4. Rigidly secure nonmovement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
   6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection: Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.

C. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

D. Coordinate first paragraph below with manufacturers' written recommendations.

E. Set continuous sill members and flashing in full sealant bed as specified in Section 07 92 00 "Joint Sealants" to produce weathertight installation.

F. Install components plumb and true in alignment with established lines and grades.

G. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

H. Install glazing as specified in Section 08 80 00 "Glazing."

I. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
   1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
   2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.3 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
   1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
   2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
   3. Alignment:
      a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
      b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
      c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
   4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

END OF SECTION
SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Mechanical door hardware for the following: Swinging doors.
   2. Gate hardware.
   3. Cylinders for door hardware specified in other Sections.
   4. Electrified door hardware.

B. Related Requirements:
   1. Divisions 01 Specification Sections apply to Work of this Section.
   2. Section 06 41 16 "Plastic-Laminate-Clad Architectural Cabinets" for cabinet door hardware provided with cabinets.
   3. Section 08 11 13 "Hollow Metal Doors and Frames."
   4. Section 08 14 16 "Flush Wood Doors."
   5. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts" for aluminum door gasketing and thresholds.
   6. Section 08 71 13 "Automatic Door Operators" for low-energy power operators and low-energy power-assist operators.
   7. Division 26 for electrical requirements.

1.2 DEFINITIONS

A. Door: A hinged or sliding barrier at the entrance of a building or room.
B. Leaf: A single independently moving panel of a door.
C. Pair: A door with two horizontal leafs.

1.3 COORDINATION

A. Floor-Recessed Door Hardware: Coordinate layout and installation with floor construction.
   1. Cast anchoring inserts into concrete.
B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.
F. Exit Devices and Door Lite: Locate the exit device below the door lite frame on hollow metal and wood doors.
1.4 PREINSTALLATION MEETINGS

A. Keying Conference: Conduct conference at Project site.
   1. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:
      a. Preliminary key system schematic diagram.
      b. Requirements for access control.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
B. Shop Drawings: For electrified door hardware. Shop drawings for manufacture standard plug connectors are not required.
   1. Include diagrams for power, signal, and control wiring.
   2. Include details of interface of electrified door hardware and building safety and security systems.
C. Samples for Initial Selection: For each type of exposed finish.
D. Samples for Verification: For each type of exposed product, in each finish specified.
   1. Tag Samples with full product description to coordinate Samples with door hardware schedule.
E. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
   2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
   3. Content: Include the following information:
      a. Identification number, location, hand, fire rating, size, and material of each door and frame.
      b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
      c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
      d. Description of electrified door hardware sequences of operation and interfaces with other building control systems.
      e. Fastenings and other installation information.
      f. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
      g. Mounting locations for door hardware.
      h. List of related door devices specified in other Sections for each door and frame.
F. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.
1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and Architectural Hardware Consultant.
B. Product Certificates: For each type of electrified door hardware.
   1. Certify that door hardware for use on each type and size of labeled fire-rated doors
      complies with listed fire-rated door assemblies.
C. Product Test Reports: For compliance with accessibility requirements, for tests performed
   by manufacturer and witnessed by a qualified testing agency, for door hardware on doors
   located in accessible routes.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
B. Schedules: Final door hardware and keying schedules.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective
   covering for storage and identified with labels describing contents.
   1. Door Hardware:
      a. Blank Keys: Provide one blank key for each lock specified.
      b. Cylinder Cores: Provide 10 extra cylinder cores for each master key group.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and
   approved by product manufacturers and of an Architectural Hardware Consultant who is
   available during the course of Work to consult Contractor, Architect, and Owner about
   door hardware and keying.
   1. Warehousing Facilities: In Project's vicinity.
   2. Scheduling Responsibility: Preparation of door hardware and keying schedule.
   3. Engineering Responsibility: Preparation of data for electrified door hardware,
      including Shop Drawings, based on testing and engineering analysis of
      manufacturer's standard units in assemblies similar to those indicated for this
      Project.
B. Architectural Hardware Consultant Qualifications: A person who is experienced in
   providing consulting services for door hardware installations that are comparable in
   material, design, and extent to that indicated for this Project and who is currently certified
   by DHI as an Architectural Hardware Consultant (AHC) and an Electrified Hardware
   Consultant (EHC); or an Architectural Openings Consultant (AOC); or an Access Control
   System Consultant (ACSC).

1.10 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware
   delivered to Project site.
B. Tag each item or package separately with identification coordinated with the final door
   hardware schedule, and include installation instructions, templates, and necessary fasteners
   with each item or package.
C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of door hardware from single manufacturer.
   1. Provide electrified door hardware from same manufacturer as mechanical door hardware unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
B. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
D. Accessibility Requirements: For door hardware on doors in an accessible route, comply with Texas Accessibility Standard DOJ's "2010 ADA Standards for Accessible Design."
   1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
   2. Comply with the following maximum opening-force requirements:
      a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
      b. Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
      c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
   3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
   4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
   5. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

2.3 SCHEDULED DOOR HARDWARE

A. Provide products for each door that comply with requirements indicated in Part 2 and door hardware schedule.
   1. Door hardware is scheduled in Section 08 71 00.10 "Door Hardware Schedule."

2.4 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allegion plc.
      b. Bommer Industries, Inc.
      c. Hager Companies.
      d. McKinney Products Company; an ASSA ABLOY Group company.
2. Non-Ferrous: Where scheduled, provide hinges with base metal of brass, bronze, or stainless steel 300 Series.
3. Provide wide throw and swing clear hinges when dimensionally required.

2.5 CONTINUOUS HINGES

A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

B. Pin-and-Barrel-Type Hinges:
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Allegion plc.
      b. Architectural Builders Hardware Mfg., Inc.
      c. Hager Companies.
      d. Markar Architectural Products, Inc; an ASSA ABLOY Group company.
      e. McKinney Products Company; an ASSA ABLOY Group company.
      f. PBB, Inc.
      g. Select Products Limited.

C. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Allegion plc.
      b. Architectural Builders Hardware Mfg., Inc.
      c. Hager Companies.
      d. Markar Architectural Products, Inc; an ASSA ABLOY Group company.
      e. McKinney Products Company; an ASSA ABLOY Group company.
      f. PBB, Inc.
      g. Select Products Limited.

D. Power Transfer: On doors scheduled power transfer, modify hinge to receive power transfer.

E. Provide wide throw and swing clear hinges when dimensionally required.

2.6 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule and within this Article.
B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
C. Lock Backset: 2-3/4 inches unless otherwise indicated.
D. Lock Trim:
   1. Lever and Escutcheons (Roses) Basis-of-Design Product: Subject to compliance with requirements, provide product indicated in door hardware schedule.
   2. Dummy Trim: Match lever lock trim and escutcheons.
E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
   1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
   2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
   3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
   4. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.

F. Mortise Locks: BHMA A156.13; Grade 1; stamped steel case with steel or brass parts; Series 1000.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Allegion plc.; L9000 or MA Series.
      b. Arrow USA; an ASSA ABLOY Group company; AM/BM Series.
      d. Cal-Royal Products, Inc.; M Series.
      e. Corbin Russwin, Inc.; an ASSA ABLOY Group company; ML2000 Series.
      f. DORMA USA, Inc; M9000 Series.
      g. Hager Companies; 3800 Series.
      h. Marks USA; 5 Series.
      i. PDQ Manufacturing; MR Series.
      j. SARGENT Manufacturing Company; ASSA ABLOY; 8200 Series.
      k. Stanley Commercial Hardware; a division of Stanley Security Solutions; QM100 Series.
      l. Yale Security Inc; an ASSA ABLOY Group company; 8800 Series.
   2. Latch operated by rotating inside or outside lever. Inside lever never locks. Outside lever locks by inside or outside key. Lock indicator on inside.

G. Push-Pull Latches: Mortise, BHMA A156.13; with paddle handles that retract latchbolt; capable of being mounted vertically or horizontally.

2.7 ELECTRIC STRIKES

A. Electric Strikes: BHMA A156.31; Grade 1; with faceplate to suit lock and frame.

2.8 ELECTROMAGNETIC LOCKS

A. Electromagnetic Locks: BHMA A156.23; electrically powered; with electromagnet attached to frame and armature plate attached to door; full-exterior or full-interior type, as required by application indicated.

B. Delayed-Egress Electromagnetic Locks: BHMA A156.24, electrically powered, with electromagnet attached to frame and armature plate attached to door; depressing push bar for more than three seconds initiates irreversible alarm and adjustable time delay for egress. When integrated with fire alarm, fire alarm voids time delay.

2.9 ELECTROMECHANICAL LOCKS

A. Electromechanical Locks: BHMA A156.25; motor or solenoid driven; with strike that suits frame.
2.10 SELF-CONTAINED ELECTRONIC LOCKS

A. Self-Contained Electronic Locks: BHMA A156.25, mortise; with internal, battery-powered, self-contained electronic locks; consisting of complete lockset, motor-driven lock mechanism, and actuating device; enclosed in zinc-dichromate-plated, wrought-steel case, and strike that suits frame. Provide key override, low-battery detection and warning, LED status indicators, and ability to program at the lock.

2.11 SURFACE BOLTS

A. Surface Bolts: BHMA A156.16, L04161; 1-inch throw.

2.12 MANUAL FLUSH BOLTS

A. Manual Flush Bolts: BHMA A156.16, L04081, and a dust proof strike, L04021; minimum 3/4-inch throw; designed for mortising into door edge.

2.13 AUTOMATIC AND SELF-LATCHING FLUSH BOLTS

A. Automatic and Self-Latching Flush Bolts: BHMA A156.16, Type 25 for automatic and Type 27 for self-latching; minimum 3/4-inch throw; designed for mortising into door edge. Include wear plates.

2.14 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4, Grade 1; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

1. Install closer on the inside of the door, unless noted otherwise.
2. Modern type with cover.
3. Provide separate adjustable backcheck intensity, closing speed, and latch speed.

2.15 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16.

2. Exterior Floor Stops: L02121, floor stop. Where overhead stops are also scheduled, coordinate mounting location with overhead stops.
3. Interior Floor Stops: Dome, L02141.

2.16 OVERHEAD STOPS AND HOLDERS

A. Overhead Stops and Holders: BHMA A156.8.

1. Overhead Stops: C02541.
2. Overhead Rod Stops: C08541. Overhead rod stops may be used on the interior of mechanical, electrical, and storage rooms where overhead stops are scheduled.
4. Overhead Rod Holders: C08511. Overhead rod holders may be used on the interior of mechanical, electrical, and storage rooms where overhead holders are scheduled.
2.17 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

B. Maximum Air Leakage: When tested according to ASTM E 283 with tested pressure differential of 0.3-inch wg, as follows:
   1. Smoke-Rated Gasketing: 0.3 cfm/sq. ft. of door opening.
   2. Gasketing on Single Doors: 0.3 cfm/sq. ft. of door opening.
   3. Gasketing on Double Doors: 0.50 cfm per foot of door opening.

2.18 DOOR SILENCERS

A. Door Silencers: BHMA A156.16, L03011.

2.19 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

2.20 GATE HARDWARE

A. Decorative Metal Gates:
   1. Gate Hinges: D&D Technologies; SureClose hydraulic closer and hinge, flush mount. Coordinate gate weight with hinge combinations.
   2. Gate Stops: L02121 floor stops. Locate gate stop to insure gate hinges close automatically and the gate hinge warranty is not voided.
   3. Gate Rim Exit Device: Detex; Advantex Series, Weatherized.
      b. Cylinder on outside.
      c. Accessible turn or pull on outside.

2.21 FABRICATION

A. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

B. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.
   1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
   2. Fire-Rated Applications:
      a. Wood or Machine Screws: For the following:
         1) Hinges mortised to doors or frames.
         2) Strike plates to frames.
         3) Closers to doors and frames.
b. Steel Through Bolts: For the following unless door blocking is provided:
   1) Surface hinges to doors.
   2) Closers to doors and frames.
   3) Surface-mounted exit devices.

3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

C. Aluminum Door Hardware: After door hardware and aluminum door submittals are approved, ship aluminum door hardware to door manufacture for factory installation.

2.22 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule. Match lock or operating trim for finishes not scheduled. Refer to above for hinge non-ferrous requirement.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

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

3.2 PREPARATION

A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Wood Doors: Comply with door and hardware manufacturers' written instructions.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
   2. Custom Steel Doors and Frames: HMMA 831.
   3. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."
B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
   1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
   2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of leaf height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Key Control System:
   1. Key Control Cabinet: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
   2. Key Lock Boxes: Install where indicated or approved by Architect to provide controlled access for fire and medical emergency personnel.

E. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 07 92 00 "Joint Sealants."

F. Stops: Provide wall stops for interior leafs and overhead stops for exterior leafs unless other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

G. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

H. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
   2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.
B. Clean operating items as necessary to restore proper function and finish.
C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.
3.6 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

3.7 DOOR HARDWARE SCHEDULE

A. Refer to Section 08 71 00.10 "Door Hardware Schedule."

END OF SECTION
SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Glass for:
      a. Doors.
      b. Interior borrowed lites.
      c. Storefront framing.
   2. Glazing sealants and accessories.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
D. Interspace: Space between lites of an insulating-glass unit.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Glass Samples: For each type of the following products; 12 inches square.
   1. Tinted glass.
   2. Coated glass.
   3. Laminated glass.
   4. Insulating glass.
C. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.
1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
   1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Glass Product: Subject to compliance with requirements, provide product indicated in glass schedules or comparable product by one of the following:
   1. AGC Glass Company North America, Inc.
   2. Guardian Industries Corp.
   3. Oldcastle BuildingEnvelope.
   4. Pilkington North America Inc.
   5. PPG Industries, Inc.
   6. Viracom, Inc.
B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
   1. Obtain tinted glass from single source from single manufacturer.
C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
   1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
      a. Basic Wind Speed: 110 mph.
      b. Importance Factor: 1.0.
      c. Exposure Category: B.
C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
   1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
   2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
3. **U-Factors:** Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
4. **Solar Heat-Gain Coefficient and Visible Transmittance:** Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.

### 2.3 GLASS PRODUCTS, GENERAL

**A. Glazing Publications:** Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: "Glazing Manual."

**B. Safety Glazing Labeling:** Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

**C. Thickness:** Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

**D. Strength:** Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

### 2.4 GLASS PRODUCTS

**A. Clear Annealed Float Glass:** ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

**B. Fully Tempered Float Glass:** ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. **Fabrication Process:** By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

### 2.5 INSULATING GLASS

**A. Insulating-Glass Units:** Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. **Sealing System:** Dual seal, with manufacturer's standard primary and secondary sealants.
2. **Spacer:** Manufacturer's standard spacer material and construction.
2.6 GASKET GLAZING

A. Provide preformed gaskets for aluminum framing.
B. ASTM C864 resilient type as recommended by glazing manufacturer for framing system furnished with extruded shape to suit glazing channel retaining slot.
C. Color selected by Architect from manufacturer's standard range of colors.

2.7 GLAZING TAPES

A. General: Provide glazing tape for interior hollow metal and wood doors and frames.
B. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
   1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
   2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.9 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
   1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
      a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
F. Provide spacers for glass lites where length plus width is larger than 50 inches.
1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
E. Do not remove release paper from tape until right before each glazing unit is installed.
F. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
E. Install gaskets so they protrude past face of glazing stops.

3.6 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.
B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
   1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
C. Remove and replace glass that is damaged during construction period.
D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.7 MONOLITHIC GLASS SCHEDULE

A. Glass Type G01: Clear annealed float glass.
   1. Minimum Thickness: 6 mm.
B. Glass Type G02: Clear fully tempered float glass.
   1. Minimum Thickness: 6 mm.
   2. Safety glazing required.
C. Glass Type G04: Tinted fully tempered float glass.
   1. Basis-of-Design Product: PPG Industries, Inc; PACIFICA.
   2. Minimum Thickness: 6 mm.

3.8 INSULATING GLASS SCHEDULE

A. Glass Type G12: Low-E-coated, tinted insulating glass.
   2. Overall Unit Thickness: 1 inch.
   3. Minimum Thickness of Each Glass Lite: 6 mm.
   4. Outdoor Lite: Tinted fully tempered float glass.
   5. Interspace Content: Argon.
   6. Indoor Lite: Clear fully tempered float glass.
   7. Low-E Coating: Pyrolytic or sputtered on second or third surface.
   8. Summer Daytime U-Factor: 0.46 maximum.
  10. Safety glazing required.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Non-load-bearing steel framing systems for interior partitions.
   2. Suspension systems for interior ceilings and soffits.
   3. Grid suspension systems for gypsum board ceilings.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Studs and Runners: Provide documentation that framing members' certification is according to SIFA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members."

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
   1. Embossed steel studs and runners.
   2. Firestop tracks.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. Horizontal Deflection: For wall assemblies, limited to following ratios of the wall height based on horizontal loading of 5 lbf/sq. ft. The ratios listed below are based on the scheduled finishes.

2.2 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products of one of the following, unless noted otherwise in this Section:
   1. AllSteel & Gypsum Products, Inc.
   2. California Expanded Metal Products Company (CEMCO).
   4. Consolidated Fabricators Corp.; Building Products Division.
   5. Craco Mfg., Inc.
   6. Custom Stud Inc.
2.3 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

B. Studs and Runners: ASTM C 645. Use either steel studs and runners or embossed steel studs and runners.
   1. Steel Studs and Runners:
      a. Minimum Base-Metal Thickness: As required by performance requirements for horizontal deflection.
      b. Depth: As indicated on Drawings.
   2. Embossed Steel Studs and Runners:
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) CEMCO; California Expanded Metal Products Co.
         2) ClarkDietrich Building Systems.
         3) MarinoWARE.
         4) MBA Building Supplies.
         5) Phillips Manufacturing Co.
         6) Steel Network, Inc. (The).
         7) Telling Industries.
      b. Minimum Base-Metal Thickness: As required by horizontal deflection performance requirements.
      c. Depth: As indicated on Drawings.

C. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base-Metal Thickness: 0.0329 inch.
   2. Depth: As indicated on Drawings.

2.4 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
B. Hanger Attachments to Concrete:
   1. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488/E 488M conducted by a qualified testing agency.
   2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.
E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch wide flanges.
   1. Depth: As indicated on Drawings 2-1/2 inches 2 inches 1-1/2 inches.
F. Furring Channels (Furring Members):
   1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch wide flanges, 3/4 inch deep.
      a. Minimum Base-Metal Thickness: 0.0296 inch.
G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
   1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
   1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
D. Install bracing at terminations in assemblies.
E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
   1. Single-Layer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
   2. Multilayer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
   3. Tile Backing Panels: As required by horizontal deflection performance requirements unless otherwise indicated.
B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
C. Install studs so flanges within framing system point in same direction.
D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
   1. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
      a. Install two studs at each jamb unless otherwise indicated.
      b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
      c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
   2. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
   3. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
   4. Curved Partitions:
      a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
      b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.
E. Direct Furring:
1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 16 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION
SECTION 09 24 00 - CEMENT PLASTERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior vertical plasterwork (stucco).
   2. Exterior horizontal plasterwork (stucco).

B. Related Sections:
   1. Division 01 Specification Sections apply to Work of the Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Samples for Initial Selection: For each type of factory-prepared finish coat and for each color and texture specified.
C. Samples for Verification: For each type of factory-prepared finish coat and for each color and texture specified, 12 by 12 inches, and prepared on rigid backing.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover, and keep them dry and protected against damage from weather, moisture, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.4 FIELD CONDITIONS

A. Comply with ASTM C 926 requirements.
B. Exterior Plasterwork:
   1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
   2. Apply plaster when ambient temperature is greater than 40 deg F.
   3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

PART 2 - PRODUCTS

2.1 METAL LATH

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
      b. CEMCO; California Expanded Metal Products Co.
      c. ClarkDietrich Building Systems.
      d. MarinoWARE.
      e. Phillips Manufacturing Co.
B. Paper Backing: FS UU-B-790a, Type I, Grade D, Style 2 vapor-permeable paper.
   1. Provide paper-backed lath at exterior locations.

2.2 ACCESSORIES

A. General: Comply with ASTM C 1063, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
      b. CEMCO; California Expanded Metal Products Co.
      c. ClarkDietrich Building Systems.
      d. MarinoWARE.
      e. Phillips Manufacturing Co.
   5. Casing Beads: Fabricated from zinc or zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
   6. Control Joints: Fabricated from zinc or zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.

2.3 MISCELLANEOUS MATERIALS

A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminants, manufactured for use in cement plaster.
C. Fasteners for Attaching Metal Lath to Substrates: ASTM C 1063.
D. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter unless otherwise indicated.

2.4 PLASTER MATERIALS

A. Colorants for Job-Mixed Finish Coats: Colorfast mineral pigments that produce finish plaster color to match Architect's sample.
B. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems formulated with colorfast mineral pigments and fine aggregates; for use over cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. California Stucco Products Corp.; Texture Flex.
      b. Dryvit Systems, Inc.; Dryvit TAFS Lymstone.
      c. El Rey Stucco Solutions; a Parex USA, Inc. brand.; Perma-Flex Fine Finish.
      d. Finestone, BASF Wall Systems, Inc.; PebbleTex.
      e. Master Wall Inc.; Superior Finishes.
2. Color: As selected by Architect from manufacturer's full range.

2.5 PLASTER MIXES

A. General: Comply with ASTM C 926 for applications indicated.
   1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. of cementitious materials.

B. Factory-Prepared Finish-Coat Mixes: For acrylic-based finish coatings, comply with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

B. Prepare smooth, solid substrates for plaster according to ASTM C 926.

3.3 INSTALLING METAL LATH

A. Metal Lath: Install according to ASTM C 1063.
   2. Flat-Ceiling and Horizontal Framing: Install flat-diamond-mesh lath.

3.4 INSTALLING ACCESSORIES

A. Install according to ASTM C 1063 and at locations indicated on Drawings.

B. Reinforcement for External (Outside) Corners:
   1. Install lath-type, external-corner reinforcement at exterior locations.

C. Control Joints: Locate as approved by Architect for visual effect and as follows:
   1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
      a. Vertical Surfaces: 144 sq. ft.
      b. Horizontal and Other Nonvertical Surfaces: 100 sq. ft.
   2. At distances between control joints of not greater than 18 feet o.c.
   3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
4. Where control joints occur in surface of construction directly behind plaster.
5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

3.5 PLASTER APPLICATION

A. General: Comply with ASTM C 926.
   1. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane in finished plaster surfaces when measured by a 10-foot straightedge placed on surface.
   2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
   3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

B. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.

3.6 PLASTER REPAIRS

A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.7 CLEANING AND PROTECTION

A. Remove temporary protection and enclosure of other work after plastering is complete. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION
SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Interior gypsum board.
   2. Tile backing panels.
   3. Texture finishes.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 06 16 00 "Sheathing" for gypsum sheathing for exterior walls.
   3. Section 09 22 16 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 DELIVERY, STORAGE AND HANDLING

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

1.4 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

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

A. Gypsum Wallboard: ASTM C 1396/C 1396M.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Gypsum.
      b. CertainTeed Corporation.
      c. Continental Building Products, LLC.
      d. Georgia-Pacific Building Products.
      e. National Gypsum Company.
      f. PABCO Gypsum.
      g. Temple-Inland Building Products by Georgia-Pacific.
      h. USG.
   2. Thickness: 5/8 inch.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Gypsum.
      b. CertainTeed Corporation.
      c. Continental Building Products, LLC.
      d. Georgia-Pacific Building Products.
      e. National Gypsum Company.
      f. PABCO Gypsum.
      g. Temple-Inland Building Products by Georgia-Pacific.
      h. USG.
   2. Thickness: 5/8 inch.

C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Gypsum.
      b. CertainTeed Corporation.
      c. Continental Building Products, LLC.
      d. Georgia-Pacific Building Products.
      e. National Gypsum Company.
      f. PABCO Gypsum.
      g. Temple-Inland Building Products by Georgia-Pacific.
      h. USG.
   2. Thickness: 1/2 inch.

2.4 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. C-Cure.
      b. CertainTeed Corporation.
      c. Custom Building Products.
2. FinPan, Inc.
3. James Hardie Building Products, Inc.
5. United States Gypsum Company.

2. Thickness: 5/8 inch.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
   2. Shapes:
      a. Cornerbead.
      b. U-Bead: J-shaped; exposed short flange does not receive joint compound.
      c. Expansion (control) joint.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.
B. Joint Tape:
   1. Interior Gypsum Board: Paper.
   2. Tile Backing Panels: As recommended by panel manufacturer.
C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use drying-type, all-purpose compound.
D. Joint Compound for Tile Backing Panels:
   1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
C. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
   1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
D. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Accumetric LLC.
   b. Grabber Construction Products.
   c. Hilti, Inc.
   d. Pecora Corporation.
   e. Specified Technologies, Inc.
   f. United States Gypsum Company.

2.8 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.
B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
E. Form control and expansion joints with space between edges of adjoining gypsum panels.
F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4 to 3/8-inch wide joints to install sealant.
G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4 to 1/2-inch wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Wallboard Type: Vertical surfaces unless otherwise indicated.
   2. Type X: Where required for fire-resistance-rated assembly.
   3. Ceiling Type: Ceiling surfaces.

B. Single-Layer Application:
   1. On partitions/walls, apply gypsum panels in the most economical direction unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
      b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
   2. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
   3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
   1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
   2. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
   3. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

D. Curved Surfaces: Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch long straight sections at ends of curves and tangent to them.

3.4 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:
   1. Cornerbead: Use at outside corners.
   2. U-Bead: Use at exposed panel edges.
   3. Curved-Edge Cornerbead: Use at curved openings.
3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
   1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
   2. Level 2: Panels that are substrate for tile.
   3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
      a. Primer and its application to surfaces are specified in Section 09 91 23 “Interior Painting.”

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 APPLYING TEXTURE FINISHES

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

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written instructions.

3.8 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION
SECTION 09 30 13 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Porcelain tile.
   2. Ceramic tile.
B. Related Requirements:
   1. Section 09 29 00 "Gypsum Board" for cementitious backer units.

1.2 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
C. Module Size: Actual tile size plus joint width indicated.
D. Face Size: Actual tile size, excluding spacer lugs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Samples for Verification:
   1. Full-size units of each type and composition of tile and for each color and finish required.
   2. Full-size units of each type of trim and accessory for each color and finish required.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.
B. Product Certificates: For each type of product.
C. Product Test Reports: For tile-setting and -grouting products.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
   2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.
1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
D. Store liquid materials in unopened containers and protected from freezing.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
   1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard grade requirements.
B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
   1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.3 TILE PRODUCTS

A. Ceramic Tile.
   1. Manufacturers: Subject to compliance with requirements, provide products indicated on drawings.
2.4 GROUT MATERIALS

A. Water-Cleanable Epoxy Grout: ANSI A118.3.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. ARDEX Americas.
      c. Boiardi Products Corporation; a QEP company.
      d. Bonsal American, an Oldcastle company.
      e. Bostik, Inc.
      f. C-Cure.
      g. Custom Building Products.
      h. Jamo Inc.
      i. LATICRETE SUPERCAP, LLC.
      j. MAPEI Corporation.
      k. Merkrete by Parex USA, Inc.
      l. Sauereisen.
      m. Southern Grouts & Mortars, Inc.
      n. Summitville Tiles, Inc.
      o. TEC / H.B. Fuller Construction Products Inc.
   2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.

B. Grout for Pregouted Tile Sheets: Same product used in factory to pregrount tile sheets.

2.5 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
B. Add materials, water, and additives in accurate proportions.
C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
   2. Verify that concrete substrates for tile floors installed with adhesives bonded mortar bed or thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
      a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

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

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
   a. Tile floors in wet areas.
   b. Tile floors consisting of tiles 8 by 8 inches or larger.
   c. Tile floors consisting of rib-backed tiles.
B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
1. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
   1. Porcelain Tile: 1/4 inch.

3.4 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
   1. Remove grout residue from tile as soon as possible.
   2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.5 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.6 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:
   1. Ceramic Tile Installation: TCNA F115; thinset mortar; epoxy grout.
      b. Grout: Water-cleanable epoxy grout.

B. Interior Wall Installations, Masonry or Concrete:
      b. Grout: Water-cleanable epoxy grout.

C. Interior Wall Installations, Metal Studs or Furring:
   1. Ceramic Tile Installation: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units.
      a. Ceramic Tile Type: As Scheduled.
      c. Grout: Water-cleanable epoxy grout.

D. Shower Wall Installations, Metal Studs or Furring:
   1. Ceramic Tile Installation: TCNA B412; thinset mortar on cementitious backer units.
      a. Thinset Mortar: mortar as recommended by manufacturer.
      b. Grout: Water-cleanable epoxy grout.
SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for interior ceilings.
B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Samples: For each exposed product and for each color and texture specified, 12 inches in size.
C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
   1. Acoustical Panels: Set of 6-inch-square Samples of each type, color, pattern, and texture.
   2. Exposed Suspension-System Members, Moldings, and Trim: Set of 12 inch long Samples of each type, finish, and color.

1.3 CLOSEOUT SUBMITTALS

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

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
   2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
   3. Hold-Down Clips: Equal to 2 percent of quantity installed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: Class C according to ASTM E 1264.
   2. Smoke-Developed Index: 450 or less.

2.3 ACOUSTICAL PANELS C1

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. American Gypsum.
   2. Armstrong World Industries, Inc.
   3. CertainTeed Corporation.
   5. Tectum Inc.

B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

C. Classification: Provide panels as follows:
   1. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; with vinyl overlay on face, back, and sealed edges.

D. Color: White.

E. Light Reflectance (LR): Not less than 0.85.

F. Ceiling Attenuation Class (CAC): Not less than 35.

G. Noise Reduction Coefficient (NRC): Not less than 0.75.

H. Edge/Joint Detail: Square.

I. Thickness: 3/4 inch.

J. Modular Size: 24 by 24 inches.
2.4 METAL SUSPENSION SYSTEM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Armstrong World Industries, Inc.
   2. CertainTeed Corporation.
   3. Chicago Metallic Corporation.

B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.

C. Wide-Face, Capped, Double-Web, Fire-Rated, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrotyically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch wide metal caps on flanges.
   2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
   3. Face Design: Flat, flush.
   4. Cap Material: Cold-rolled steel or aluminum.
   5. Cap Finish: Painted white Painted in color as selected from manufacturer's full range Painted to match color indicated by manufacturer's designation Plated with metallic finish indicated by manufacturer's designation Natural finish for aluminum.

2.5 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
   1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:
   2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch diameter wire.

C. Hold-Down Clips: Manufacturer's standard hold-down.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged. Proceed with installation only after unsatisfactory conditions have been corrected.

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

3.2 PREPARATION

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

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.

4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.

6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

7. Do not attach hangers to steel deck tabs.

8. Do not attach hangers to steel roof deck. Attach hangers to structural members.

9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
   1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
   2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
   1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
   2. Install hold-down clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.
      a. Hold-Down Clips: Space 24 inches o.c. on all cross runners.

3.4 CLEANING

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

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

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes vinyl base.
B. Related Sections:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

1.3 MAINTENANCE MATERIAL SUBMITTALS

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

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 FIELD CONDITIONS

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

2.1 VINYL BASE RB1

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Armstrong World Industries, Inc.
   2. Burke Mercer Flooring Products; a division of Burke Industries Inc.
   3. Flexco.
   4. Johnsonite; A Tarkett Company.
   5. Roppe Corporation, USA.
   6. VPI Corporation.

B. Product Standard: ASTM F 1861, Type TV (vinyl, thermoplastic).
   2. Style and Location: Style B, Cove.

C. Minimum Thickness: 0.080 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until materials are the same temperature as space where they are to be installed.

D. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.
3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.
B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
E. Do not stretch resilient base during installation.
F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
G. Job-Formed Corners:
   1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
      a. Form without producing discoloration (whitening) at bends.
   2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
      a. Miter or cope corners to minimize open joints.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
B. Perform the following operations immediately after completing resilient-product installation:
   1. Remove adhesive and other blemishes from surfaces.
C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION
SECTION 09 65 19 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes Rubber floor tile.
B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.3 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.
B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
C. Close spaces to traffic during floor tile installation.
D. Close spaces to traffic for 48 hours after floor tile installation.
E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

2.2 RUBBER FLOOR TILE

A. Products: Subject to compliance with requirements, provide the following:
   1. Allstate Contract Floors; BELEM Rubber Tile.
C. Hardness: Grade 1, minimum hardness of 85, measured using Shore, Type A durometer according to ASTM D 2240.
D. Wearing Surface: Molded pattern.
   1. Molded-Pattern Figure: Raised discs.
E. Thickness: 0.125 inch.
F. Size: 24 by 24 inches.
PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Remove substrate coatings and substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
   2. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
   4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
      a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
      b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
   1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
   1. Lay tiles in pattern indicated.
C. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
D. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
F. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
B. Perform the following operations immediately after completing floor tile installation:
   1. Remove adhesive and other blemishes from surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.
C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
D. Cover floor tile until Substantial Completion.

END OF SECTION
SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes modular carpet tile.
B. Related Requirements:
   1. Section 02 41 19 "Selective Demolition" for removing existing floor coverings.
   2. Section 09 65 13 "Resilient Base and Accessories" Section 09 65 19 "Resilient Tile Flooring" for resilient wall base and accessories installed with carpet tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
   2. Include manufacturer's written installation recommendations for each type of substrate.
B. Shop Drawings: For carpet tile installation, plans showing the following:
   1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
   2. Carpet tile type, color, and dye lot.
   3. Type of subfloor.
   4. Type of installation.
   5. Pattern of installation.
   6. Pattern type, location, and direction.
   7. Pile direction.
   8. Type, color, and location of insets and borders.
   9. Type, color, and location of edge, transition, and other accessory strips.
   10. Transition details to other flooring materials.
C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
   2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.
D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

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

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on Drawings.
B. Color: Indicated on Drawings.
C. Pattern: Indicated on Drawings.
D. Size: Indicated on Drawings.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.
C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 03 30 00 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

D. Preparations: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method: Free lay; install carpet tiles without adhesive.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.
E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:
   1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
   2. Remove yarns that protrude from carpet tile surface.

B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION
SECTION 09 91 13 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
   1. Steel.
   2. Exterior portland cement plaster (stucco).
   3. Exterior gypsum board.
B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 09 91 23 "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.2 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523, a matte flat finish.
B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523, a high-side sheen flat, velvet-like finish.
C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523, an eggshell finish.
D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523, a satin-like finish.
E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523, a semi-gloss finish.
F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523, a gloss finish.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
B. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 12 inches square.
   2. Step coats on Samples to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.
C. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   2. VOC content.
1.4 CLOSEOUT SUBMITTALS
   A. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

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

1.6 QUALITY ASSURANCE
   A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
      1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
         a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
         b. Other Items: Architect will designate items or areas required.
      2. Final approval of color selections will be based on mockups.
         a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
      3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 DELIVERY, STORAGE, AND HANDLING
   A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacture's label with the following information:
      1. Product name and type (description).
      2. Batch date.
      3. Color number.
      4. VOC content.
      5. Environmental handling requirements.
      6. Surface preparation requirements.
      7. Application instructions.
   B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
      1. Maintain containers in clean condition, free of foreign materials and residue.
      2. Remove rags and waste from storage areas daily.
1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company products indicated or comparable product from one of the following:
   1. Benjamin Moore & Co.
   2. Kwal, Division of Sherwin-Williams.
   3. Glidden Professional, Division of PPG Architectural Finishes, Inc.
   4. PPG Architectural Finishes, Inc.
   5. Kelly Moore.
B. Source Limitations: Obtain paint materials from single source from single listed manufacturer.
   1. Manufacturer's designations listed on a separate color schedule are for color reference only and do not indicate prior approval.

2.2 PAINT, GENERAL

A. Standards: Provide products that comply with Manufacture's Premium 1st Quality standards indicated and like VOC limits.
B. Material Compatibility:  
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
D. Colors: As indicated in a color schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of
the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.

1. Report, in writing, conditions that may affect application, appearance, or performance of paint.

B. Substrate Conditions:

1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   a. Masonry (Clay and CMU): 12 percent.
   b. Portland Cement Plaster: 12 percent.
   c. Gypsum Board: 12 percent.

2. Portland Cement Plaster Substrates: Verify that plaster is fully cured.

3. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

C. Proceed with coating application only after unsatisfactory conditions have been corrected; application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.

4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

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

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Portland Cement Plaster (Stucco), Nontraffic Surfaces:
   1. Latex System:
      c. Topcoat: Latex, exterior, satin, (Gloss Level 3-4): S-W A-100 Exterior Latex Satin, A82 Series, at 4.0 mils wet, 1.5 mils dry, per coat.

B. Ferrous Metal, Galvanized-Metal, and Aluminum Substrates:
   1. Water-Based Light Industrial Coating System:
      a. Prime Coat: Shop primer specified in Section where substrate is specified.
C. Exterior Gypsum Board Substrates:
   1. Latex System:
      c. Topcoat: Latex, exterior, low-sheen, (Gloss Level 3-4): S-W A-100 Exterior Latex Low Sheen, A12 Series, at 4.0 mils wet, 1.5 mils dry, per coat.

END OF SECTION
SECTION 09 91 23 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Surface preparation and the application of paint systems on interior substrates.
   2. Fire and smoke assembly identification.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 09 91 13 "Exterior Painting" for surface preparation and the application of
      paint systems on exterior substrates.

1.2 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to
   ASTM D 523, a matte flat finish.

B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees,
   according to ASTM D 523, a high-side sheen flat, velvet-like finish.

C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to
   ASTM D 523, an eggshell finish.

D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees,
   according to ASTM D 523, a satin-like finish.

E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523, a semi-gloss finish.

F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523, a gloss finish.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application
   instructions.

B. Samples for Verification: For each type of paint system and in each color and gloss of
   topcoat.
   1. Submit Samples on rigid backing, 12 inches square.
   2. Step coats on Samples to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same
      designations indicated on Drawings and in schedules.

D. VOC content.

1.4 CLOSEOUT SUBMITTALS

A. Coating Maintenance Manual: Provide coating maintenance manual including area
   summary with finish schedule, area detail designating location where each
   product/color/finish was used, product data pages, material safety data sheets, care and
   cleaning instructions, touch-up procedures, and color samples of each color and finish
   used.
1.5 MAINTENANCE MATERIAL SUBMITTALS

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

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacturer's label with the following information:
   1. Product name and type (description).
   2. Batch date.
   3. Color number.
   4. VOC content.
   5. Environmental handling requirements.
   6. Surface preparation requirements.
   7. Application instructions.

B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
C. Lead Paint: It is not expected that lead paint will be encountered in the Work.
   1. If suspected lead paint is encountered, do not disturb; immediately notify Primary Designer and Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company products indicated or comparable product from one of the following:
   1. Benjamin Moore & Co.
   2. Kwal, Division of Sherwin-Williams.
   3. Glidden Professional, Division of PPG Architectural Finishes, Inc.
   4. PPG Architectural Finishes, Inc.
   5. Kelly Moore.

B. Source Limitations: Obtain paint materials from single source from single listed manufacturer.
   1. Manufacturer's designations listed on a separate color schedule are for color reference only and do not indicate prior approval.

2.2 PAINT, GENERAL

A. Standards: Provide products that comply with Manufacture’s Premium 1st Quality standards indicated and like VOC limits.

B. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. Colors: As indicated in finish legend.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.
   1. Report, in writing, conditions that may affect application, appearance, or performance of paint.

B. Substrate Conditions:
   1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
      a. Concrete: 12 percent.
3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Maintenance Repainting Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
   1. Concrete Floors: Remove oil, dust, grease, dirt, and other foreign materials. Comply with SSPC-SP-13/NACE 6 or ICRI 03732.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Aluminum Substrates: Remove loose surface oxidation.

I. Wood Substrates:
   1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
   2. Sand surfaces that will be exposed to view, and dust off.
   3. Prime edges, ends, faces, undersides, and backsides of wood.
   4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
   1. Paint the following work where exposed in occupied spaces:
      a. Equipment, including panelboards.
      b. Uninsulated metal piping.
      c. Uninsulated plastic piping.
      d. Pipe hangers and supports.
      e. Metal conduit.
      f. Plastic conduit.
      g. Other items as directed by Architect.
   2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

F. Fire and Smoke Assembly Identification: Where assembly types are identified in Drawings, provide stenciled identification in accessible concealed spaces.
   1. Assembly Types Requiring Identification: Fire walls, fire barriers, fire partitions, smoke barriers, and smoke partitions.
   2. Accessible concealed spaces include above ceilings.
   3. Locate within 15 feet of partition ends and at intervals not exceeding 30 feet measured horizontally.
   4. Lettering not less than 3 inches in height with a minimum 3/8-inch stroke in a contrasting color.
   5. Wording: "Fire and/or smoke barrier - Protect all openings."

3.4 FIELD QUALITY CONTROL

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

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. CMU Substrates:
   1. Latex System:

B. Metal Substrates (Aluminum, Steel, Galvanized Steel):
   1. Water-Based Dry-Fall System:
      a. Top Coat: Dry-fall latex, flat: S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42-80 Series, at 6.0 mils wet, 1.7 mils dry.

   2. Acrylic/Alkyd System:
      a. Prime Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, at 5.0 to 10.0 mils wet, 2.0 to 4.0 mils dry.

C. Wood Substrates: Including exposed wood items not indicated to receive shop-applied finish.
   1. Latex System:

D. Gypsum Board and Spray-Texture Ceiling Substrates:
   1. Latex System:

END OF SECTION
SECTION 10 21 13.19 - PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 06 10 00 "Rough Carpentry" Section 06 10 53 "Miscellaneous Rough Carpentry" for blocking.
   3. Section 10 28 00 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories mounted on toilet compartments.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings: For toilet compartments.
   1. Include plans, elevations, sections, details, and attachment details.
   2. Show locations of centerlines of toilet fixtures.
   3. Show locations of floor drains.

C. Samples for Initial Selection: For each type of toilet compartment material indicated.
   1. Include Samples of hardware and accessories involving material and color selection.

D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
   1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch- square Samples of same thickness and material indicated for Work.
   2. Each type of hardware and accessory.

E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.3 INFORMATIONAL SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

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

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents and source.
   1. Door Hinges: One hinge(s) with associated fasteners.
   2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.
   3. Door Bumper: One bumper(s) with associated fasteners.
4. Door Pull: One door pull(s) with associated fasteners.
5. Fasteners: Ten fasteners of each size and type.

1.6 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.
B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and TAS for toilet compartments designated as accessible.

2.2 SOLID-PLASTIC TOILET COMPARTMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Accurate Partitions Corporation.
   2. All American Metal Corp.
   4. Ampco, Inc.
   5. Bradley Corporation; Mills Partitions.
   7. Global Steel Products Corp.
   8. Hadrian Manufacturing Inc.
   10. Marlite.
   11. Metpar Corp.
   12. Partition Systems Incorporated of South Carolina; Columbia Partitions.
   13. Scranton Products.
   14. Weis-Robart Partitions, Inc.
B. Toilet-Enclosure Style: Overhead braced.
C. Urinal-Screen Style: Wall hung.

D. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, no-sightline system, and with homogenous color and pattern throughout thickness of material.
   1. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless-steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
   2. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range.

E. Pilaster Shoes Sleeves (Caps): Manufacturer's standard design; stainless steel.
F. Brackets (Fittings):
   1. Full-Height (Continuous) Type: Manufacturer's standard design; extruded aluminum or stainless steel.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
   1. Hinges: Manufacturer's minimum 0.062-inch thick stainless-steel paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees continuous, cam type that swings to a closed or partially open position continuous, spring-loaded type Insert requirement, allowing emergency access by lifting door. Mount with through-bolts.
   2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
   5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M.
B. Aluminum Extrusions: ASTM B 221.
C. Brass Castings: ASTM B 584.
D. Brass Extrusions: ASTM B 455.
E. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
F. Stainless-Steel Castings: ASTM A 743/A 743M.
G. Zamac: ASTM B 86, commercial zinc-alloy die castings.

2.5 FABRICATION

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

B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
   1. Confirm location and adequacy of blocking and supports required for installation.

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

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
   1. Maximum Clearances:
      a. Pilasters and Panels: 1/2 inch.
      b. Panels and Walls: 1 inch.
   2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
      a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
      b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION
SECTION 10 28 13 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Public-use washroom accessories.
   2. Shower room accessories.
   3. Private-use bathroom accessories.
   5. Warm-air dryers.
   6. Childcare accessories.
   7. Underlavatory guards.
   8. Custodial accessories.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 09 30 13 "Ceramic Tiling" for ceramic toilet and bath accessories.
   3. Section 10 28 13.63 "Detention Toilet Accessories" for accessories designed for installation in detention facilities.

1.2 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Include electrical characteristics.

B. Samples: Full size, for each exposed product and for each finish specified.
   1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated.
   2. Identify accessories using designations indicated.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

B. Toilet Tissue (Roll) Dispenser:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. A&J Washroom Accessories, Inc.
      c. Bobrick Washroom Equipment, Inc.
      d. Bradley Corporation.
      e. Brey-Krause Manufacturing Co.
      f. GAMCO Specialty Accessories; a division of Bobrick.
      g. Tubular Specialties Manufacturing, Inc.

C. Paper Towel (Folded) Dispenser:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. A&J Washroom Accessories, Inc.
      c. Bobrick Washroom Equipment, Inc.
      d. Bradley Corporation.
      e. Brey-Krause Manufacturing Co.
      f. GAMCO Specialty Accessories; a division of Bobrick.
      g. Seachrome Corporation.
      h. Tubular Specialties Manufacturing, Inc.

D. Liquid-Soap Dispenser:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. A&J Washroom Accessories, Inc.
      c. Bobrick Washroom Equipment, Inc.
      d. Bradley Corporation.
      e. Brey-Krause Manufacturing Co.
      f. GAMCO Specialty Accessories; a division of Bobrick.
      g. Seachrome Corporation.
      h. Tubular Specialties Manufacturing, Inc.
   2. Description: Designed for dispensing soap in liquid or lotion form.

E. Grab Bar:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. A&J Washroom Accessories, Inc.
      c. Bobrick Washroom Equipment, Inc.
d. Bradley Corporation.
e. Brey-Krause Manufacturing Co.
f. GAMCO Specialty Accessories; a division of Bobrick.
g. Tubular Specialties Manufacturing, Inc.

3. Material: Stainless steel, 0.05 inch thick.
a. Finish: Smooth, No. 4 finish (satin).

5. Configuration and Length: As indicated on Drawings.

F. Sanitary-Napkin Disposal Unit:
1. Manufacturers: Subject to compliance with requirements, provide products by one of
   the following:
   a. A&J Washroom Accessories, Inc.
c. Bobrick Washroom Equipment, Inc.
d. Bradley Corporation.
e. Brey-Krause Manufacturing Co.
f. GAMCO Specialty Accessories; a division of Bobrick.
g. Seachrome Corporation.
h. Tubular Specialties Manufacturing, Inc.

3. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

G. Mirror Unit:
1. Manufacturers: Subject to compliance with requirements, provide products by one of
   the following:
   a. A&J Washroom Accessories, Inc.
c. Bobrick Washroom Equipment, Inc.
d. Bradley Corporation.
e. Brey-Krause Manufacturing Co.
f. GAMCO Specialty Accessories; a division of Bobrick.
g. Tubular Specialties Manufacturing, Inc.

2. Frame: Stainless-steel channel.
a. Corners: Manufacturer's standard.
3. Hangers: Produce rigid, tamper and theft-resistant installation, using method indicated below.
a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
4. Size: As indicated on Drawings.

H. Coat Hook:
1. Manufacturers: Subject to compliance with requirements, provide products by one of
   the following:
   a. A&J Washroom Accessories, Inc.
c. Bobrick Washroom Equipment, Inc.
d. Bradley Corporation.
e. Brey-Krause Manufacturing Co.
f. GAMCO Specialty Accessories; a division of Bobrick.
g. Tubular Specialties Manufacturing, Inc.
2. Description: Single-prong unit.

2.3 SHOWER ROOM ACCESSORIES

A. Source Limitations: Obtain shower room accessories from single source from single manufacturer.
B. Shower Curtain Rod:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. A&J Washroom Accessories, Inc.
      c. Bobrick Washroom Equipment, Inc.
      d. Bradley Corporation.
      e. Brey-Krause Manufacturing Co.
      f. GAMCO Specialty Accessories; a division of Bobrick.
      g. Tubular Specialties Manufacturing, Inc.
   2. Description: 1-inch OD; fabricated from nominal 0.0375-inch thick stainless steel.
   4. Finish: Stainless steel, No. 4 finish (satin).
C. Shower Curtain:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. A&J Washroom Accessories, Inc.
      c. Bobrick Washroom Equipment, Inc.
      d. Bradley Corporation.
      e. Brey-Krause Manufacturing Co.
      f. GAMCO Specialty Accessories; a division of Bobrick.
      g. Tubular Specialties Manufacturing, Inc.
   2. Size: Minimum 6 inches wider than opening by 72 inches high.
   3. Material: Vinyl, minimum 0.006 inch thick, opaque, matte.
   4. Color: As selected from manufacturer's full range.
   5. Grommets: Corrosion resistant at minimum 6 inches o.c. through top hem.
   6. Shower Curtain Hooks: Chrome-plated or stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.
D. Folding Shower Seat:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. A&J Washroom Accessories, Inc.
      c. Bobrick Washroom Equipment, Inc.
      d. Bradley Corporation.
      e. Brey-Krause Manufacturing Co.
      f. GAMCO Specialty Accessories; a division of Bobrick.
      g. Tubular Specialties Manufacturing, Inc.
   2. Configuration: L-shaped seat, designed for wheelchair access.
   3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect.
E. Soap Dish:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  a. A&J Washroom Accessories, Inc.
  c. Bobrick Washroom Equipment, Inc.
  d. Bradley Corporation.
  e. Brey-Krause Manufacturing Co.
  f. GAMCO Specialty Accessories; a division of Bobrick.
  g. Tubular Specialties Manufacturing, Inc.
2. Description: Without washcloth bar.

F. Robe Hook:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  a. A&J Washroom Accessories, Inc.
  c. Bobrick Washroom Equipment, Inc.
  d. Bradley Corporation.
  e. Brey-Krause Manufacturing Co.
  f. GAMCO Specialty Accessories; a division of Bobrick.
  g. Tubular Specialties Manufacturing, Inc.
2. Description: Double-prong unit.

2.4 WARM-AIR DRYERS

A. Source Limitations: Obtain warm-air dryers from single source from single manufacturer.
B. Electric Hand Dryers:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  a. Dyson Inc.
2. Description: Dyson Airblade DB.
4. Operation: Electronic-sensor activated with operation time of 10 to 20 seconds.
5. Cover Material and Finish: Molded plastic, gray.

2.5 CHILDCARE ACCESSORIES

A. Source Limitations: Obtain childcare accessories from single source from single manufacturer.
B. Diaper-Changing Station:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  b. Diaper Deck & Company, Inc.
  c. Foundations Children's Products.
  d. GAMCO Specialty Accessories; a division of Bobrick.
  e. Koala Kare Products.
  f. SafeStrap Company, Inc. (SSC, Inc.).
  g. Tubular Specialties Manufacturing, Inc.
2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
   a. Engineered to support minimum of 250-lb static load when opened.
3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
5. Material and Finish: Stainless steel, No. 4 finish (satin), exterior shell with rounded plastic corners; HDPE interior in manufacturer's standard color.

2.6 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION
SECTION 10 44 13 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fire-protection cabinets for the following:
      a. Portable fire extinguishers.
   B. Related Requirements:
      1. Division 01 Specification Sections apply to Work of this Section.
      2. Section 10 44 16 "Fire Extinguishers."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed, semirecessed, or surface-mounting method and relationships of box and trim to surrounding construction.
B. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.

1.3 CLOSEOUT SUBMITTALS

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

1.4 COORDINATION

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

PART 2 - PRODUCTS

2.1 FIRE-PROTECTION CABINET (FEC)

A. Cabinet Type: Suitable for fire extinguisher.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. JL Industries, Inc.; a division of the Activar Construction Products Group.
      b. Larsens Manufacturing Company.
      c. Potter Roemer LLC.
   B. Cabinet Construction: Nonrated.
   C. Cabinet Material: Cold-rolled steel sheet.
   D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
      1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
      2. Rolled-Edge Trim: 2-1/2-inch backbend depth.
   E. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.
   F. Cabinet Trim Material: Same material and finish as door.
G. Door Material: Steel sheet.
H. Door Style: Fully glazed panel with frame.
I. Door Glazing: Tempered float glass (clear).
J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
   1. Provide manufacturer's standard.
   2. Provide manufacturer's standard hinge permitting door to open 180 degrees.
K. Accessories:
   1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
      a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
      1) Location: Applied to cabinet glazing.
      2) Application Process: Pressure-sensitive vinyl letters.
      3) Lettering Color: Black.
      4) Orientation: Vertical.
L. Materials:
   1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
      a. Finish: Baked enamel or powder coat.
      b. Color: As selected by Architect from full range of industry colors and color densities.

2.2 FABRICATION

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

2.3 GENERAL FINISH REQUIREMENTS

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
C. Finish fire-protection cabinets after assembly.
D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
   1. Fire extinguishers weighing 40 pounds or less: 54 inches above finished floor to top of cabinet.
   2. Fire extinguishers weighing more than 40 pounds: 42 inches above finished floor to top of cabinet.
B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
   1. Provide inside latch and lock for break-glass panels.
C. Identification: Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION
SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes portable, fire extinguishers.
B. Related Requirements:
   1. Divisions 01 Specification Sections apply to Work of this Section.
   2. Section 10 44 13 "Fire Protection Cabinets."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.
B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
   1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet (FEC) indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. JL Industries, Inc.; a division of the Activa Construction Products Group.
b. Larsens Manufacturing Company.
c. Potter Roemer LLC.
3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged fire extinguishers.
   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes pipe, fittings, valves, and connections for sprinkler systems.
B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 23 05 00 "General Mechanical Requirements."
   3. Section 23 05 00.20 "Basic Mechanical Materials and Methods."

1.2 REFERENCES

A. American Society of Mechanical Engineers:
   2. ASME B16.11 - Forged Steel Fittings - Socket-Welding and Threaded.
   3. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
   4. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
   5. ASME B16.25 - Buttwelding Ends.
   7. ASME B16.4 - Gray Iron Threaded Fittings.
   8. ASME B16.5 - Pipe Flanges and Flanged Fittings.
  10. ASME B36.10M - Welded and Seamless Wrought Steel Pipe.

B. ASTM International:

C. American Welding Society:
   1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
   2. AWS D1.1 - Structural Welding Code - Steel.

D. American Water Works Association:

E. National Fire Protection Association:
   2. NFPA 14 - Standard for the Installation of Standpipe, Private Hydrants and Hose Systems.
   3. NFPA 24 - Installation of Private Fire Service Mains and Their Appurtenances.

1.3 SUBMITTALS

A. Refer to Division 01 and Section 23 05 00 for submittals.
B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
C. Product Data: Submit manufacturer's catalog information. Indicate valve data and ratings.
D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of components and tag numbering.
B. Operation and Maintenance Data: Submit spare parts lists.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 13 and 14 standards.

1.6 QUALIFICATIONS

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

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.
B. Furnish cast iron and steel valves with temporary protective coating.
C. Furnish temporary end caps and closures on piping and fittings. Maintain in place until installation.
1.8 WARRANTY
   A. Furnish five-year manufacturer warranty for basic fire suppression materials and methods.

1.9 EXTRA MATERIALS
   A. Furnish two sets of valve stem packing for each size and type of valve installed.

PART 2 - PRODUCTS

2.1 VALVES
   A. Gate Valves:
      1. Up to and Including 2 inches: Bronze body and trim, rising stem, hand wheel, solid wedge or disc, threaded ends.
      2. Over 2 inches: Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, hand wheel, OS&Y, solid bronze or cast iron wedge, flanged or grooved ends.
      3. Over 4 inches: Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged ends, iron body indicator post assembly.
   B. Globe Valves:
      1. Up to and Including 2 inches: Bronze body, bronze trim, rising stem and hand wheel, inside screw, renewable rubber disc, threaded ends, with back seating capacity packable under pressure.
      2. Over 2 inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.
   C. Ball Valves:
      1. Up to and including 2 inches: Bronze two piece body, brass, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, lever hand, threaded ends with union.
      2. Over 2 inches: Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle or gear drive hand wheel for sizes 10 inches and over, flanged.
   D. Butterfly Valves:
      1. Bronze Body: Stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, hand wheel and gear drive and integral indicating device, and built-in tamper proof switch rated 10 amp at 115 volt AC.
      2. Cast or Ductile Iron Body: Cast or ductile iron, chrome or nickel plated ductile iron or aluminum bronze disc, resilient replaceable EPDM seat, wafer, lug, or grooved ends. With extended neck, hand wheel and gear drive and integral indicating device, and internal tamper switch rated 10 amp at 115 volt AC.
   E. Check Valves:
      1. Up to and including 2 inches: Bronze body and swing disc, rubber seat, threaded ends.
      2. Over 2 inches: Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged ends with automatic ball check.
      3. 4 inches and Over: Iron body, bronze disc with stainless steel spring, resilient seal, threaded, wafer, or flanged ends.
   F. Drain Valves:
      1. Compression Stop: Bronze with hose thread nipple and cap.
      2. Ball Valve: Brass with cap and chain, 3/4 inch hose thread.
G. Double Check Valve Assemblies:
   1. Manufacturer:
      a. Ames Company Series 2000SS.
      b. Substitutions: Refer to Section 23 05 00 for substitutions.
   2. The main valve body shall be manufactured from 300 series stainless steel to provide corrosion resistance, 100 percent lead free through the waterway. The double check shall consist of two independently operated spring loaded cam-check valves, required test cocks, and optional inlet and outlet resilient seated shutoff valves. Each cam-check shall be internally loaded and provide a positive drip tight closure against the reverse flow of liquid caused by backsiphonage or backpressure. The modular cam-check include a stainless steel spring and cam-arm, rubber faced disc and a replaceable seat. There shall be no brass or bronze parts used within the cam-check valve assembly. The valve cover shall be held in place through the use of a single grooved style two-bolt coupling. The main assembly shall consist of two independently operating torsion spring check assemblies, two resilient seated isolation valves, and four ball valve type test cocks.

2.2 ABOVE GROUND PIPING
A. Steel Pipe: ASTM A 53/A 53M, Grade B; ASTM A 135; ASTM A 795; Schedule 40 black.
   4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
   5. Mechanical Formed Fittings: Carbon-steel housing with integral pipe stop and O-ring pocked and O-ring uniformly compressed into permanent mechanical engagement onto pipe.

2.3 PIPE HANGERS AND SUPPORTS
A. Conform to NFPA 13.
B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
C. Hangers for Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
E. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
F. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
G. Vertical Support: Steel riser clamp.
H. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.4 HOSE CABINET VALVES
A. Manufacturers:
   1. Larsens-VC1818-RL.
   2. Substitutions: Refer to Section 23 05 00 for substitutions.
B. Hose Connection Valve: Angle type; brass finish; 2-1/2-inch size, thread to match fire department hardware, 300 psi working pressure, with threaded cap and chain of brass finish.
C. Hose Connection Valve Cabinets:
   2. Tub: 1 gage thick steel, prepared for pipe and accessory rough in.
   3. Door: 12 gage thick steel, flush, hinged, positive latch device.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
B. Remove scale and foreign material, from inside and outside, before assembly.
C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install piping in accordance with NFPA 13 for sprinkler systems.
B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
C. Install piping to conserve building space, to not interfere with use of space and other work.
D. Group piping whenever practical at common elevations.
E. Install pipe sleeve at piping penetrations through footings, partitions, walls, and floors. Seal pipe and sleeve penetrations to maintain fire resistance equivalent to fire separation.
F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
G. Pipe Hangers and Supports:
   1. Install in accordance with NFPA 13.
   2. Install hangers to with minimum 1/2-inch space between finished covering and adjacent work.
   3. Place hangers within 12 inches of each horizontal elbow.
   4. Use hangers with 1-1/2-inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   6. Where installing several pipes in parallel and at same elevation, provide multiple or trapeze hangers.
   7. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
H. Slope piping and arrange systems to drain at low points. Install eccentric reducers to maintain top of pipe level.
I. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
J. Do not penetrate building structural members unless indicated.
K. Where more than one piping system material is specified, install compatible system components and joints. Install flanges, union, and couplings at locations requiring servicing.
L. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.
M. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.
N. Install ball valves for shut-off or isolating service.
O. Install drain valves at main shut-off valves, low points of piping and apparatus.
P. Where inserts are omitted, drill through concrete slab from below and install through-bolt with recessed square steel plate and nut above slab.

3.3 CLEANING

A. Clean entire system after other construction is complete.

END OF SECTION
SECTION 21 13 13 - WET-PIPE SPRINKLER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes wet-pipe sprinkler system, system design, installation, and certification.
B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 REFERENCES

A. National Fire Protection Association:

1.3 SYSTEM DESCRIPTION

A. System to provide coverage for building areas noted.
B. Provide hydraulically designed system to NFPA 13 occupancy requirements.
C. Determine volume and pressure of incoming water supply from water flow test data. Revise design when test data become available prior to submittals.
D. Interface system with building fire and smoke alarm system.
E. Provide fire department connections.

1.4 SUBMITTALS

A. Refer to Division 01 and Section 23 05 00 for submittals.
B. Shop Drawings: Indicate layout of finished ceiling areas indicating sprinkler locations coordinated with ceiling installation. Indicate detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
C. Product Data: Submit data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
D. Design Data: Submit design calculations; signed and sealed by a certified fire protection Engineer or designer. The engineer or designer shall be certified by the State of Texas. Proof of certification is required.
E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of sprinklers and deviations of piping from Drawings. Indicate drain and test locations.
B. Operation and Maintenance Data: Submit components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 13.
1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years’ experience.

B. Installer: Company specializing in performing Work of this Section with minimum three years’ experience.

C. Design system under direct supervision of a certified fire protection engineer or designer experienced in design of this Work and certified by the State of Texas.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers until installation.

B. Furnish piping with temporary inlet and outlet caps until installation.

1.9 WARRANTY

A. Furnish five-year manufacturer warranty.

1.10 EXTRA MATERIALS

A. Furnish extra sprinklers under provisions of NFPA 13.

B. Furnish suitable wrenches for each sprinkler type.

C. Furnish metal storage cabinet located adjacent to fire riser.

PART 2 - PRODUCTS

2.1 SPRINKLERS

A. Manufacturers:
   1. Grinnell Corp.
   2. Reliable Sprinkler Corp.
   3. Viking Model.
   4. Substitutions: Refer to Section 23 05 00.

B. Suspended Ceiling Type:
   1. Type: Concealed pendant type with matching push on escutcheon plate.
   2. Finish: Brass.
   3. Escutcheon Plate Finish: Enamel, color to be determined by Architect.
   4. Fusible Link: Fusible solder link type or glass bulb type temperature rated for specific area hazard.

C. Exposed Area Type:
   1. Type: Standard upright type with guard.
   2. Finish: Brass.
   3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

D. Side Wall Type:
   1. Type: Semi-recessed horizontal side wall type with matching escutcheon plate and guard.
   2. Finish: Brass.
   3. Escutcheon Plate Finish: Chrome plated.
4. Fusible Link: Fusible solder link type or glass bulb type temperature rated for specific area hazard.
E. Guards: Finish to match sprinkler finish.

2.2 PIPING SPECIALTIES

A. Horn/Strobe Alarm: The horn/strobe shall be listed to UL 1971 and UL 464 and shall be approved for fire protective service. The horn/strobe shall be wired as a primary-signaling notification appliance for visible signaling appliances, flashing at 1Hz over the strobe’s entire operating voltage range. The strobe light shall consist of a xenon flash tube and associated lens/reflect system. The horn shall have three audibility options and an option to switch between a temporal three pattern and a non-temporal (continuous) pattern. These options are set by a multiple position switch. On four-wire products, the strobe shall be powered independently of the sounder. The horn on horn/strobe models shall operate on a coded or non-coded power supply. The outdoor horn/strobe shall be listed for outdoor use by UL and shall operate between minus 40 degrees and 151 degrees F. The products shall be listed for use with an outdoor/weatherproof back box with half inch and three-fourths inch conduit entries.
B. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.
C. Fire Department Connections:
   1. Type: Flush mounted wall type with chrome plated finish.
   2. Outlets: Two-way with fire department thread size. Threaded dust-cap and chain of matching material and finish.
   3. Drain: 3/4-inch automatic drip, connected to drain.
   4. Label: “Sprinkler-Fire Department Connection.”
D. Flexible Commercial Sprinkler Connection
   1. Manufacturers:
      a. Flexhead Industries.
      b. Substitutions: Refer to Section 23 05 00.
   2. Flexible stainless steel hose assembly and bracketing system connects sprinkler heads to branch lines.
      a. Mounting bracket shall be compatible with any suspended or gypsum board ceiling system.
      b. Hose:
         1) Industrial grade, all welded, no O-ring construction, uses all 304 stainless steel components.
         2) Rated up to 175 psi without the need for additional hangers.
         3) Approved for use in suspended ceiling system.
         4) True-bore 1 inch internal corrugated hose diameter.
         5) Fully braided hose shall provide protection against pressure surges.
         6) Shall be FM/UL approved.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with NFPA 13.
B. Place pipe runs to minimize obstruction to other work.
C. Install piping in concealed spaces above finished ceilings.
D. Center sprinklers in two directions in ceiling tile and install piping offsets.
E. Install guards on sprinklers.
F. Hydrostatically test entire system.
G. Require test be witnessed by Fire Marshal and Owner's insurance underwriter.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Verify signal devices are installed and connected to fire alarm system.

3.3 CLEANING

A. Flush entire piping system of foreign matter.

3.4 PROTECTION OF INSTALLED CONSTRUCTION

A. Apply masking tape or paper cover to protect concealed sprinklers, cover plates, and sprinkler escutcheons not receiving field paint finish. Remove after painting.

END OF SECTION
SECTION 22 11 00 - FACILITY WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Domestic water piping, above grade.
   2. Unions and flanges.
   3. Valves.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 REFERENCES

A. American National Standards Institute:

B. American Society of Mechanical Engineers:
   1. ASME B 16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
   2. ASME B 16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
   3. ASME B 16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
   4. ASME B 31.9 - Building Services Piping.
   5. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.
   6. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

C. American Society of Sanitary Engineering:
   1. ASSE 1010 - Performance Requirements for Water Hammer Arresters.
   2. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers.
   3. ASSE 1012 - Performance Requirements for Backflow Preventer with Intermediate Atmospheric Vent.
   4. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers.
   5. ASSE 1019 - Performance Requirements for Wall Hydrants, Freezeless, Automatic Draining, AntiBackflow Types.

D. ASTM International:
27. ASTM F 1282 - Standard Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe.

E. American Welding Society:
1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

F. American Water Works Association:
6. AWWA C651 - Disinfecting Water Mains.
7. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.
8. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in., for Water Service.

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

H. Plumbing and Drainage Institute:

1.3 SUBMITTALS

A. Division 01 and Section 23 05 00 “Submittals.”
B. Product Data:
   1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturer's catalog information.
   2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
   3. Domestic Water Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.
C. Manufacturer's Installation Instructions: Submit installation instructions for pumps, valves and accessories.
D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of valves and equipment.
B. Operation and Maintenance Data: Submit spare parts list, exploded assembly views and recommended maintenance intervals.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State and local standards.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years’ experience.
B. Installer: Company specializing in performing Work of this Section with minimum three years’ experience.
1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept valves and equipment on site in shipping containers with labeling in place. Inspect for damage.
B. Provide temporary protective coating on cast iron and steel valves.
C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.1 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B 88, Type L, hard drawn.
   1. Fittings: ASME B 16.18, cast copper alloy or ASME B 16.22, wrought copper and bronze.
   2. Joints: Solder, lead free, ASTM B 32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F or Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.
   3. Copper Press Fitting:
      a. Manufacturers:
         1) Viega.
         2) Ridge Tool Company.
         3) Substitutions: Not permitted.
      b. Press Fitting: Copper and copper alloy press fittings shall conform to material requirements of ASME B 16.18 or ASME B 16.22 and performance criteria of IAPMO PS117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press ends shall have SC (Smart Connect™) feature design (leakage path). In ProPress 1/2-inch to 4-inch dimensions the Smart Connect Feature assures leakage of liquids and/or gases from inside the system past the sealing element of an unpressed connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.

2.2 UNIONS AND FLANGES

A. Unions for Pipe 2 Inches and Smaller:
   1. Copper Piping: Class 150, bronze unions with soldered or brazed joints.
   2. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Flanges for Pipe 2-1/2 Inches and Larger:
   1. Copper Piping: Class 150, slip-on bronze flanges.
   2. Gaskets: 1/16-inch thick preformed neoprene gaskets.
2.3 BALL VALVES

A. Manufacturers:
   1. Apollo Valves.
   2. Milwaukee.
   3. NIBCO, Inc.
   4. Substitutions: Section 23 05 00.

B. 2-1/2 Inches and Smaller: MSS SP 110, 600 psi WOG, listed Lead Free-0.25 percent lead maximum, two piece bronze body, chrome plated brass ball, full port, teflon seats, blow-out proof stem, solder or threaded ends with union and lever handle.

C. 3 Inches and Larger: MSS SP 110, 400 psi WOG, listed Lead Free-0.25 percent lead maximum, two piece bronze body, brass ball, full part, PTFE seats, blow-out proof stem, threaded ends with union and lever handle.

2.4 BUTTERFLY VALVES

A. Manufacturers:
   1. NIBCO, Inc.
   2. Substitutions: Refer to Section 22 05 00 for substitutions.

B. 2-1/2 Inches and Larger: MSS SP 67, Class 200.
   1. Body: Cast or ductile iron, lug ends, stainless steel stem, extended neck.
   2. Disc: Nickel-plated ductile iron.
   3. Seat: Resilient replaceable EPDM.
   4. Handle and Operator: 10 position lever handle.

2.5 CHECK VALVES

A. Horizontal Swing Check Valves:
   1. Manufacturers:
      a. NIBCO, Inc.
      b. Substitutions: Refer to Section 23 05 00 for substitutions.
   2. 2-1/2 Inches and Larger: MSS SP 71, Class 125, cast iron body, bolted cap, bronze or cast iron disc, renewable disc seal and seat, flanged ends.

2.6 RELIEF VALVES

A. Pressure Relief:
   1. ANSI Z21.22 certified, bronze body, Teflon seat, steel stem and springs, automatic, direct pressure actuated.
   2. Bronze body, Teflon seat, steel stem and springs, automatic, direct pressure actuated at maximum 60 psi, UL listed for fuel oil, capacities ASME certified and labeled.

B. Temperature and Pressure Relief:
   1. ANSI Z21.22 certified, bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 deg F, capacity ASME certified and labeled.

2.7 WATER HAMMER ARRESTORS

A. ASSE 1010; stainless steel or copper construction, bellows or piston type sized in accordance with PDI WH-201.
B. Pre-charged suitable for operation in temperature range 334 to 250 deg F and maximum 150 psi working pressure.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION - HANGERS AND SUPPORTS

A. Install hangers and supports in accordance with Section 23 05 29.10.

3.3 INSTALLATION - ABOVE GROUND PIPING

A. Install non-conducting dielectric connections wherever jointing dissimilar metals.
B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
C. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.
D. Group piping whenever practical at common elevations.
E. Slope piping and arrange systems to drain at low points.
F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 23 07 05.
H. Provide access where valves and fittings are not accessible.
I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
J. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Division 09.
K. Install domestic water piping in accordance with ASME B 31.9.
L. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Division 07.
M. Install unions downstream of valves and at equipment or apparatus connections.
N. Install valves with stems upright or horizontal, not inverted.
O. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
Q. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
R. Install ball valves for throttling, bypass, or manual flow control services.
S. Install potable water protection devices on plumbing lines where contamination of domestic water may occur; janitor rooms, fire sprinkler systems, flush valves, and interior and exterior hose bibs.
T. Pipe relief from valves and drains to nearest floor drain.
U. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping as per PDI standards.
V. Install air chambers on hot and cold water supply piping to each fixture. Fabricate same size as supply pipe or 3/4-inch minimum, and minimum 18 inches long.
W. Press Connections: Copper press fittings shall be made in accordance with the manufacturer’s installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

3.4 FIELD QUALITY CONTROL

A. Test domestic water piping system in accordance with applicable local code.

3.5 CLEANING

A. Prior to starting Work, verify system is complete, flushed and clean. Clean piping as required by local code or as follows.
B. Verify pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
C. Inject disinfectant, free chlorine in liquid, powder and tablet or gas form, throughout system to obtain residual from 50 to 80 mg/L.
D. Bleed water from outlets to obtain distribution and test for disinfectant residual at minimum 15 percent of outlets.
E. Maintain disinfectant in system for 24 hours.
F. When final disinfectant residual tests less than 25 mg/L, repeat treatment.
G. Flush disinfectant from system until residual concentration is equal to incoming water or 1.0 mg/L.
H. Take samples no sooner than 24 hours after flushing, from 5 percent of outlets and from water entry, and analyze in accordance with AWWA C651.
I. Provide written verification of eyewitness of disinfection procedure and include in O & M.

END OF SECTION
SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Sanitary sewer piping buried within 5 feet of building.
   2. Sanitary sewer piping above grade.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 REFERENCES

A. American Society of Mechanical Engineers:
   2. ASME A 112.21.1 - Floor Drains.
   4. ASME B 16.3 - Malleable Iron Threaded Fittings.
   5. ASME B 16.4 - Gray Iron Threaded Fittings.
   6. ASME B 16.23 - Cast Copper Alloy Solder Joint Drainage Fittings (DWV).
   7. ASME B 16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
   8. ASME B 31.9 - Building Services Piping.

B. ASTM International:

C. Cast Iron Soil Pipe Institute:

D. Manufacturers Standardization Society of the Valve and Fittings Industry:
1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
3. MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
4. MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
5. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
6. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
7. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

E. Plumbing and Drainage Institute:

1.3 SUBMITTALS

A. Division 01 and Section 23 05 00 “Submittals.”
B. Product Data:
1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
2. Sanitary Drainage Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.
C. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.
D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS
A. Project Record Documents: Record actual locations of equipment and clean-outs.

1.5 QUALITY ASSURANCE
A. Perform Work in accordance with State and local standards.

1.6 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years’ experience.
B. Installer: Company specializing in performing Work of this Section with minimum three years’ experience.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.8 ENVIRONMENTAL REQUIREMENTS
A. Do not install underground piping when bedding is wet or frozen.

1.9 FIELD MEASUREMENTS
A. Verify field measurements prior to fabrication.

1.10 WARRANTY
A. Refer to Section 23 05 00 for product warranties.

PART 2 - PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING
A. Cast Iron Soil Pipe: ASTM A 74, service weight, bell and spigot ends.
   1. Fittings: Cast iron, ASTM A 74.
   2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C 564 neoprene gaskets or lead and oakum.
B. PVC Pipe: ASTM D 2729, polyvinyl chloride (PVC) material, bell and spigot solvent sealed ends.
   1. Fittings: PVC, ASTM D 2729.
C. PVC Pipe: ASTM D 3034, Type PSM, polyvinyl chloride (PVC) material, bell and spigot style rubber ring sealed gasket joint.
   1. Fittings: PVC, ASTM D 3034.
D. PVC Pipe: ASTM D 1785, Schedule 40, polyvinyl chloride (PVC) material, bell and spigot style solvent sealed joint ends.
   1. Fittings: ASTM D 2466, Schedule 40, PVC.
E. Plastic Pipe: ASTM D 2665, polyvinyl chloride (PVC) material.

2.2 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A 74, service weight.
   1. Fittings: Cast iron, ASTM A 74.
   2. Joints: ASTM C 564, rubber gasket joint devices or lead and oakum.
B. Cast Iron Pipe: CISPI 301, hub-less.
   1. Fittings: Cast iron, CISPI 301.
C. PVC Pipe: ASTM D 2729, polyvinyl chloride (PVC) material.
   1. Fittings: ASTM D 2729, PVC.
D. PVC Pipe: ASTM D 2665, polyvinyl chloride (PVC) material.
   1. Fittings: ASTM D 2665, PVC.
E. PVC Pipe: ASTM D 1785 Schedule 40, polyvinyl chloride (PVC) material.
   1. Fittings: ASTM D 2466, Schedule 40, PVC.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

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

3.3 INSTALLATION – HANGERS AND SUPPORTS

A. Pipe Hangers and Supports:
   1. Install hangers in accordance with Section 23 05 29.10.

3.4 INSTALLATION - BURIED PIPING SYSTEMS

A. Verify connection to existing piping system size, location, and invert are as indicated on Drawings.
B. Establish elevations of buried piping with not less than 2 feet of cover.
C. Establish minimum separation of sanitary sewer from other services piping in accordance with local code.
D. Remove scale and dirt on inside of piping before assembly.
E. Excavate pipe trench in accordance with Section 23 05 00.
F. Install pipe to elevation as indicated on Drawings.
G. Route pipe in straight line.
H. Metallic Piping: Install plastic ribbon tape continuous over top of pipe. Refer to Section 23 05 53.
I. Non-Metallic Piping: Install trace wire continuous over top of pipe. Refer to Section 23 05 53.
J. Pipe Cover and Backfilling:
   1. Backfill trench in accordance with Section 23 05 00.

3.5 INSTALLATION - ABOVE GROUND PIPING

A. Establish invert elevations, slope for drainage as required by local code. Maintain gradients.
B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Provide clearances at cleanout for snaking drainage system.
C. Encase exterior cleanouts in concrete flush with grade.
D. Install floor cleanouts at elevation to accommodate finished floor.
E. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
F. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
G. Install piping to maintain headroom. Do not spread piping, conserve space.
H. Group piping whenever practical at common elevations.
I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
J. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 23 07 05.
K. Provide access where valves and fittings are not accessible.
L. Install piping penetrating roofed areas to maintain integrity of roof assembly.
M. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
N. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Division 09.
O. Install bell and spigot pipe with bell end upstream.
P. Sleeve pipes passing through partitions, walls and floors.
Q. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Division 07.
R. Support cast iron drainage piping at every joint.
S. Do not install PVC piping within a return air plenum. PVC may be used if insulated with one layer of 1.5-inch FyreWrap Insulation.

3.6 FIELD QUALITY CONTROL

A. Test sanitary waste and vent piping system in accordance with applicable code.
SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Water closets.
   2. Urinals.
   3. Lavatories.
   4. Sinks.
   5. Service sinks.
B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 SUBMITTALS

A. Division 01 and Section 23 05 00 “Submittals.”
B. Product Data: Submit catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
C. Manufacturer's Installation Instructions: Submit installation methods and procedures.
D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit fixture, trim, exploded view and replacement parts lists.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with State and local standards.
B. Provide products requiring electrical connections listed and classified by UL LLC, as suitable for purpose specified and indicated.

1.5 QUALIFICATIONS

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

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.
B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.
PART 2 - PRODUCTS

2.1 FIXTURES

A. Refer to the Drawings Plumbing Fixture Schedule for fixture make, model numbers, and type.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify walls and floor finishes are prepared and ready for installation of fixtures.
B. Verify electric power is available and of correct characteristics.
C. Confirm millwork is constructed with adequate provision for installation of counter top lavatories and sinks.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

A. Install Work in accordance with State and local standards.
B. Install each fixture with trap, easily removable for servicing and cleaning.
C. Provide chrome plated rigid or flexible supplies to fixtures with stops, reducers, and escutcheons.
D. Install components level and plumb.
E. Install and secure fixtures in place with wall supports or wall carriers and bolts.
F. Seal fixtures to wall and floor surfaces with sealant as specified in Division 07, color to match fixture.
G. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.
H. For ADA accessible water closets, install flush valve with handle to wide side of stall.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Review millwork shop-drawings. Confirm location and size of fixtures and openings before rough in and installation.

3.5 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

A. Clean plumbing fixtures and equipment.
3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Do not permit use of fixtures before final acceptance.

END OF SECTION
SECTION 23 05 00 - GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 DESCRIPTION

A. Work covered by this Division shall consist of furnishing all labor, equipment, supplies and materials and in performing all operations necessary for the installation of complete and operating mechanical systems as required by these Specifications and/or shown on the Drawings, subject to the terms and conditions of the Contract. The Work shall also include the completion of such mechanical and electrical details not mentioned or shown which are necessary for the successful operation of all systems described on the Drawings or required by these Specifications; this includes the furnishing all materials for the filling the systems to make them operable, including water, refrigerant, oil and grease. Prove satisfactory operation of all equipment and controls to the Engineer on request.

B. Work Not Included: Certain labor, material and equipment may be furnished and/or installed under other Divisions of these Specifications. This Contractor shall coordinate with other trades and arrange his work to make the part fit together. The following items are to be accomplished under other Divisions of these Specifications:
   1. Temporary Heat: Refer to paragraph in this Section.
   2. Temporary Water and Toilet: Refer to General Conditions.
   3. Roof Curbs: Refer to paragraph in this Section.
   4. Electrical Equipment and Wiring: Refer to paragraph in this Section.
   5. Concrete: Refer to paragraph in this Section.

C. Equipment Furnished by Owner: Rough-in services pipes to locations as required by Architectural and Mechanical Drawings and equipment Shop Drawings. Provide service valves on all pipes except waste and vent pipes. Final Connection to equipment will be made by this Contractor.

1.3 BIDDING

A. All mechanical equipment shall be new unless specified otherwise in the Specifications or on the Drawings.

B. All bids must be based only on the equipment and materials as scheduled on the Drawings and as specified or on equivalent equipment and materials. Any Contractor who assumes equivalence of products and who bases his proposal on that assumption does so at his own risk.

C. A listing of approved alternative manufacturers does not mean that all products of a particular alternative manufacturer are acceptable alternative to the scheduled items. All fixtures and devices must still be submitted according to the prescribed procedures. In addition, some items that have an important visual affect, e.g. electric water coolers, may be required to receive Owner’s or Architectural approval also.
1.4 EXISTING UTILITIES

A. The Drawings indicate the locations, type and sizes of various utilities within the Site where known. These utilities are indicated as accurately as possible. If the Contractor encounters any utilities during construction which are not shown on the Drawings, they shall ask for written instructions from the Architect. Any relocation or remodeling required will then be directed by a change order. This Contractor shall assume all responsibility for protection of all utilities, shown or not, and for repair required by this construction.

B. Contractor shall verify location, size, elevation, pressure and any other pertinent data of the existing utilities. Additional costs incurred due to failure to verify such data and to coordinate associated work with respective utility providers shall not be the Owner’s responsibility but shall be borne by the Contractor.

C. All costs associated with providing utilities including, but not limited to, connection fees, boring under roads, etc., shall be included in the Contractor’s proposal price whether such costs are incurred by Contractor or charged by the utility company.

D. Submission of a proposal by the Contractor shall be considered an acknowledgment by the Contractor of his compliance with this Section.

1.5 CODES, PERMITS AND FEES

A. Contractor shall comply with all local, state and national codes and shall pay for all applicable costs, fees, permits, licenses and inspections for this Division.

1.6 TEMPORARY HEAT

A. Temporary heat will be furnished by the General Contractor. Use of the permanent heating system will not be allowed without written authorization from the Engineer, Architect and Owner. In case the permanent heating system is used for temporary heat, the General Contractor shall pay all the costs until acceptance by the Owner. Warranty of equipment shall not start until acceptance by the Owner.

1.7 DRAWINGS

A. Contract Drawings are diagrammatic only and are not intended to be scaled for dimensions. All dimensions shall be taken from Architectural Drawings, certified equipment Drawings and from the structure itself before fabricating and work. All space requirements and equipment locations shall be verified, coordinated with other trades, as it is the various Contractor’s responsibility to install the systems complete in the space provided without extra charges to the Owner.

B. It is intended that anything, whether labor and materials, which is usually furnished as part of any equipment specified and which is necessary for operation shall be furnished as part of the Contract without additional cost, whether or not shown or described.

C. All piping in finished areas of the building shall be concealed except where otherwise noted on the Drawings.

D. All equipment shall be installed in accordance with manufacturer’s recommendations, unless approval is given in writing by the Consulting Mechanical Engineer for deviation.
1.8 REQUIREMENTS OF REGULATORY AGENCIES

A. The mechanical work shall be performed in strict accordance with the local and state codes, ordinances, and regulations governing the particular work involved. Furnish, without extra charge, any additional material and labor when and where required to comply with these Rules and Regulations, though the work is not mentioned in the Specifications or shown on the Drawings. When the Specifications or Drawings call for or describe materials or construction of a better quality or larger sizes than required by the above mentioned Rules and Regulations, the provisions of these Specifications and accompanying Drawings shall take precedence.

1.9 QUALIFICATIONS

A. All mechanics shall be capable journeymen, skilled in the work assigned to them with licensing required by the inspecting authority. All welders must have been certified within the past three years to perform the Work, which they are doing.

1.10 WARRANTY

A. All materials and equipment shall be new unless otherwise specified.
B. Guarantee all workmanship, material and equipment and replace any found defective without cost to the Owner, for ONE year after final acceptance, as defined in General Conditions.
C. Each warranty for longer than one year as described above (that comes with equipment used on the job) shall be passed into the Owner in the Operation and Maintenance Manual, along with the dates of start and end of warranty.
D. Refer to General Conditions for additional information regarding specific warranty requirements.

1.11 PROJECT RECORD DOCUMENTS

A. Before final payment, provide the Architect with one clean set of Drawings and Specifications corrected up-to-date as job progress. These documents shall reflect the As-Built conditions. Refer to General Conditions for additional information.

1.12 SUBMITTALS

A. The intent of this Section is to give general submittal information, refer to specific submittal information in the subsequent mechanical sections.
B. Sale of Electronic CADD Files:
   1. Refer to Architectural specification Section 01 33 00 “Submittal Procedures,” OR call the Parkhill, Smith & Cooper, Inc., office issuing this project and request the pricing for electronic files.
C. Within 10 days after award of the Contract, and before orders are placed, Contractor shall submit specific information on list of equipment and principal materials specified. Contractor shall indicate and/or provide names of manufacturers, catalog and model numbers, cut sheets, and such other supplementary information as necessary for evaluation. Submittal shall be electronic using .pdf file extension.
D. Requirements for each Submittal:
   1. Bear a dated stamp or specific written indication that the Contractor has reviewed and approved all submittal prior to submission to Architect,
   2. Have all information deleted by Contractor that pertains to the means and methods of construction or to fabrication, assembly, installation, or erection (approval by Architect shall not extend to the these areas unless specifically noted by Architect),
   3. Be clearly and SPECIFICALLY marked as to which specific piece of equipment is being submitted, bye use of a permanent marker, stamp, etc., so as to distinguish it from other pieces of equipment that may occur on the same page,
   4. Be clearly marked as to which available options are being submitted that are associated with a piece of equipment, and
   5. Be complete with respect to quantities, dimensions, specific performance, materials, and similar data to enable the Architect to review the proposed equipment.

E. Omission by Contractor of any of the above requirements or submittals will subject submittal to automatic rejection without review.

F. Any submittals received by Architect that were not requested shall be returned without review of any kind.

G. Installation Instructions: For certain products or systems as identified in subsequent Specifications Sections or on the Drawings, the Contractor shall be required to provide copies of manufacturer’s installation instructions with the submittal. When required as such, the installation instructions are considered part of the submittal and their omission may result in automatic rejection of the submittal. Where more than one identical device are scheduled, only one set of installation instructions needs to be submitted, e.g. if seven five-ton split systems air conditions are scheduled, only one five-ton unit installation instruction needs to be submitted. Similarly, if one set of installation instructions is identified by the manufacturer and on the instructions to be applicable to more than one type or size of devices, e.g. if one set of air conditioner instructions is good for three, four, five-ton units, then only one instruction set is required for these devices.

1.13 SUBSTITUTED PRODUCTS

A. Material or equipment specified by manufacturer’s name is being used as a basis of standard, unless otherwise noted. The Architect will be the sole judge on the equivalence of substituted equipment and materials.

B. It shall be the Contractor’s responsibility to verify that submitted substitute equipment will fit in space available. The Contractor’s submittal for acceptance of the substitute shall include a written statement of whether or not such acceptance would require any subsequent or associated changes to the Drawings or Specifications. Any such changes shall be described in writing, briefly but complete.

C. The Contractor shall be responsible for the costs of any such modifications due to substitution of materials or equipment for that which was specified or scheduled. The cost shall be complete, that is, it shall include the cost affect of any and all other trades.

D. The Architect may request detailed Shop Drawing or plan layouts of mechanical rooms or systems of the substituted equipment.
1.14 SAFETY

A. General: Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work, and Contractor shall comply with all laws governing safety, specifically the “Occupational Safety and Health Standards” and the “Safety and Health Regulations for Construction”, state and federal.

B. According to OSHA, a hazardous chemical is any chemical, which is a physical hazard or a health hazard. This may include items such as paints, solvents, adhesives, sealants, cleaners, etc. If a Contractor produces, uses, or stores hazardous chemicals at the workplace, then contractor shall develop, implement, and maintain a hazard communication program in compliance with the latest OSHA requirements. In Projects with multiple tenants in which the building is partially occupied during all or part of the Project, Contractor shall inform the building manager or Owner, according to OSHA guidelines, of any hazardous chemicals being produced, stored, or used in the building so that other tenants may be notified. Contractor shall employ required methods of training, information, handling, ventilation, labeling, storing, disposal, and removal of hazardous chemicals.

1.15 LABELING

A. Each device for which an independent testing authority has established a standard shall have affixed a label indicating its compliance and listing. Refer to General Conditions for list of such independent testing authorities.

1.16 SITE VISIT REPORTS

A. During the course of the job, the Architect will make site visits to observe Work in progress and will subsequently prepare a written site visit report, which will be sent to the Contractor and to whomever else the Architect desires. The Contractor shall prepare a written and typed response within seven calendar days of his receiving the site visit report. The General Contractor shall include in his response the following information.
   1. Date of site visit by the Architect,
   2. Date of receipt of the site visit report,
   3. Name and title of the preparer of the response,
   4. An item number referenced to the site report,
   5. A brief three or four word description of the item,
   6. The Contractor or Subcontractor affected,
   7. The proposed course of action, and
   8. An expected time of completion of the action.

1.17 CUTTING AND PATCHING

A. No joists, beams, girders, columns, slabs, or other structural elements shall be cut, drilled, or altered in any way by the Contractor without first obtaining written permission and instructions from the Architect.

B. Where it is necessary to cut through any non-structural elements of walls, floors, or ceilings to permit the installation of any Work under this Contract, or to repair any defects that may appear up to the expiration of the guarantee, such cutting shall be done by Contractor with as little damage as reasonably possible to the element being cut or to adjacent elements.
C. After the necessary work has been completed, the damage shall be repaired by the respective Contractor, who shall pay all costs of such cutting, repairs and patching. All patching or sealing of cuts, penetrations, etc., including final appearance of same, shall be done to the approval of the Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials shall be new and of specified quality, unless specifically noted otherwise. Materials shall be free from defects. Where manufacturer names are mentioned in the Specifications or on the Drawings, it has been done in order to establish a standard of quality and construction.

B. Contractor will be responsible for transportation of his material to and from the job site, and will be responsible for the storage and protection of his materials and work until the final acceptance of the job. At the end of each day of work, each Contractor is responsible for covering or protecting his work and/or materials that may be susceptible to damage even if such damage is the result of unforeseen causes, e.g. an overnight thunderstorm. Failure to do so will be sufficient cause for rejection of any item in question, and any such item shall be replaced by Contractor at no cost to the Owner.

C. Contractor shall verify that all pieces of equipment will fit through available openings in the building and that all equipment can be installed without modification of building structure.

2.2 EQUIPMENT SCHEDULE

A. All equipment major items are specified in the equipment schedules on the drawings and shall be new and furnished complete with all accessories normally supplied with the catalog item listed and all other accessories necessary for a complete and satisfactory installation.

B. Equipment items so noted will require start-up by factory trained personnel. Equipment items so noted will require factory approved service personnel who shall provide all service, including all parts and all labor, as requested by the Owner, during the full period of equipment warranty.

2.3 EQUIPMENT RATINGS

A. Equipment capacities as scheduled on the Drawings are at Project site altitude. Capacities of submitted equipment must be corrected for project site altitude unless otherwise noted.

2.4 WORKMANSHIP

A. The workmanship shall, in all respects, be of the highest grade, and all construction shall be done according to the best practices of the trade. Piping, ducting and conduit shall be concealed unless otherwise noted, and installed square to the building lines. Any work not meeting this requirement shall be replaced or rebuilt without extra expense to the Owner.
2.5 V-BELT DRIVES

A. V-belt drives shall be of fabric and rubber construction of approved manufacture. Multiple belts shall be matched and all belts shall be adjusted to drive the apparatus properly and to prevent slippage and undue wear in starting motor nameplate rating.

2.6 BELTGUARDS

A. The Contractor shall provide for each V-belt drive a painted steel belt guard, which shall be constructed around an angle iron frame, securely bolted to the floor or apparatus. The guard shall completely enclose drives and pulleys and be constructed to comply with all safety requirements. Hinged access doors not less than 6-inch x 6-inch shall be provided for access to motors and fan shaft for test purposes.

2.7 ELECTRICAL WIRING AND CONTROL EQUIPMENT

A. All disconnects, motor starters, relays, wiring, etc. shall comply with all requirements of Division 26.

B. The Mechanical Contractor must refer to the electrical control equipment and wiring shown on the Electrical Drawings. Any changes or additions required by specified or substituted equipment furnished shall be the complete responsibility of the Contractor furnishing the equipment.

C. All electrical equipment characteristics (voltage, etc.) must be VERIFIED by the Mechanical Contractor prior to ordering. It is imperative that voltage and phase characteristics are checked with the Electrical Drawings.

D. All motors shall be built in accordance with the current applicable IEEE, ASA and NEMA standards. All general-purpose motors shall be open drip-proof machines for installation indoors and/or in protected locations. Totally enclosed fan cooled (TEFC) motors shall be used in all areas of exposure to weather or other environmental contamination. Motors shall be rated explosion-proof when located in hazardous atmospheres. Type II weather-protected motors may be used in lieu of TEFC motors on roof fan units and similar equipment. Motors mounted in direct sun shall be provided with a shield to forbid direct radiation from the sun when the sun is 45 degrees or greater above the horizon.

E. Unless indicated otherwise, motors shall be NEMA design B with a service factor of 1.15 with 40 deg C rise and total temperature rise of 65 deg C ambient and when powered from the system voltage feeding the motor. TEFC motors shall have a service factor of 1.00 with total temperature rise of 65 deg C in the above conditions. Single-phase motors shall be NEMA Type N split phase induction motors with built-in thermal protectors. Single-phase motors connected on loads requiring high starting torque shall be capacitor-start induction motors.

F. All motors shall be all copper wound, high power factor, high efficiency motors. Electric motors shall be an energy efficient type as defined in the latest edition of NEMA document no. MG1. Motor efficiency shall be made available to the Architect as required.

G. If there is not a separate “Controls Contractor” for this Project, the mechanical Contractor is responsible for providing and installing all control wiring. Wiring and conduit is to be provided and installed as directed under the Division 26 specifications.
2.8 EQUIPMENT AND PIPING SUPPORTS

A. All supporting systems for piping, equipment, and materials supported by the building structure shall be submitted to the Architect for approval prior to purchase and installation.

B. Roof Supports:
   1. Contractor shall provide and install roof supports for all uninsulated piping routed on the roof.
      a. For single pipes through 5 inches in size, such as gas pipes, etc., the roof support shall be a MAPA, MS-4RA or MS-5RA, which consists of a one piece combination roof deck base, adjustable height pipe supports, and hard cast rubber roller with nylon bushings. Provide walk pad under pipe support as recommended by the pipe support manufacturer. Mob pad and support to roof.
      b. Manufacturer’s installation recommendations vary depending on roof types, but the Contractor is responsible for verifying the roof type and adhering strictly to the appropriate set of manufacturer’s installation instructions.
      c. Spacing of roof supports shall be as recommended by the manufacturer.

2.9 ROOF PENETRATIONS

A. Piping:
   1. Penetration shall be accomplished with factory-made assemblies designed specifically for the purpose. The use of pitch pans or pitch pockets is not allowed. Contractor shall provide a factory-made penetration assembly as follows:
      a. For pipes, conduits, etc. up to 3 inches in diameter that can or are intended to be turned to horizontal after passing through the roof (e.g. small electrical conduit, gas piping, refrigerant lines, water pipes, etc.) the device shall consist of a curb assembly with a welded 18 gauge galvanized steel shell and base, 1-1/2 inches thick 3 pcf rigid insulation, 0.50-inch aluminum or 20 gauge galvanized cap with minimum 3-inch over hang and 1-inch rigid insulation, and 2-inch x 6-inch wood nailer. Product shall be Custom Curb Model CPC, ThyCurb Model RP-2 with TC-1, 2, or 3 curb, or approved equivalent.

B. Ductwork without Equipment:
   1. Penetration shall be accomplished with a factory-made insulated roof curb. Curb shall be made of welded 18 gauge galvanized steel shell and base plate, shall be lined with 1-1/2 inch 3 pcf rigid insulation, shall have minimum 2-inch x 2-inch wood nailer, and shall be reinforced with 1-inch x 1-inch x 1-foot 8-inch steel angle on sides 24 inches and larger. Product(s) shall be manufactured by Custom Curb, Inc., ThyCurb, Roof Products and Systems, Pate, or approved equivalent.

C. Ductwork with Equipment:
   1. Each piece of roof mounted equipment such as exhaust or supply fans, relief or intake hoods, packaged rooftop air conditioners, air handlers, etc., shall be provided and installed with an insulated roof curb designed to mate with the equipment and provide a weatherproof enclosure. In the event that a preinsulated curb is not available, an uninsulated curb is acceptable if the Contractor provides and installs field insulation per the manufacturer’s instructions. Contractor shall provide the roof curb(s) to the Roofing Contractor for installation.
D. General:
   1. All roof flashing assemblies and roof curbs shall be closely coordinated with other work
      through the Roofing Contractor to insure that the flashing, canting, insulation type and
      location, etc., is correct and appropriate for the particular roof construction type.
   2. Each roof curb shall be selected and provided so that the top of the curb shall be level
      after installation. Provide tapered curb as required to match roof slope. The curb shall
      provide a minimum clearance of 10 inches between the top of the finished roof surface
      and the top of the wood nailer, continuous around the curb perimeter.
   3. Each roof penetration location shown on the drawing is approximate. Refer to the
      Architectural and Structural Drawing for the structural openings. Refer to CUTTING
      AND PATCHING Section of this Specification for more information.
   4. Provide each roof curb with other options as scheduled on the Drawings.

2.10 ACCESSIBILITY

A. Access Panels:
   1. Access panels shall be provided wherever necessary for possible future replacement,
      adjustment, or maintenance of operating devices such as machinery, valves, dampers,
      switches, relays, etc., or to other critical non-operating devices such as pull boxes,
      inspection parts, gauges, etc. Such access panels shall be provided and install by
      Contractor, whether or not shown on the Drawings, and shall be brought to the attention
      of the Architect for approval of type, color, etc. Where access is provided in rated
      members, the access panels shall be of a type that maintains the integrity of the member
      penetrated.

B. Access to Equipment:
   1. All pipes, tubing, conduit, etc. including, but not limited to, draining piping of any type,
      electrical conduit, wiring not in conduit, and pneumatic control tubing shall be installed
      in such a way so as not to prevent and/or not to make necessary difficult the removal,
      operation, use, or maintenance of equipment, access panels or doors, pathways
      (especially in attics or crawlspaces), observation ports, measurement or balancing
      devices, junction boxes.
   2. If access for these purposes is prevented or made unreasonably difficult in the opinion of
      the Architect, then the Contractor shall make modifications or repairs at no cost to
      anyone except the Contractor. Such modifications or repairs shall be considered neither
      complete nor adequate until the Architect is satisfied that access for the above purpose is
      achieved.

2.11 PROTECTION OF PENETRATION

A. All penetrations of fire or smoke barriers shall be sealed, sleeves (if any), insulation (if any),
   and vibration isolation (if any) that maintain the fire or smoke resistance of the barrier in

B. Contractor shall verify locations and type of all partitions penetrations from the Drawings.
   Sealing material and methods shall be per UL recommendations.
2.12 BEDDING COURSE

A. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

PART 3 - EXECUTION

3.1 STORAGE

A. Provide for proper storage of all materials and equipment and assume responsibility for losses due to any cause. All storage shall be within the Contract limits of the building site or in a bonded warehouse. All equipment and materials must be covered and stored out of the elements; any item, which has become rusted, will not be permitted to be used.

B. Each Contractor shall provide temporary storage facilities suitable for equipment stored at the job site. Storage facilities shall be rainproof and lockable as required. Materials or equipment stored on site but not in a lockable rainproof storage facility shall be stored above ground or above slab. Contractor shall take necessary precautions to prevent entry of and/or damage from dirt, trash, water, or vermin. Equipment not properly stored and protected shall be, at the discretion of the Engineer, replaces at no cost to the Owner. Roofs are not acceptable storage areas unless specifically allowed in writing by the Architect.

3.2 INSTALLATION AND ARRANGEMENT

A. Install all work to permit removal (without damage to other parts) of coils, heat exchanger bundles, boiler tubes, fan shafts and wheels, filters, belt guards, sheaves and drives and all other parts which might require periodic replacement or maintenance. Arrange pipes, ducts and equipment to permit ready access to valves, traps, starters, motors, control components and to clear opens of doors and of access panels.

B. Offsets, transitions and changes in direction in pipes and ducts shall be made as required to maintain proper head room and pitch of sloping pipes whether or not indicated on the Drawings. Furnish and install all traps, air vents, sanitary vents, etc., as required to affect these offsets, transitions and changes in direction.

C. Duct transitions and offsets required to connect ductwork to equipment shall be made as required whether or not indicated on the Drawings.

3.3 PROTECTION OF WORK AND PROPERTY

A. Where there are existing facilities, be responsible for protection thereof, whether or not such facility is to be removed or relocated or remain as installed. Moving or removing any facility must be done so as not to cause interruption the work or Owner’s Operation.

B. All pipe and duct openings shall be closed with caps or plugs during installation. All fixtures shall be covered and protected against injury. At final completion, all work shall be cleaned and delivered in an unblemished condition, or refinished and repainted at the discretion of the Architect.
3.4 CONCEALED AND EXPOSED WORK

A. “Concealed” is intended to mean within such spaces as pipe chases, pipe trenches, above plaster ceilings, in walls and buried pipe is inaccessible when building is completed. “Exposed” is intended to be within equipment rooms, unfinished spaces, above “pushup” ceilings, accessible pipe tunnels, etc., where pipe is accessible.

3.5 CONCRETE

A. Mechanical Contractor shall coordinate all requirements for concrete. All concrete shall be furnished under the Architectural Divisions of these Specifications.

3.6 FIELD MEASUREMENTS

A. The Contractor shall verify the dimensions and conditions governing work at the Project site. He shall examine adjoining work on which his work is dependent, for perfect efficiency, and shall report any work, which must be corrected.

3.7 LUBRICATION

A. The Contractor shall provide all oil and grease for the operating of all equipment until acceptance. The Contractor shall be held responsible for all damage to bearings while the equipment is being operated by him up to the date of acceptance of the equipment. The Contractor shall protect all bearings and shafts during installation and shall thoroughly grease the steel shafts to prevent corrosion.

3.8 MANUFACTURER’S DIRECTION

A. The Contractor shall install all equipment in strict accordance with all directions and recommendations furnished by the manufacturer. Where such directions are in conflict with the plans and specifications, the Contractor shall report such conflicts to the Architect who shall make changes deemed necessary and desirable.

3.9 FLUSHING, CLEANING & STERILIZING

A. Before final connections are made in the piping systems, all piping shall be blown out with air and then completely washed out with cleaning compounds. The systems shall be flushed for complete removal of all foreign materials. Furnish all temporary connections, valves, etc., required for this purpose.

B. After flushing, sterilize the domestic water systems with an approved chlorinating agent to provide a dosage on not less than 50 ppm. After minimum contact period of eight hours, the system shall be flushed with clean water until the residual chlorine is no greater than the city water.
3.10 TESTS

A. Test all new storm drain, vent and waste lines with standing water test of 12 feet of head. Test to be held for a minimum of two hours, or as required by local code.
B. Test all new domestic cold, hot and recirculating hot water service lines at 50 psig above operating pressure, without exceeding the pressure rating of the piping materials. Test to be held for a minimum of two hours, or as required by local code.
C. Test all new gas lines at 1-1/2 times the proposed maximum working pressure, but not less than 5 psig. Test to be held for a minimum of two hours, or as required by local code.
D. Test fire protection at 200 psig. Test to be held for a minimum of two hours, or as required by local code.
E. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
F. All tests shall be witnessed and approved by the Architect and the local authority having jurisdiction before covering or insulating. The satisfactory operation of blowers, pumps and other equipment with moving parts shall be demonstrated to the Architect. Equipment without movable parts shall have pressure or other tests performed by the Contractor to demonstrate satisfactory operation.
G. Furnish all instruments, pumps, blowers and equipment required for the testing.
H. Provide written copies of these test reports for inclusion on the Operations and Maintenance Manuals and submit one copy to Mechanical Engineer.

3.11 PAINTING

A. Surfaces of all equipment and material not provided with a factory finish coat shall be thoroughly cleaned, primed (if not factory primed) and finish coated with a high quality alkyd industrial enamel of a color chosen by the Owner.

3.12 SPECIAL OPENINGS

A. The Contractor shall attempt to schedule delivery of all large equipment requiring special openings for installation prior to enclosing of area. Where this is not possible written notice of required openings which must be provided shall be listed by size and location and submitted to the General Contractor prior to enclosing of areas involved. Work required to construct openings and the associated cost of enclosing them shall be done at no additional cost to the Owner.

3.13 PLACING IN OPERATION

A. All ducts, pipes, equipment, controls, etc., shall be cleaned of plaster and other foreign debris
B. Before final acceptance, all strainers shall be thoroughly cleaned or replaced, all bearings shall be oiled or greased and all drains shall be cleaned out and primed. All permanent filters shall be cleaned; throwaway type filters shall be replaced with new filters.
C. The systems shall be placed in operation.
D. The Contractor shall verify that all controls are set to meet operating conditions specified.
   1. Example: Boiler operating control set at 180 deg F. Limit control set at 200 deg F.
E. The Contractor shall verify that all pieces of equipment are operable and that all sequence of controls are being met.
F. Contractor to adjust seating through the first year as required by Architect.
3.14 BALANCING, TESTING AND ADJUSTING THE MECHANICAL SYSTEMS

A. The Contractor shall include in their proposal the cost of testing, adjusting, and balancing (TAB). The mechanical contractor will be responsible to hire a certified TAB contractor. The Mechanical Contractor shall coordinate with the TAB Contractor to correct deficiencies noted by the TAB Contractor during TAB testing.

3.15 OPERATION AND MAINTENANCE INSTRUCTIONS

A. Contractor shall prepare and provide six copies of operating and maintenance manuals. Contractor shall deliver the six bound sets to the Engineer for approval. Each manual shall be in a ring binder and shall be indexed with dividers for each Section. Delivery of required documents is a condition of final acceptance.

B. Each manual shall contain, but not limited to, the following general sections:
   1. Certificates of acceptance from the inspecting authorities,
   2. Waiver of all liens,
   3. Warranties with starting dates and end dates for each pieces of equipment and/or for each system (warranties shall begin on date of substantial completion and acceptance by the Owner),
   4. Names, telephone and fax numbers and addresses of all subcontractors, vendors, manufacturer’s representatives, and warranties providers,
   5. Certification letters from each Contractor that each system furnished and installed by that Contractor and/or subcontractors is started-up, balanced, adjusted and checked for proper operation in accordance with the intent of the Contract Documents,
   6. Spare parts lists for each piece of equipment,
   7. Lubrication charts showing type of lubrication and application methods and frequencies,
   8. Filter cleaning or replacement schedule (On Contractor’s letterhead stationary),
   9. Preventative maintenance schedule for checking all items such as belt drives, safety controls, oil and refrigerant charges, and seasonal changer over recommendations. Cleaning of all strainers, traps, coils, tower pans, tubes, sprays, etc. (on Contractor’s letterhead stationary),
   10. Normal operating instructions including a sequence of operations (on Contractor’s letterhead stationary),
   11. Instructions as to procedures to be followed for emergency situations, such as alarms or safety items being tripped. (on Contractor’s letterhead stationary),
   12. Instruction on who to call for service during guarantee period, (on Contractor’s letterhead stationary),
   13. Copies of As-Built Drawings on reproducible vellum as produced by a Xerox or photographic process and,
   14. Copies of all approved Shop Drawing submittals including nameplate date, design parameters, name, telephone and fax numbers, address of vendor, manufacturer’s representative and warrantee provider.

C. Approval will not be given for final payment until the tests, balancing and operating instruction portions have been completed.

3.16 INSTRUCTIONS TO THE OWNER

A. Contractor shall instruct the Owner’s operating personnel in the operations and maintenance of all mechanical systems and equipment. There shall be a minimum of eight hours of training. Contractor shall furnish any special servicing tools required for maintenance.
B. Contractor shall conduct a demonstration of the installation upon completion and final acceptance of the work. There shall be a minimum eight hour demonstration. Prior to this all work shall have been completed, tested, balanced and placed in operation. Qualified personnel must be present at the demonstration to operate all the systems and prove the performance of the equipment. The schedule for this demonstration shall be coordinated with the Engineer.

3.17 EXCAVATION FOR PIPE AND CONDUIT

A. Excavate trenches to indicated gradients, lines, depths, and elevations.
B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade. Level bottom of all trenches and cover all PVC pipe with processed chat.
   1. For pipes and conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
   2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
   3. Excavate trenches 4 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
D. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
E. All piping and conduit trenches across pavement shall be backfilled with two-sack concrete to within 12 inches of finished grade.
F. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
   1. Under structures, building slabs, steps, and pavements, scarify and recomact top 12 inches of existing subgrade and each layer of backfill or fill material at 95 percent.
   2. Under walkways, scarify and recomact top 6 inches below subgrade and compact each layer of backfill or fill material at 92 percent.
   3. Under lawn or unpaved areas, scarify and recomact top 6 inches below subgrade and compact each layer of backfill or fill material at 85 percent.
G. Install detectable warning tape above conduits and pipe, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.
H. Protection:
   1. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
   2. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
      a. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recomact.
3. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   a. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

I. Disposal of Surplus and Waste Materials:
   1. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner’s property unless otherwise directed by Owner.
   2. Repair: Any damage to shrubs, grass or structures shall be repaired to previous condition by Contractor at no additional expense to Owner.

J. Bracing and Sheeting: Open cut trenches shall be sheeted and braced as required by OSHA and the requirements of the State of Texas as necessary for the safety of workmen or the protection of property.

END OF SECTION
SECTION 23 05 00.20 - BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. The following basic mechanical materials and methods to complement other Division 22 and 23 Sections.
      a. Piping materials and installation instructions common to most piping systems.
      b. Concrete equipment base construction requirements.
      c. Equipment nameplate data requirements.
      d. Labeling and identifying mechanical systems and equipment is specified in Section 23 05 53 “Mechanical Identification.”
      e. Nonshrink grout for equipment installations.
      f. Field-fabricated metal and wood equipment supports.
      g. Installation requirements common to equipment specification Sections.
      h. Cutting and patching.
      i. Touchup painting and finishing.
   2. Pipe and pipe fitting materials are specified in piping system Sections.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 DEFINITIONS

A. Pipe, pipe fittings, and piping include tube, tube fittings, and tubing.
B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
C. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
D. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
E. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
F. 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.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 01 and Section 23 05 00 of the Specification.
B. Product data for following piping specialties:
   1. Mechanical sleeve seals.
   2. Dielectric Fittings.
   3. Access Doors.
1.4 QUALITY ASSURANCE

A. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."
   1. Comply with provisions of ASME B31 Series "Code for Pressure Piping."
   2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.
B. ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
C. Equipment Selection: Equipment of greater or larger power, 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. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.
B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.
C. Protect flanges, fittings, and piping specialties from moisture and dirt.
D. Protect stored plastic pipes from direct sunlight. Support to prevent sagging and bending.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.
B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
C. Coordinate the 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 prior to closing in the building.
E. Coordinate connection of electrical services.
F. 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.
G. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."
H. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces. Install identifying devices prior to installing acoustical ceilings and similar concealment.
PART 2 - PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. Refer to individual piping system specification Sections for pipe and fitting materials and joining methods.
B. Pipe Threads: ASME B 1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual piping system specification Sections in Divisions 22 and 23 for special joining materials not listed below.
B. Pipe Flange Gasket Materials: Suitable for the chemical and thermal conditions of the piping system contents.
   1. ASME B 16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, except where thickness or specific material is indicated.
      a. Full-Face Type: For flat-face, Class 125 cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250 cast-iron and steel flanges.
   2. ASME B 16.20 for grooved, ring-joint, steel flanges.
   3. AWWA C110, rubber, flat face, 1/8-inch thick, except where other thickness is indicated; and full-face or ring type, except where type is indicated.
C. Flange Bolts and Nuts: ASME B 18.2.1, carbon steel, except where other material is indicated.
D. Plastic Pipe Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, except where other type or material is indicated.
E. Solder Filler Metal: ASTM B 32.
   1. Alloy Sn95 or Alloy Sn94: Tin (approximately 95 percent) and silver (approximately 5 percent), having 0.10 percent lead content.
F. Brazing Filler Metals: AWS A5.8.
   1. BCuP Series: Copper-phosphorus alloys.
   2. BAg1: Silver alloy.
G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
H. Solvent Cements: Manufacturer's standard solvents complying with the following:
   4. PVC to ABS Transition: Made to requirements of ASTM D 3138, color other than orange.
J. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon steel bolts and nuts.
K. Couplings: Iron body sleeve assembly, fabricated to match outside diameters of plain-end pressure pipes.
   2. Followers: ASTM A 47, Grade 32510 or ASTM A 536 ductile iron.
   5. Finish: Enamel paint.
2.3 PIPING SPECIALTIES

A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type where required to conceal protruding fittings and sleeves.
   1. Inside Diameter: Closely fit around pipe, tube, and insulation.
   2. Outside Diameter: Completely cover opening.
   3. Cast Brass: One-piece, with setscrew.
      a. Finish: Rough brass.
      b. Finish: Polished chrome plate.
   4. Cast Brass: Split casting, with concealed hinge and setscrew.
      a. Finish: Rough brass.
      b. Finish: Polished chrome plate.
   5. Stamped Steel: One-piece, with setscrew and chrome-plated finish.
   6. Stamped Steel: One-piece, with spring clips and chrome-plated finish.
   7. Stamped Steel: Split plate, with concealed hinge, setscrew, and chrome-plated finish.
   8. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome-plated finish.
   9. Stamped Steel: Split plate, with exposed-rivet hinge, setscrew, and chrome-plated finish.
   10. Stamped Steel: Split plate, with exposed-rivet hinge, spring clips, and chrome-plated finish.
   11. Cast-Iron Floor Plate: One-piece casting.

B. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals to prevent galvanic action and stop corrosion.
   1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.
   2. Insulating Material: Suitable for system fluid, pressure, and temperature.
   4. Dielectric Flanges: Factory-fabricated, companion-flange assembly for 150- or 300-psig minimum pressure to suit system pressures.
   5. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
      a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure to suit system pressures.
   6. Dielectric Couplings: Galvanized-steel coupling, having inert and noncorrosive, thermoplastic lining, with threaded ends and 300-psig minimum working pressure at 225 deg F temperature.
   7. Dielectric Nipples: Electroplated steel nipple, having inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig working pressure at 225 deg F temperature.

C. Mechanical Sleeve Seals: Modular, watertight mechanical type. Components include interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve. Connecting bolts and pressure plates cause rubber-sealing elements to expand when tightened.

D. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
   1. Steel Sheet Metal: 24-gage or heavier galvanized sheet metal, 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, having plain ends and integral water stop, except where other features are specified.
4. Wall Penetration Systems: Wall sleeve assembly, consisting of housing, gaskets, and pipe sleeve, with 1 mechanical-joint end conforming to AWWA C110 and 1 plain pipe-sleeve end.
   a. Penetrating Pipe Deflection: 5 percent without leakage.
   b. Housing: Ductile-iron casting having waterstop and anchor ring, with ductile-iron gland, steel studs and nuts, and rubber gasket conforming to AWWA C111, of housing and gasket size as required to fit penetrating pipe.
   c. Pipe Sleeve: AWWA C151, ductile-iron pipe.
   d. Housing-to-Sleeve Gasket: Rubber or neoprene push-on type of manufacturer's design.
5. Cast-Iron Sleeve Fittings: Commercially made sleeve having an integral clamping flange, with clamping ring, bolts, and nuts for membrane flashing.
   a. Underdeck Clamp: Clamping ring with setscrews.

2.4 GROUT

A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
   2. Design Mix: 5000-psi 28-day compressive strength.

2.5 ACCESS DOORS

A. Flush mounted steel access doors with 16 ga. frame and 14 ga. panel. Prime coat finish. Concealed spring hinges, screwdriver cam-lock. Doors in fire rated surfaces shall be U.L. listed and labeled. Doors to be Milcor or approved equivalent.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS--COMMON REQUIREMENTS

A. General: Install piping as described below, except where system Sections specify otherwise. Individual piping system specification Sections in Divisions 22 and 23 specify piping installation requirements unique to the piping system.
B. General Locations and Arrangements: Drawings (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. Install piping as indicated, except where deviations to layout are approved on coordination Drawings.
C. Install piping at indicated slope.
D. Install components having 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, except where 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 printed instructions.

M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
   1. Chrome-Plated Piping: Cast-brass, one-piece, with setscrew, and polished chrome-plated finish. Use split-casting escutcheons, where required, for existing piping.
   2. Uninsulated Piping Wall Escutcheons: Cast-brass or stamped-steel, with setscrew.
   3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
   4. Insulated Piping: Cast-brass or stamped-steel, with concealed hinge, spring clips, and chrome-plated finish.
   5. Piping in Utility Areas: Cast-brass or stamped-steel, with setscrew or spring clips.

N. Sleeves are required for core drilled holes.

O. Install sleeves for pipes passing through concrete and masonry walls, concrete floor and roof slabs, and where indicated.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, concrete floor and roof slabs, and where indicated.
   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 4 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring where specified.
   2. Build sleeves into new walls and slabs as work progresses.
   3. Install large enough sleeves to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
      a. Steel Pipe Sleeves: For pipes smaller than 6 inches.
      b. Steel Sheet-Metal Sleeves: For pipes 6 inches and larger that penetrate gypsum board partitions.
      c. Cast-Iron Sleeve Fittings: For floors having membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 4 inches above finished floor level. Flashing is specified in Division 07.
         1) Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.
   4. Except for below-grade wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants specified in Division 07.

Q. Above Grade, Exterior Wall, and Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installation of mechanical seals.
   1. Install steel pipe for sleeves smaller than 6 inches.
   2. Install cast-iron wall pipes for sleeves 6 inches and larger.
   3. Assemble and install mechanical seals according to manufacturer's printed instructions.
R. Below Grade, Exterior Wall, and 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 installation of mechanical seals.

1. Below Grade, Exterior Wall, and Pipe Penetrations: Install ductile-iron wall penetration system sleeves according to manufacturer's printed installation instructions.

S. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping sealant material. Firestopping materials are specified in Division 07.

T. Verify final equipment locations for roughing in.

U. Refer to equipment specifications in other Sections for roughing-in requirements.

V. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping system 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.
5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B 1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full inside diameter. Join pipe fittings and valves as follows:
   a. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
   b. Apply appropriate tape or thread compound to external pipe threads (except where dry seal threading is specified).
   c. Align threads at point of assembly.
   d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
   e. Damaged Threads: Do not use pipe or pipe fittings having threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
8. Plastic Pipe and Fitting Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following standards:
   a. Comply with ASTM F 402 for safe handling of solvent-cement and primers.
   e. Poly (Vinyl Chloride) (PVC) Non-Pressure Application: ASTM D 2855.
   f. PVC to ABS (Non-Pressure) Transition: Procedure and solvent cement described in ASTM D 3138.
   a. Plain-End Pipe and Fittings: Butt joining.
   b. Plain-End Pipe and Socket-Type Fittings: Socket joining.

W. Piping Connections: Except as otherwise indicated, make piping connections as specified below.
   1. Install unions in piping 2 inches and smaller adjacent to each valve and at final connection to each piece of equipment having a 2-inch or smaller threaded pipe connection.
   2. Install flanges in piping 2-1/2 inches and larger adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
   3. Dry Piping Systems (Gas): Install dielectric unions and flanges to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION—COMMON REQUIREMENTS

A. Install equipment to provide the maximum possible headroom where 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 the Architect.
C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.
D. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
E. Install equipment giving right-of-way to piping systems installed at a required slope.

3.3 ACCESS DOORS

A. Furnish an access door for each pipe chase for each floor. This includes both toilet plumbing chases and pipe riser chases. Access doors assembly to be size 16-inch x 16-inch. Access doors are not shown on floor plans. Access door locations shall be field verified.
B. Also, furnish access doors in all non-removable ceiling and in partitions and walls where necessary access to plumbing cleanouts, shock absorbers, fire dampers, manual dampers, valves and other mechanical devices requiring access. Size these as required for access with minimum size of 12-inch x 12-inch.
C. Any access doors furnished for installation in fire rated surfaces or assembly shall carry an approved fire rating for that use.
D. Any access doors furnished for installation in glued on acoustical surfaces or assembly shall have recessed door to allow installation of tiles.
E. Provide all access doors to the General Contractor for them to construct into the building.

3.4 PAINTING AND FINISHING

A. Refer to Division 09 for field painting requirements.
B. Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.
3.5 CONCRETE BASES

A. Construct concrete equipment bases of dimensions indicated, but not less than 4 inches larger than supported unit in both directions. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi, 28-day compressive strength concrete and reinforcement use fibrillated or monofilament polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long. Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE

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 AWS D1.1 "Structural Welding Code--Steel."

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.
B. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.
C. Attach to substrates as required to support applied loads.

3.8 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of the trades involved.
B. Repair cut surfaces to match adjacent surfaces.

3.9 GROUTING

A. Install nonmetallic nonshrink grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's printed instructions.
B. Clean surfaces that will come into contact with grout.
C. Provide forms for placement of grout, as required.
D. Avoid air entrapment when placing grout.
E. Place grout to completely fill equipment bases.
F. Place grout on concrete bases to provide a smooth bearing surface for equipment.
G. Place grout around anchors.
H. Cure placed grout according to manufacturer's printed instructions.

3.10 DEMOLITION

A. Disconnect, demolish, and remove work specified under Divisions 22 and 23 and as indicated.
B. Where 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. Abandoned Work: Cut and remove buried pipe abandoned in place, 2 inched beyond the face of adjacent construction. Cap and patch surface to match existing finish.
E. Removal: Remove indicated equipment from the Project site.
F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

END OF SECTION
SECTION 23 05 29.10 - HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pipe hangers and supports.
   2. Hanger rods.
   3. Equipment curbs.
   4. Formed steel channel.
   5. Equipment bases and supports.
B. Related Sections:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 REFERENCES

A. American Society of Mechanical Engineers:
   1. ASME B 31.1 - Power Piping.
   2. ASME B 31.5 - Refrigeration Piping.
   3. ASME B 31.9 - Building Services Piping.
B. ASTM International:
C. American Welding Society:
   1. AWS D1.1 - Structural Welding Code - Steel.
D. FM Global:
E. Manufacturers Standardization Society of the Valve and Fittings Industry:
   1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
   2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
   3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.3 SUBMITTALS

A. Division 01 and Section 23 05 00 “Submittals.”
B. Shop Drawings: Indicate system layout with location including critical dimensions, sizes, and pipe hanger and support locations and detail of trapeze hangers.
C. Product Data:
   1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
D. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
E. Manufacturer's Installation Instructions:
   1. Hangers and Supports: Submit special procedures and assembly of components.
F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
1.4 QUALITY ASSURANCE
   A. Perform Work in accordance with State and local standards.
   B. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.

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

1.6 DELIVERY, STORAGE, AND HANDLING
   A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
   B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

1.7 FIELD MEASUREMENTS
   A. Verify field measurements prior to fabrication.

1.8 WARRANTY
   A. Section 23 05 00: Product warranties.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS
   A. Plumbing Piping – DWV and Storm Drainage:
      1. Conform to ASME B 31.9, ASTM F 708, MSS SP58, MSS SP69, or MSS SP89.
      2. Hangers for Pipe Sizes 1/2 to 1-1/2-Inch: Malleable iron or carbon steel, adjustable swivel, split ring.
      3. Hangers for Pipe Sizes 2 Inches and Larger: Carbon steel, adjustable, clevis.
      4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
      5. Wall Support for Pipe Sizes 3 Inches and Smaller: Cast iron hook.
      8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
      9. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.
   B. Plumbing Piping - Water:
      1. Conform to ASME B 31.9, ASTM F 708, MSS SP58, MSS SP69, or MSS SP89.
      2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron or carbon steel, adjustable swivel, split ring.
      3. Hangers for Cold Pipe Sizes 2 Inches and Larger: Carbon steel, adjustable, clevis.
5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
6. Wall Support for Pipe Sizes 3 Inches and Smaller: Cast iron hook.
9. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
10. Floor Support for Hot Pipe Sizes 4 Inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.2 ACCESSORIES
   A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.3 EQUIPMENT CURBS
   A. Fabrication: Unless otherwise noted, shall be welded 18 gage galvanized steel shell and base, mitered 3-inch cant, variable step to match roof insulation, 1-1/2 inch thick insulation, factory installed wood nailer. Provide tapered curbs to match roof slope.

2.4 FORMED STEEL CHANNEL
   A. Manufacturers:
      2. Unistrut Corp.
      3. Substitutions: See Section 23 05 00.
   B. Product Description: Galvanized (12 gage) thick steel. With holes 1-1/2 inches on center.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Verify the existing conditions before starting Work.
   B. Verify openings are ready to receive sleeves.

3.2 PREPARATION
   A. Obtain permission from Architect before using powder-actuated anchors.
   B. Do not drill or cut structural members without obtaining permission from Architect/Engineer.

3.3 INSTALLATION - PIPE HANGERS AND SUPPORTS
   A. Install in accordance with ASME B 31.1, ASME B 31.5, ASME 31.9, ASTM F 708, MSS SP 58, MSS SP 69, or MSS SP 89.
   B. Support horizontal piping as scheduled.
   C. Install hangers with minimum 1/2-inch space between finished covering and adjacent work.
   D. Place hangers within 12 inches of each horizontal elbow.
   E. Use hangers with 1-1/2-inch minimum vertical adjustment.
F. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

G. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

H. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

I. Support riser piping independently of connected horizontal piping.

J. Provide copper plated hangers and supports for copper piping.

K. Design hangers for pipe movement without disengagement of supported pipe.

L. Prime coat exposed steel hangers and supports. Refer to Division 09. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

M. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 23 07 05.

3.4 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 4 inches thick and extending 6 inches beyond supported equipment. Refer to Division 03.

B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of steel members, formed steel channel, or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.5 INSTALLATION - FLASHING

A. Provide flexible flashing and metal Counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked 1-inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash, and seal.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36-inch sheet size. Fasten flashing to drain clamp device.

D. Seal floor drains watertight to adjacent materials.

E. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms for sound control.

F. Provide curbs for mechanical roof installations 10 inches minimum high above roofing surface. Flash and counter-flash with sheet metal; seal watertight. Attach Counterflashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints.

G. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.6 FIELD QUALITY CONTROL

A. Inspect installed firestopping for compliance with Specifications and submitted Schedule.

3.7 CLEANING

A. Clean adjacent surfaces of firestopping materials.
3.8 PROTECTION OF FINISHED WORK
A. Protect adjacent surfaces from damage by material installation.

3.9 SCHEDULES
A. PIPE HANGER SPACING (OR AS REQUIRED BY LOCAL CODE)

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<tr>
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END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Nameplates.
   2. Tags.
   3. Stencils.
   4. Pipe markers.
   5. Ceiling tacks.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 REFERENCES

A. American Society of Mechanical Engineers:

1.3 SUBMITTALS

A. Division 01 and Section 23 05 00 “Submittals.”
B. Product Data: Submit manufacturers catalog literature for each product required.
C. Manufacturer's Installation Instructions: Indicate installation instructions, special
   procedures, and installation.
D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

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

1.5 QUALITY ASSURANCE

A. Conform to ASME A 13.1 for color scheme for identification of piping systems and
   accessories.

1.6 QUALIFICATIONS

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

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.
PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Manufacturers:
   1. Seton Identification Products.
   2. Substitutions: Section 23 05 00.

B. Product Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.2 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inches diameter with finished edges.

B. Tag Chart: Typewritten letter size list of applied tags and location in anodized aluminum frame.

2.3 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
   1. Up to 2 Inches Outside Diameter of Insulation or Pipe: 1/2-inch-high letters.
   2. 2-1/2 to 6 Inches Outside Diameter of Insulation or Pipe: 1-inch high letters.
   3. Over 6 Inches Outside Diameter of Insulation or Pipe: 1-3/4 inches high letters.

B. Stencil Paint: As specified in Division 09, semi-gloss enamel, colors and lettering size conforming to ASME A 13.1.

2.4 PIPE MARKERS


B. Plastic Pipe Markers:
   1. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

C. Plastic Tape Pipe Markers:
   1. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Plastic Underground Pipe Markers:
   1. Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil. thick, manufactured for direct burial service. Markers used on nonmetallic pipe shall contain tracer wire.

2.5 CEILING TACKS

A. Description: Steel with 3/4-inch diameter color-coded head.

B. Color code as follows:
   1. HVAC Equipment: Yellow.
   2. Fire Dampers/Smoke Dampers: Red.
PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.
B. Prepare surfaces in accordance with Division 09 for stencil painting.

3.2 INSTALLATION

A. Apply stencil painting in accordance with Division 09.
B. Install identifying devices after completion of coverings and painting.
C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
D. Install tags using corrosion resistant chain. Number tags consecutively by location.
E. Install underground plastic pipe markers 8 to 10 inches below finished grade, directly above buried pipe.
F. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates or stencil painting. Identify in-line pumps and other small devices with tags.
G. Identify control panels and major control components outside panels with plastic nameplates.
H. Identify valves in main and branch piping with tags.
I. Identify air terminal units and radiator valves with numbered tags.
J. Tag automatic controls, instruments, and relays. Key to control schematic.
K. Identify piping, concealed or exposed, with plastic pipe markers, plastic tape pipe markers or stenciled painting. Use tags on piping 3/4-inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
L. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION
SECTION 23 05 93 - TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Testing, adjusting, and balancing of air systems.
   2. Measurement of final operating condition of HVAC systems.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 REFERENCES

A. Associated Air Balance Council:

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

C. Natural Environmental Balancing Bureau:
   1. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

1.3 SUBMITTALS

A. Division 01 and Section 23 05 00 “Submittals.”
B. Prior to commencing Work, submit proof of latest calibration date of each instrument.
C. Test Reports: Indicate data on AABC MN-1 National Standards for Total System Balance forms or NEBB Report forms.
D. Field Reports: Indicate deficiencies preventing proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
E. Prior to commencing Work, submit report forms or outlines indicating adjusting, balancing, and equipment data required. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty or NEBB Certificate of Conformance Certification.
F. Submit draft copies of report for review prior to final acceptance of Project.
G. Furnish reports in soft cover, letter size, 3-ring binder manuals, complete with table of contents page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of balancing valves and rough setting.
B. Operation and Maintenance Data: Furnish final copy of testing, adjusting, and balancing report inclusion in operating and maintenance manuals.
1.5 QUALITY ASSURANCE
   A. Perform Work in accordance with State and local standards.
   B. Perform Work in accordance with AABC MN-1 National Standards for Field Measurement and Instrumentation, Total System Balance and NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.
   C. Maintain one copy of each document on site.
   D. Prior to commencing Work, calibrate each instrument to be used. Upon completing Work, recalibrate each instrument to assure reliability.

1.6 QUALIFICATIONS
   A. Agency: Company specializing in testing, adjusting, and balancing of systems specified in this Section with minimum three years documented experience certified by AABC or NEBB.
   B. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor and a registered professional engineer experienced in performance of this Work and licensed in State of Texas.

1.7 SEQUENCING
   A. Sequence balancing between completion of systems tested and Date of Substantial Completion.

1.8 SCHEDULING
   A. Schedule and provide assistance in final adjustment.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Verify systems are complete and operable before commencing Work. Verify the following:
      1. Systems are started and operating in safe and normal condition.
      2. Temperature control systems are installed complete and operable.
      3. Proper thermal overload protection is in place for electrical equipment.
      4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
      5. Duct systems are clean of debris.
      6. Fans are rotating correctly.
      7. Fire and volume dampers are in place and open.
      8. Air coil fins are cleaned and combed.
      9. Access doors are closed and duct end caps are in place.
     10. Air outlets are installed and connected.
     11. Duct system leakage is minimized.
3.2 PREPARATION
A. Furnish instruments required for testing, adjusting, and balancing operations.
B. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

3.3 INSTALLATION TOLERANCES
A. Air Handling Systems: Adjust to within plus or minus 10 percent of design.
B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.4 ADJUSTING
A. Verify recorded data represents actual measured or observed conditions.
B. Permanently mark settings of dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
C. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.
D. Report defects and deficiencies noted during performance of services, preventing system balance.
E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
F. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner.
G. Check and adjust systems approximately six months after final acceptance and submit report.

3.5 AIR SYSTEM PROCEDURE
A. Adjust air handling and distribution systems to obtain required or design supply, return, and exhaust air quantities at site altitude.
B. Make air quantity measurements in main ducts by Pitot tube traverse of entire cross sectional area of duct.
C. Measure air quantities at air inlets and outlets.
D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts.
E. Use volume control devices to regulate air quantities only to extent adjustments do not create objectionable air motion or sound levels. Effect volume control by using volume dampers located in ducts.
F. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes to vary fan speed. Vary branch air quantities by damper regulation.
G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across fan. Make allowances for 50 percent loading of filters.
I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
K. At modulating damper locations, take measurements and balance at extreme conditions.
3.6 SCHEDULES

A. Equipment Requiring Testing, Adjusting, and Balancing:
   1. Packaged Roof Top Heating/Cooling Units.
   2. Fans.
   3. Air Filters.
   4. Air Inlets and Outlets.

B. Report Forms:
   1. Title Page:
      a. Name of Testing, Adjusting, and Balancing Agency.
      b. Address of Testing, Adjusting, and Balancing Agency.
      c. Telephone and facsimile numbers of Testing, Adjusting, and Balancing Agency.
      d. Project name.
      e. Project location.
      f. Project Architect.
      g. Project Engineer.
      h. Project Contractor.
      i. Project altitude.
      j. Report date.
   2. Summary Comments:
      a. Design versus final performance.
      b. Notable characteristics of system.
      c. Description of systems operation sequence.
      d. Summary of outdoor and exhaust flows to indicate building pressurization.
      e. Nomenclature used throughout report.
      f. Test conditions.
   3. Instrument List:
      b. Manufacturer.
      c. Model number.
      d. Serial number.
      e. Range.
      f. Calibration date.
   4. Electric Motors:
      a. Manufacturer.
      b. Model/Frame.
      c. HP/BHP and kW.
      d. Phase, voltage, amperage; nameplate, actual, no load.
      e. RPM.
      f. Service factor.
      g. Starter size, rating, heater elements.
      h. Sheave Make/Size/Bore.
   5. V-Belt Drive:
      a. Identification/location.
      b. Required driven RPM.
      c. Driven sheave, diameter and RPM.
      d. Belt, size and quantity.
      e. Motor sheave diameter and RPM.
      f. Center to center distance, maximum, minimum, and actual.
6. Cooling Data:
   a. Identification/number.
   b. Location.
   c. Service.
   d. Manufacturer.
   e. Air flow, design and actual.
   f. Entering air DB temperature, design and actual.
   g. Entering air WB temperature, design and actual.
   h. Leaving air DB temperature, design and actual.
   i. Leaving air WB temperature, design and actual.
   j. Air pressure drop, design and actual.

7. Heating Data:
   a. Identification/number.
   b. Location.
   c. Service.
   d. Manufacturer.
   e. Air flow, design and actual.
   f. Entering air temperature, design and actual.
   g. Leaving air temperature, design and actual.
   h. Air pressure drop, design and actual.

8. Air Moving Equipment:
   a. Location.
   b. Manufacturer.
   c. Model number.
   d. Serial number.
   e. Arrangement/Class/Discharge.
   f. Air flow, specified and actual.
   g. Return air flow, specified and actual.
   h. Outside air flow, specified and actual.
   i. Total static pressure (total external), specified and actual.
   j. Inlet pressure.
   k. Discharge pressure.
   l. Sheave Make/Size/Bore.
   m. Number of Belts/Make/Size.
   n. Fan RPM.

9. Return Air/Outside Air Data:
   a. Identification/location.
   b. Design air flow.
   c. Actual air flow.
   d. Design return air flow.
   e. Actual return air flow.
   f. Design outside air flow.
   g. Actual outside air flow.
   h. Return air temperature.
   i. Outside air temperature.
   j. Required mixed air temperature.
   k. Actual mixed air temperature.
   l. Design outside/return air ratio.
   m. Actual outside/return air ratio.
10. **Exhaust Fan Data:**
   a. Location.
   b. Manufacturer.
   c. Model number.
   d. Serial number.
   e. Air flow, specified and actual.
   f. Total static pressure (total external), specified and actual.
   g. Inlet pressure.
   h. Discharge pressure.
   i. Sheave Make/Size/Bore.
   j. Number of Belts/Make/Size.
   k. Fan RPM.

11. **Air Distribution Test Sheet:**
   a. Air terminal number.
   b. Room number/location.
   c. Terminal type.
   d. Terminal size.
   e. Area factor.
   f. Design velocity.
   g. Design air flow.
   h. Test (final) velocity.
   i. Test (final) air flow.
   j. Percent of design air flow.

END OF SECTION
SECTION 23 07 05 - HVAC AND PLUMBING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Ductwork insulation.
   2. Insulation jackets.
   3. Piping system insulation.
   4. Insulation accessories including vapor retarders, jackets, and accessories.
B. Related Sections:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 REFERENCES

A. ASTM International:

B. Sheet Metal and Air Conditioning Contractors:
   1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

1.3 SUBMITTALS
   A. Division 01 and Section 23 05 00 “Submittals.”
   B. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.
   C. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.
   D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALIFICATIONS
   A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years’ experience.
   B. Applicator: Company specializing in performing Work of this Section with minimum three years’ experience approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
   B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.6 ENVIRONMENTAL REQUIREMENTS
   A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
   B. Maintain temperature during and after installation for minimum period of 24 hours.

1.7 FIELD MEASUREMENTS
   A. Verify field measurements prior to fabrication.
1.8 WARRANTY

A. Section 23 05 00 for product warranties.

PART 2 - PRODUCTS

2.1 MAN MADE MINERAL FIBER

A. Manufacturers:
   2. Knauf.
   3. Owens Corning.
   4. Substitutions: Section 23 05 00 for substitutions.

B. Insulation: ASTM C 547 Mineral Fiber Pipe Insulation, Type I, 850 degrees F.

C. Vapor Retarder Jacket:
   1. ASTM C 921, White Kraft paper with glass fiber yarn, bonded to aluminized film.
   2. Moisture Vapor Transmission: ASTM E 96; 0.02 perm-inches.

D. Tie Wire: 0.048-inch stainless steel with twisted ends on maximum 12-inch centers.

E. Vapor Retarder Lap Adhesive:
   1. Compatible with insulation.

F. Insulating Cement/Mastic:
   1. ASTM C 195; hydraulic setting on mineral wool.

G. Glass Fiber Fabric:
   1. Cloth: Untreated; 9 oz/sq yd weight.
   2. Blanket: 1.0 lb/cu ft density.
   3. Weave: 10 x 10.

H. Indoor Vapor Retarder Finish:
   1. Cloth: Untreated; 9 oz/sq yd weight.
   2. Vinyl emulsion type acrylic, compatible with insulation, white color.

I. Insulating Cement:
   1. ASTM C 449/C 449M.

2.2 MINERAL FIBER, FLEXIBLE

A. Manufacturers:
   2. Knauf.
   3. Owens Corning.
   4. Substitutions: Section 23 05 00 for substitutions.

B. Insulation: ASTM C 553 Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications, Type II.
   1. Density: .75 PCF.

C. Vapor Retarder Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture vapor transmission: ASTM E 96; 0.02 perm.
   3. Secure with pressure sensitive tape.

D. Vapor Retarder Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

E. Tie Wire: Annealed steel, 16 gage.
2.3 PIPE INSULATION AND EQUIPMENT JACKETS

A. PVC Plastic Pipe Jacket:
   1. Manufacturers:
      b. Knauf.
      c. Owens Corning.
      d. Substitutions: Section 23 05 00 for substitutions.
   2. Product Description: ASTM D 1784, one piece molded type fitting covers and sheet material, off-white color.
   3. Thickness: 15 mil.

B. PVC Plastic Equipment Jacket:
   1. Manufacturers:
      b. Knauf.
      c. Owens Corning.
      d. Substitutions: Section 23 05 00 for substitutions.
   2. Product Description: Sheet material, off-white color.
   3. Minimum Service Temperature: -40 degrees F.
   4. Maximum Service Temperature: 150 degrees F.
   5. Moisture Vapor Transmission: ASTM E 96; 0.002 perm-inches.

C. Covering Adhesive Mastic:
   1. Compatible with insulation.

D. Aluminum Pipe Jacket:
   1. ASTM B 209.
   2. Thickness: 0.020-inch thick.
   3. Finish: Stucco embossed.
   5. Fittings: 0.016-inch-thick die shaped fitting covers with factory attached protection liner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify piping, equipment and ductwork has been tested before applying insulation materials.
B. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Exposed Piping: Locate insulation and cover seams in least visible locations.
B. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
C. Man-made mineral fiber insulated pipes conveying fluids below ambient temperature:
   1. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.

D. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

E. Man-made mineral fiber insulated pipes conveying fluids above ambient temperature:
   1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

F. Inserts and Shields:
   1. Application: Piping or Equipment 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under finish jacket.
   4. Insert configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
   5. Insert material: Compression resistant insulating material suitable for planned temperature range and service.

G. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Division 07 for penetrations of assemblies with fire resistance rating greater than one hour.

H. Factory Insulated Equipment: Do not insulate.

I. Exposed Equipment: Locate insulation and cover seams in least visible locations.

J. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

K. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

L. Insulated equipment containing fluids below ambient temperature: Insulate entire system.

M. Mineral fiber insulated equipment containing fluids below ambient temperature: Provide vapor retarder jackets, factory-applied or field-applied. Finish with glass-cloth and vapor barrier adhesive.

N. For hot equipment containing fluids over 140 degrees F, insulate flanges and unions with removable sections and jackets.

O. Mineral fiber insulated equipment containing fluids above ambient temperature: Provide standard jackets, with or without vapor retarder, factory-applied or field-applied. Finish with glass cloth and adhesive.

P. Finish insulation at supports, protrusions, and interruptions.

Q. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

R. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.

S. Insulated ductwork conveying air below ambient temperature:
   1. Provide insulation with vapor retarder jackets.
   2. Finish with tape and vapor retarder jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

T. Insulated ductwork conveying air above ambient temperature:
1. Provide with or without standard vapor retarder jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

U. External Duct Insulation Application:
1. Secure insulation with vapor retarder with wires and seal jacket joints with vapor retarder adhesive or tape to match jacket.
2. Secure insulation without vapor retarder with staples, tape, or wires.
3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
4. Seal vapor retarder penetrations by mechanical fasteners with vapor retarder adhesive.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

V. For hot equipment containing fluids over 140 deg F, insulate flanges and unions with removable sections and jackets.

W. Exterior Applications: Provide vapor retarder jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with aluminum jacket with seams located at 3 or 9 o’clock position on side of horizontal piping with overlap facing down to shed water.

3.3 SCHEDULES

A. Plumbing Systems:
1. Domestic Hot Water Supply:
   a. Man-made Mineral Fiber Insulation:
      1) Pipe Size Range: 1.5-inch or less.
         (a) Thickness: 1-inch.
      2) Pipe Size Range: Greater than 1.5-inch.
         (a) Thickness: 1 1/2-inch.
   2. Domestic Cold Water:
      a. Man-made Mineral Fiber Insulation:
         1) Pipe Size Range: All sizes.
            (a) Thickness: 1/2-inch.

B. Supply Ducts:
1. Mineral Fiber, Flexible:
   a. Thickness: Required to obtain R-6.

C. Return Ducts:
1. Mineral Fiber, Flexible:
   a. Thickness: Required to obtain R-6.

END OF SECTION
SECTION 23 31 00 - HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Duct Materials.
   2. Insulated flexible ducts.
   3. Transverse duct connection system.
   4. Ductwork fabrication.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 REFERENCES

A. ASTM International:
   2. ASTM A 90/A 90M - Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
   5. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   6. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

B. National Fire Protection Association:
   2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems.

C. Sheet Metal and Air Conditioning Contractors:
   2. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

D. UL LLC:
   1. UL 181 - Factory-Made Air Ducts and Connectors.
1.3 PERFORMANCE REQUIREMENTS

A. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.4 SUBMITTALS

A. Division 01 and Section 23 05 00 for submittals.
B. Product Data: Submit data for duct materials and duct connectors.
C. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA HVAC Air Duct Leakage Test Manual.
D. Manufacturer's Installation Instructions: Submit special procedures for glass fiber ducts.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.
B. Construct ductwork to NFPA 90A standards.

1.7 QUALIFICATIONS

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

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.
B. Maintain temperatures during and after installation of duct sealant.

1.9 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 WARRANTY

A. Section 23 05 00 for product warranties.
PART 2 - PRODUCTS

2.1 DUCT MATERIALS

A. Galvanized Steel Ducts: ASTM A 653/A 653M galvanized steel sheet, lock-forming quality, having G90 zinc coating of in conformance with ASTM A 90/A 90M.
B. Fasteners: Rivets, bolts, or sheet metal screws.
C. Hanger Rod: ASTM A 36/A 36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.2 INSULATED FLEXIBLE DUCTS

A. Product Description: Two ply vinyl film supported by helical wound spring steel wire; fiberglass insulation; aluminized vapor barrier film.
   1. Pressure Rating: 10 inches wg positive and 1.0 inches wg negative.
   3. Temperature Range: -10 degrees F to 160 degrees F.
   4. Thermal Resistance: 6.0 square feet-hour-degree F per BTU.

2.3 DUCTWORK FABRICATION

A. Fabricate and support rectangular ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and as indicated on Drawings. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
B. Fabricate and support round ducts with longitudinal seams in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible (Round Duct Construction Standards), and as indicated on Drawings. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
C. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide air foil turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.
D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
E. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
F. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree tee connections.
G. Seal joints between duct sections and duct seams with welds, gaskets, mastic adhesives, mastic plus embedded fabric systems, or tape.
   1. Sealants, Mastics and Tape: Conform to UL 181A. Provide products bearing appropriate UL 181A markings.
   2. Do not provide sealing products not bearing UL approval marking.
   3. Any mastic used on outside of building exposed on roof shall be rated for that environment.
H. All ductwork shall be constructed to meet seal class A.
2.4 TRANSVERSE DUCT CONNECTION SYSTEM

A. Manufacturers:
   1. Ductmate.
   2. Substitutions: Refer to Section 23 05 00.

B. Product Description: SMACNA “F” rated or SMACNA “J” rated rigidity class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify sizes of equipment connections before fabricating transitions.

3.2 INSTALLATION

A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
B. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
C. Use crimp joints with or without bead or beaded sleeve couplings for joining round duct sizes 8 inches and smaller.
D. Install duct hangers and supports in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
E. Use double nuts and lock washers on threaded rod supports.
F. Connect flexible ducts to metal ducts with draw bands.
G. Set plenum doors 6 to 12 inches above floor. Arrange door swing so fan static pressure holds door in closed position.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Install openings in ductwork where required to accommodate thermometers and controllers. Install pitot tube openings for testing of systems. Install pitot tube complete with metal can with spring device or screw to prevent air leakage. Where openings are provided in insulated ductwork, install insulation material inside metal ring.
B. Connect diffusers to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.
C. Connect air outlets and inlets to supply ducts directly or with five foot maximum length of flexible duct. Do not use flexible duct to change direction.

3.4 CLEANING

A. Final Cleaning: Refer to Division 01.
B. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air flow, clean one half of system completely before proceeding to other half. Protect equipment with potential to be harmed by excessive dirt with temporary filters; or bypass during cleaning.
3.5 SCHEDULES

A. Ductwork Material Schedule

<table>
<thead>
<tr>
<th>AIR SYSTEM</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply</td>
<td>Steel</td>
</tr>
<tr>
<td>Return</td>
<td>Steel</td>
</tr>
<tr>
<td>General Exhaust</td>
<td>Steel</td>
</tr>
</tbody>
</table>

B. Ductwork Pressure Class Schedule

<table>
<thead>
<tr>
<th>AIR SYSTEM</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant Volume Supply</td>
<td>2-inch wg regardless of velocity</td>
</tr>
<tr>
<td>Return and Relief</td>
<td>1-inch wg regardless of velocity</td>
</tr>
<tr>
<td>General Exhaust</td>
<td>1-inch wg regardless of velocity</td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   2. Combination fire-and-smoke dampers.
   3. Duct access doors.
   4. Volume control dampers.
   5. Flexible duct connections.
   6. Duct test holes.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 REFERENCES

A. National Fire Protection Association:
   2. NFPA 92A - Recommended Practice for Smoke-Control Systems.

B. Sheet Metal and Air Conditioning Contractors:
   1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

C. UL LLC:
   1. UL 33 - Heat Responsive Links for Fire-Protection Service.
   2. UL 555 - Fire Dampers.

1.3 SUBMITTALS

A. Division 01 and Section 23 05 00 for submittals.

B. Product Data: Submit data for shop fabricated assemblies including fire/smoke dampers including locations and ratings, backdraft dampers, flexible duct connections, volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Submit for Combination Smoke and Fire Dampers.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of access doors, test holes, and fire/smoke dampers.

B. Operation and Maintenance Data: Submit for Combination Smoke and Fire Dampers.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State and local standards.
1.6 QUALIFICATIONS
   A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years’ experience.

1.7 DELIVERY, STORAGE, AND HANDLING
   A. Protect dampers from damage to operating linkages and blades.

1.8 FIELD MEASUREMENTS
   A. Verify field measurements prior to fabrication.

1.9 COORDINATION
   A. Coordinate Work where appropriate with building control Work.

1.10 WARRANTY
   A. Refer to Section 23 05 00 for product warranties.

PART 2 - PRODUCTS

2.1 BACK-DRAFT DAMPERS
   A. Product Description: Multi-Blade, back-draft dampers: Parallel-action, gravity-balanced, Galvanized 16 gage thick steel, or extruded aluminum. Blades, maximum 6-inch width, with felt or flexible vinyl sealed edges. Blades linked together in rattle-free manner with 90-degree stop, steel ball bearings, and plated steel pivot pin. Furnish dampers with adjustment device to permit setting for varying differential static pressure.

2.2 COMBINATION FIRE AND SMOKE DAMPERS
   A. Manufacturers:
      1. Greenheck.
      2. Nailor.
      3. Ruskin.
      4. Substitutions: Section 23 05 00.

   B. Fabricate in accordance with NFPA 90A, UL 555, and UL 555S.

   C. Multiple-Blade Dampers: Fabricate with 16 gage galvanized steel frame and blades. Furnish oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 x 1/2-inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2-inch actuator shaft.

   D. Operators: UL listed and labeled spring return electric type suitable for 120 volts, single phase, 60 Hz. non-stall motor. Locate damper operator on exterior of duct and link to damper operating shaft.

   E. Normally Closed Smoke Responsive Fire Dampers: Curtain type, opening by gravity upon actuation of Electro thermal link, flexible stainless steel blade edge seals to produce constant sealing pressure.

   F. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.
2.3 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.

B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, furnish minimum 1 inch thick insulation with sheet metal cover.
   1. Less than 12 inches square, secure with sash locks.
   2. Up to 18 Inches Square: Furnish two hinges and two sash locks.
   3. Up to 24 x 48 Inches: Three hinges and two compression latches.
   4. Larger Sizes: Furnish additional hinge.
   5. Access panels with sheet metal screw fasteners are not acceptable.

2.4 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized frame channel with suitable hardware.

C. End Bearings: Except in round ductwork 12 inches and smaller, furnish end bearings. On multiple blade dampers, furnish oil-impregnated nylon or sintered bronze bearings.

D. Quadrants:
   1. Furnish locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on standoff mounting brackets, bases, or adapters.
   3. Where rod lengths exceed 30 inches furnish regulator at both ends.

2.5 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Connector: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric conforming to NFPA 90A, minimum density 30 oz per sq yd.
   3. Metal: 3 inch wide, 24 gage galvanized steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify rated walls are ready for fire/smoke damper installation.

B. Verify ducts and equipment installation are ready for accessories.

C. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.
3.2 INSTALLATION

A. Install in accordance with NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.

B. Install back-draft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated on Drawings.

C. Install duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and as indicated on Drawings. Install minimum 8 x 8-inch size for hand access, 18 x 18-inch size for shoulder access, and as indicated on Drawings. Review locations prior to fabrication.

D. Install temporary duct test holes where indicated on Drawings and required for testing and balancing purposes. Cut or drill in ducts. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

E. Provide combination fire and smoke dampers at locations as indicated on Drawings. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

F. Install combination smoke and fire dampers in accordance with NFPA 92A.

3.3 DEMONSTRATION

A. Demonstrate re-setting of fire/smoke dampers to Owner's representative.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes ceiling mounted exhaust fans.
B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 REFERENCES

A. American Bearing Manufacturers Association:
   1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
   2. ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings.
B. Air Movement and Control Association International, Inc.:
   2. AMCA 204 - Balance Quality and Vibration Levels for Fans.
   5. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
C. American Refrigeration Institute:
D. National Electrical Manufacturers Association:
   1. NEMA MG 1 - Motors and Generators.
   2. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
E. UL LLC:
   1. UL 705 - Power Ventilators.

1.3 SUBMITTALS

A. Refer to Section 23 05 00 for submittals.
B. Product Data: Submit data on each type of fan and include accessories, fan curves with specified operating point plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, electrical characteristics and connection requirements.
C. Manufacturer’s Installation Instructions: Submit fan manufacturer’s instructions.
D. Manufacturer’s Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.5 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA 210 and bear AMCA Certified Rating Seal.
B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.
C. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
D. Balance Quality: Conform to AMCA 204.
E. Perform Work in accordance with State and local standards.

1.6 QUALIFICATIONS

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

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect motors, shafts, and bearings from weather and construction dust.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.9 WARRANTY

A. Refer to Section 23 05 00 for product warranties.

1.10 EXTRA MATERIALS

A. Furnish two sets of belts for each fan.

PART 2 - PRODUCTS

2.1 CEILING MOUNTED EXHAUST FANS

A. Manufacturer:
   1. Greenheck.
   2. Loren Cook Company.
   3. Twin City.
B. Wheel:
   1. Forward curved centrifugal wheel.
   2. Constructed of galvanized steel or calcium carbonate filled polypropylene.
   3. Statically and dynamically balanced in accordance with AMCA Standard 204-05.
C. Motors:
   1. Motor enclosures shall be open drip proof (ODP), opening in the frame body and/or end brackets.
   2. Motors are permanently lubricated sleeve bearing type to match with the fan load and furnished at the specific voltage and phase.
   3. Motor shall be mounted on vibration isolators and be accessible for maintenance.
   4. Thermal overload protection.
D. Housing:
   1. Constructed of heavy gauge galvanized steel.
   2. Interior shall be lined with 0.5 inches of acoustical insulation.
   3. Profile as low as 10-1/2 inches.
E. Spring Loaded Aluminum Backdraft Damper:
   1. Prevents air from entering back into the building when fan is off.
   2. Eliminates rattling or unwanted backdrafts.
F. Outlet:
   1. Type of Outlet: Round.
   2. Field rotatable from horizontal to vertical discharge.
   3. Duct collar shall include an aluminum backdraft damper.
G. Grille: Constructed of high impact polystyrene; plastic shall be factory standard.
H. External Electrical Access: Eliminates removing the motor pack, which saves time on installation.
I. Mounting Brackets: Fully adjustable for multiple installation conditions.
J. Options/Accessories:
   1. Speed Controls:
      a. Controls the fan's output.
      b. Fan can be adjusted to 60 percent of full speed.
   2. Wall Discharge:
      a. Type: Round Connection, hooded wall cap. Example: Greenheck model WC or equivalent.
   3. Roof Discharge:
      a. Flat Roof Caps Example: Greenheck Model RCC-7 or equivalent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify roof curbs are installed and dimensions are as instructed by manufacturer.

3.2 INSTALLATION

A. Secure roof fans with cadmium plated steel lag screws to roof curb.
B. Centrifugal Fans: Install flexible connections specified in Section 23 33 00 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.
C. Install backdraft dampers on inlet to roof exhaust fans.
D. Install safety screen where inlet or outlet is exposed.
E. Install backdraft dampers on discharge of exhaust fans and as indicated on Drawings. Refer to Section 23 33 00.
F. Provide sheaves required for final air balance.
G. Provide backdraft dampers on outlet from centrifugal fans and as indicated on the Drawings.

3.3 DEMONSTRATION

A. Demonstrate fan operation and maintenance procedures.

3.4 PROTECTION OF FINISHED WORK

A. Do not operate fans for until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

END OF SECTION
SECTION 23 37 00 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Diffusers.
   2. Registers
B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 REFERENCES

A. Air Movement and Control Association International, Inc.:
   1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.
B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
   1. ASHRAE 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets.
C. Sheet Metal and Air Conditioning Contractors:
   1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

1.3 SUBMITTALS

A. Refer to Division 01 and Section 23 05 00 for submittals.
B. Product Data: Submit sizes, finish, and type of mounting. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
C. Test Reports: Rating of air outlet and inlet performance.
D. Manufacturer’s Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of air outlets and inlets.

1.5 QUALITY ASSURANCE

A. Test and rate diffuser, register, and grille performance in accordance with ASHRAE 70.
B. Test and rate louver performance in accordance with AMCA 500.
C. Perform Work in accordance with State and local standards.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years’ experience.

PART 2 - PRODUCTS

2.1 AIR OUTLETS AND INLETS

A. Refer to the Mechanical Schedules on the Drawings for make, model and type.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify inlet and outlet locations.
B. Verify ceiling systems are ready for installation.
C. Verify prepared openings and flashings are ready to receive work and opening dimensions are as instructed by louver manufacturer.
D. Verify electric power is available and of correct characteristics.

3.2 INSTALLATION

A. Install diffusers to ductwork with airtight connection.
B. Install balancing dampers on duct take-off to diffusers, grilles, and registers, whether or not dampers are furnished as part of diffuser, grille, and register assembly. Refer to Section 23 33 00.
C. Paint visible portion of ductwork behind air outlets and inlets matte black. Refer to Division 09.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

END OF SECTION
SECTION 23 82 39 - UNIT HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes propeller unit heaters with electric-resistance heating coils.
B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 REFERENCES

A. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
B. National Fire Protection Association:
   1. NFPA 70 - National Electrical Code.
C. UL:
   1. UL 823 - Standard for Electric Heaters for Use in Hazardous (Classified) Locations.
   3. UL 2021 - Fixed and Location-Dedicated Electric Room Heaters.

1.3 SUBMITTALS

A. Refer to Division 01 and Section 23 05 00 for submittals.
B. Product Data: Submit manufacturer’s literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
C. Manufacturer’s Installation Instructions: Submit Indicate rigging and assembly.
D. Manufacturer’s Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit manufacturer’s descriptive literature, operating instructions, maintenance and repair data, and parts listing.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with state and local standards.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years’ experience.
B. Installer: Company specializing in performing Work of this Section with minimum three years’ experience.
1.7 **DELIVERY, STORAGE, AND HANDLING**

A. Accept heaters and controls on site in factory packaging. Inspect for damage.

1.8 **FIELD MEASUREMENTS**

A. Verify field measurements prior to fabrication.

**PART 2 - PRODUCTS**

2.1 **ELECTRIC RESISTANCE UNIT HEATERS**

A. Manufacturers:
   1. Reznor.
   2. Modine.
   3. Q-Mark.
   4. Substitutions: Refer to Section 23 05 00 for substitutions.

B. Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heater exchanger, controls and accessories:
   1. Discharge Louvers: Individually adjustable louvers to match cabinet finish to direct air flow up or down as needed.
   2. Control Voltage: 24 Volt, 60 Hertz.
   3. Location: Suspended.

C. Cabinet: Galvanized steel, corrosion resistant baked enamel finish, easily removed and secured access panels, insulated or double panel construction.

D. Supply Fan: Propeller type with direct drive.

E. Heat Exchanger: Nickel-chromium-wire heating element enclosed in metallic sheath mechanically bonded into fins, or stainless steel tubular elements with aluminum fins, with automatic, integrated high-temperature cutout and overheat reset sensor. Element supports shall eliminate thermal expansion noise.

F. Controls:
   1. Unit Mounted Room Thermostat: Adjustable, low voltage, to control heat exchanger operation, and supply fan to maintain temperature setting.

G. Motor Type: Permanently lubricated, totally enclosed, thermally protected, continuous duty.

**PART 3 - EXECUTION**

3.1 **EXAMINATION**

A. Examine areas to receive unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 **INSTALLATION**

A. Install units in accordance with NFPA 90B and NFPA 70.

B. Provide hangers and supports for suspended units. Refer to Section 22 05 29.
C. Provide operating controls.
D. Provide connection to electrical power systems. Refer to Division 26.

END OF SECTION
SECTION 26 05 00 - BASIC ELECTRICAL METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Related Requirements:
   1. Division 01 Specification Sections apply to work of this Section.
   2. Division 23 "Heating, Ventilating, and Air-Conditioning."
   3. Division 26 "Electrical."
   4. Section 26 05 26 "Grounding and Bonding."

1.2 REQUIREMENTS OF REGULATORY AGENCIES AND STANDARDS

A. Regulatory Agencies: Installation, materials, equipment and workmanship shall conform to the applicable provisions of the following:
   3. Terms and conditions of the electrical utility and other authorities having lawful jurisdiction pertaining to the work required.
   4. All temperature control wiring and associated conduit and boxes, shall be provided under other Sections of the Specifications. All power and control wiring, not identified under Division 23, shall be provided under Division 26. Division 26 requirements include power wiring for smoke dampers and 120-volt power for mechanical equipment control equipment at all locations where required. It shall be the responsibility of the Electrical Contractor to coordinate for all locations requiring such power.
   5. The work covered by Division 26 of the Specifications includes the furnishing of all materials, labor, transportation, tools, permits, and fees for the complete installation of all electrical work required in the Contract Drawings.

B. In the event that additional or special construction is required, Contractor is responsible for providing all material and equipment which are usually furnished with such construction in order to complete the installation, whether indicated or not.

C. Contractor shall familiarize himself with the existing conditions of the site and advise Architect of any discrepancy or conflict prior to bidding.

D. Contractor shall be responsible for all permits, fees, and licenses required for the Project. All cost of such permits or fees shall be included in the bid.

E. All equipment and material shall be installed in accordance with the applicable manufacturer’s recommendations and standards.

F. Install sleeves, sealant pans, and roof penetrations as required for the installation of the electrical work. All such work is subject to the approval of Architect.

1.3 SUBMITTALS

A. The intent of this Section is to give general submittal information, refer to specific submittal information in the subsequent Sections.

B. Within 10 days after award of the contract, and before orders are placed, Contractor shall submit specific information on list of equipment and principal materials specified. Contractor shall indicate and/or provide names of manufacturers, catalog and model numbers, cut sheets, and such other supplementary information as necessary for evaluation. Minimum of six copies, or as directed by Architect, of each shall be submitted and shall include all items mentioned by
model number and/or manufacturer’s name in the Specifications or in schedules on the Drawings.

C. Requirements for each submittal:
1. Bear a dated stamp or specific written indication that Contractor has reviewed and approved all submittal prior to submission to Architect.
2. Have all information deleted by Contractor that pertains to the means and methods of construction or to fabrication, assembly, installation, or erection (approval by Architect shall not extend to these areas unless specifically noted by Architect).
3. Be clearly and SPECIFICALLY marked as to which specific piece of equipment is being submitted, by use of a permanent marker, stamp, etc., so as to distinguish it from other pieces of equipment that may occur on the same page.
4. Be clearly marked as to which available options are being submitted that are associated with a piece of equipment.
5. Be complete with respect to quantities, dimensions, specific performance, materials, and similar data to enable Architect to review the proposed equipment.

D. Omission by Contractor of any of the above requirements or submittals will subject submittal to automatic rejection without review.

E. Submittals received by Architect not requested shall be returned without review of any kind.

PART 2 - PRODUCTS

2.1 EQUIPMENT REQUIREMENTS

A. The electrical requirements for equipment specified or indicated on the Drawings are based on information available at the time of design. If equipment furnished for installation has electrical requirements other than indicated on the Electrical Drawings, Contractor shall make any required changes to wire and conduit size, controls, overcurrent protection and installation as required to accommodate the equipment supplied, without additional charge to Owner. The complete responsibility and costs for such adjustments shall be assigned to the respective Section of this Specification under which the equipment is furnished.

2.2 MATERIALS

A. All similar materials and equipment shall be the product of the same manufacturer unless specified otherwise.
B. Materials and equipment shall be the standard products of manufacturers regularly engaged in the production of such material and shall be the manufacturer's current and standard design.
C. Altitude: Equipment affected by altitude shall perform satisfactorily for the function intended at the altitude of the Project site.

PART 3 - EXECUTION

3.1 GENERAL

A. Fabrication, erection and installation of the complete electrical system shall be done in accordance with accepted good practice by qualified personnel experienced in such work and shall proceed in an orderly manner so as not to impede the progress of the Project. The Electrical Contractor shall check all areas and surfaces where electrical equipment or material is to be installed, removed or relocated and report any unsatisfactory conditions before starting
work. Commencement of work signifies this Contractor's acceptance of existing conditions. In the acceptance or rejection of the finished installation, no allowance will be made for lack of skill on the part of workmen. Surfaces requiring coatings will be completed prior to installation of any electrical work on these surfaces.

B. The Electrical Drawings are diagrammatic. The installation requirements shall be carefully coordinated with structural, architectural and mechanical conditions and shall be adjusted to avoid conflict.

C. All work shall be concealed in walls, ceilings, chases unless specifically noted to be exposed or otherwise approved.

D. The locations of electrical equipment is approximate and are not intended to convey the exact details and mounting of location of outlets, equipment and other items. Exact locations are to be field determined by actual measurements.

E. Consult the Architectural Drawings to determine wall finishes and locations of wall mounted equipment, counter top splashes and similar items to avoid conflict with electrical equipment.

F. Provide for the 120V power and fire alarm connections to the fire smoke dampers. Provide a toggle switch disconnect for each damper. Refer to the Mechanical Drawings for locations. Connect a maximum of five dampers per circuit. Connect to 20A/1P spare breakers on the critical branch.

G. Part of this Project will include the installation of conduits, boxes, pullstrings, and other pathways to provide pathways for Owner installed data and phone cabling.

3.2 PERFORMANCE TESTS

A. Thoroughly test all control circuits, fixtures, services and all circuits for proper operating condition and freedom from grounds and short circuits before acceptance is requested. All equipment, appliances and devices shall be operated under load conditions.

B. After the interior wiring system installation is complete conduct operating tests for approval. When requested, test all the wire, cable, devices and equipment after installation, to assure that all material continues to possess all the original characteristics as required by governing codes and standards listed in these Specifications.

C. After motor operation has been verified make voltage readings at all panelboards and starters. Based on these readings, make final adjustments of primary taps on all transformers in the building as directed, or coordinate with the utility proper building voltage.

D. Perform such other tests as required by other Sections of these Specifications or as requested to prove acceptability.

E. Furnish all instruments and labor for testing.

F. All material installed shall be listed, inspected, and approved by a nationally accepted testing laboratory such as UL and/or ETL. All material shall bear the UL or ETL label where available.

3.3 SUBMITTAL AND APPROVAL OF MATERIALS

A. All requirements for submittals shall comply with the applicable provisions included in the individual Specification Sections.

B. Unless identified as a sole source item, the listing of product manufacturers, catalog numbers, etc., on the Drawings is intended to establish a standard of quality of the product. It is the responsibility of Contractor to review all items he intends to submit. If equipment other than that indicated on Drawings is proposed by Contractor, the information will be reviewed at the time of the submission of the submittal.
3.4 PROJECT PHASING

A. Contractor shall make himself familiar with all construction documents associated with this Project and clearly adhere to the phasing requirements and work restrictions stated herein.

B. Contractor shall be responsible for maintaining permanent power to all locations that are required to remain occupied. Outages for other areas shall be coordinated with Owner. Any temporary provisions required to provide temporary power shall be included in the Proposal.

3.5 WORK IN EXISTING BUILDING

A. Part of the work associated with this Project includes demolition and remodel work within the existing facility.

END OF SECTION
SECTION 26 05 05 - SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Sections Includes:
   1. Removal of existing electrical equipment, wiring, and conduit in areas to be remodeled; removal of designated construction; dismantling, cutting and alterations for completion of the Work.
   2. Disposal of materials.
   4. Identification of utilities.
   5. Salvaged items.
   6. Protection of items to remain.
   7. Relocate existing equipment to accommodate construction.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 COORDINATION

A. Conduct demolition to minimize interference with adjacent and occupied building areas.
B. Coordinate demolition work with general contractor.
C. Coordinate and sequence demolition so as not to cause shutdown of operation of surrounding areas.
D. Shut-down Periods:
   1. Coordinate in advance with Architect, Owner, and library staff.
E. Identify salvage items in cooperation with Owner.
F. Provide temporary lighting to uniform 15 foot candles, if not provided by natural lighting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify wiring and equipment indicated to be demolished serve only abandoned facilities.
B. Verify termination points for demolished services.

3.2 PREPARATION

A. Erect, and maintain temporary safeguards, including warning signs and lights, barricades, and similar measures, for protection of the public, Contractor’s employees, and existing improvements to remain.
B. Temporary egress signage and emergency lighting as required.

3.3 DEMOLITION

A. Demolition Drawings are based on field observation and existing record documents. Report discrepancies to Architect before disturbing existing installation.
B. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
C. Remove conduit, wire, boxes, and fastening devices to avoid any interference with new installation.
D. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
E. Reconnect equipment being disturbed by renovation work and required for continue service to power panel currently serving the load or nearest available panel.
F. Disconnect or shut off service to areas where electrical work is to be removed. Remove electrical fixtures, equipment, and related switches, outlets, conduit and wiring which are not part of final Project.
G. Install temporary wiring and connections to maintain existing systems in service during construction.
H. Remove, relocate, and extend existing installations to accommodate new construction.
I. Repair adjacent construction and finishes damaged during demolition and extension work.
J. Remove exposed abandoned grounding and bonding components, fasteners and supports, and electrical identification components, including abandoned components above accessible ceiling finishes. Cut embedded support elements flush with walls and floors.
K. Clean and repair existing equipment to remain or to be reinstalled.
L. Protect and retain power to existing active equipment remaining.
M. Cap abandoned empty conduit at both ends.

3.4 EXISTING PANELBOARDS

A. Ring out circuits in existing panel affected by the Work. Where additional circuits are needed, reuse circuits available for reuse. Install new breakers where required.
B. Tag unused circuits as spare.
C. Where existing circuits are indicated to be reused, use sensing measuring devices to verify circuits feeding Project area or are not in use.
D. Remove existing wire no longer in use from panel to equipment.
E. Provide new updated directories where more than three circuits have been modified or rewired.
F. Provide power to the fire alarm control panels and remote power supplies as required. Provide power from the existing power panels. All new circuit breakers shall match the existing.

3.5 SALVAGE ITEMS

A. Remove and protect items indicated on Drawings to be salvaged and returned to Owner. The Owner shall retain the first right of refusal of all removed equipment. Where the Owner does not desire salvaged equipment, the Contractor shall remove and properly dispose of such equipment.
B. Items of salvageable value may be removed as work progresses. Transport salvaged items from site as they are removed.

3.6 CLEANING

A. Remove demolished materials as work progresses. Legally dispose.
B. Keep workplace neat.
3.7 PROTECTION OF FINISHED WORK

A. Do not permit traffic over unprotected floor surface.

END OF SECTION
SECTION 26 05 13 - BUILDING WIRE AND CABLE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Building wire and cable.
   2. Wiring connectors and connections.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 01 31 00 ”Project Management and Coordination.”
   3. Section 01 33 00 ”Submittal Procedures.”
   4. Section 01 40 00 ”Quality Requirements.”
   5. Section 01 70 00 ”Closeout Procedures.”
   6. Section 26 05 53 ”Electrical Identification.”

1.2 REFERENCES

A. NECA: Standard of Installation.

1.3 SUBMITTALS FOR REVIEW

A. Section 01 33 00 ”Submittal Procedures” for procedures for submittals.
B. Product Data: Provide for each cable assembly type.

1.4 SUBMITTALS FOR INFORMATION

A. Section 01 33 00 - Submittal Procedures: Procedures for submittals.
B. Test Reports: Indicate procedures and values obtained.
C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01 70 00 ”Closeout Procedures” for procedures for submittals.
B. Project Record Documents: Record actual locations of components and circuits.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years’ documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to NFPA 70.
B. Furnish products listed and classified by UL as suitable for the purpose specified and indicated.
1.8 PROJECT CONDITIONS
A. Section 01 31 00 "Project Management and Coordination."
B. Verify that field measurements are as indicated.
C. Conductor sizes are based on copper.
D. Wire and cable routing indicated is approximate unless dimensioned.

1.9 COORDINATION
A. Coordinate Work under provisions of Section 01 31 00 "Project Management and Coordination."
B. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths shall be provided as required.

PART 2 - PRODUCTS

2.1 BUILDING WIRE
A. Manufacturers:
   1. American Cable.
   2. Houston Wire and Cable.
   4. Substitutions: Refer to Section 01 60 00 "Product Requirements."
B. Description: Single conductor insulated wire.
C. Conductor: Copper.
D. Insulation Voltage Rating: 600 volts.
E. Insulation: NFPA 70, Type indicated herein. All ampacity ratings shall be based on 75 degreesC rating.
F. MC Cable: Shall not be utilized on this Project.

2.2 WIRING CONNECTORS
A. Split Bolt Connectors:
   1. Buchanan.
   2. Burndy.
   3. Ilsco.
   4. Substitutions: Refer to Section 01 60 00 "Product Requirements."
B. Solderless Pressure Connectors:
   1. Buchanan.
   2. Burndy.
   3. Ilsco.
   4. Substitutions: Refer to Section 01 60 00 "Product Requirements."
C. Spring Wire Connectors:
   1. Ideal.
   2. Substitutions: Refer to Section 01 60 00 "Product Requirements."
D. Compression Connectors:
   1. Buchanan.
   2. Burndy.
   3. Ilsco.
   4. Substitutions: Refer to Section 01 60 00 "Product Requirements."
PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 31 00 "Project Management and Coordination" for verification of existing conditions before starting work.
B. Verify that interior of building has been protected from weather.
C. Verify that mechanical work likely to damage wire and cable has been completed.
D. Verify that raceway installation is complete and supported.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 WIRING METHODS

A. All Locations: Use only building wire, Type THW or THHN/THWN insulation, in raceway.
B. Use wiring methods indicated.

3.4 INSTALLATION

A. Section 01 40 00 "Quality Requirements" for manufacturer's instructions.
B. Route wire and cable as required to meet Project Conditions.
C. Install cable in accordance with the NECA - Standard of Installation.
D. Use solid conductor for feeders and branch circuits 10 AWG and smaller.
E. Use conductor not smaller than 12 AWG for power and lighting circuits with the exception of pre-manufactured fixture whips, listed for such use and not exceeding 6 feet in length.
F. Use conductor not smaller than 14 AWG for control circuits except as indicated on Drawings.
G. Use 10 AWG conductors for 20 ampere, branch circuits longer than 100 feet and as indicated on the Drawings.
H. Install all conductors in conduit.
I. Pull all conductors into raceway at same time.
J. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
K. Protect exposed cable from damage.
L. All cables shall be neatly supported.
M. Use suitable cable fittings and connectors.
N. Neatly train and lace wiring inside boxes, equipment, and panelboards.
O. Clean conductor surfaces before installing lugs and connectors.
P. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
Q. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
R. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
S. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
T. Identify and color code wire and cable under provisions of Section 26 05 53 "Electrical Identification." Identify each conductor with circuit number or other designation indicated.
U. The number of conductors in each conduit run shall be limited to the requirements as indicated on the drawings and indicated in Article 310 of the National Electrical Code (i.e., no more than four current carrying conductors, including the grounded conductor in a single home run).

V. Provide a dedicated neutral (grounded conductor) for all phase-to-ground branch circuits. This will negate the requirement of opening all phase conductors simultaneously.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 "Quality Requirements" for field inspection, testing and adjusting.
B. Inspect and test in accordance with NETA ATS, except Section 4.
C. Perform inspections and tests listed in NETA ATS, Section 7.3.1.

END OF SECTION
SECTION 26 05 19 - EQUIPMENT WIRING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes electrical connections to equipment specified under other Sections.
B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 01 31 00 "Project Management and Coordination."
   3. Section 01 33 00 "Submittal Procedures."
   4. Section 26 05 00 "Basic Electrical Methods."

1.2 REFERENCES

A. NEMA WD 1: General Purpose Wiring Devices.
B. NEMA WD 6: Wiring Device Configurations.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00 "Submittal Procedures."
B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.
B. Furnish products listed and classified by UL as suitable for purpose specified and shown.

1.5 COORDINATION

A. Coordinate work under provisions of Section 01 31 00 "Project Management and Coordination."
B. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other Sections.
C. Determine connection locations and requirements.
D. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.
E. Sequence electrical connections to coordinate with start-up schedule for equipment.

PART 2 - PRODUCTS

2.1 CORDS AND CAPS

A. Attachment Plug Construction: Conform to NEMA WD 1.
B. Configuration: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
C. Cord Construction: ANSI/NFPA 70, multi-conductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.

D. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

E. Division 26 "Electrical," Contractor shall be responsible for providing matching cord/receptacle for all equipment not furnished with such equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify conditions under provisions of Section 01 31 00 "Project Management and Coordination."

B. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.

D. Provide receptacle outlet where connection with attachment plug is indicated. Provide cord and cap where field-supplied attachment plug is indicated.

E. Provide suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

F. Install disconnect switches, controllers, control stations, and control devices as indicated.

G. Modify equipment control wiring with terminal block jumpers as indicated.

H. Provide interconnecting conduit and wiring between devices and equipment where indicated.

I. Check and modify phase connections as required for proper motor rotation.

J. Provide power to equipment only after equipment supplier verifies acceptance to receive and approves.

K. Contractor shall coordinate with all equipment to verify exact power and control wiring as required to properly serve equipment.

END OF SECTION
SECTION 26 05 26 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Equipment grounding conductors.
   2. Bonding.
B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 REFERENCES

C. TDSHS: Requirements of the Texas Department of State Health Services.

1.3 GROUNDING SYSTEM DESCRIPTION

A. Metal frame of the building.

1.4 PERFORMANCE REQUIREMENTS

A. Grounding System Maximum Resistance: 10 ohms.

1.5 SUBMITTALS FOR REVIEW

A. Section 01 33 00 "Submittal Procedures" for procedures for submittals.
B. Product Data: Provide for grounding electrodes and connections.

1.6 SUBMITTALS FOR CLOSEOUT

A. Section 01 77 00 "Closeout Procedures" for procedures for submittals.
B. Project Record Documents: Record actual locations of components and grounding electrodes.
C. Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Section, minimum three years’ documented experience, and with service facilities within 100 miles of Project.

1.8 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.
B. Products: Listed and classified by UL as suitable for the purpose specified and indicated.
PART 2 - PRODUCTS

2.1 MECHANICAL CONNECTORS
   A. Material: Bronze.

2.2 EXOTHERMIC CONNECTIONS
   A. Manufacturers: Cadweld.

2.3 WIRE
   A. Material: Stranded copper.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Section 01 31 00 - Project Management and Coordination: Verification of existing conditions prior to beginning Work.

3.2 INSTALLATION
   A. Section 01 40 00 - Quality Requirements: Manufacturer’s instructions.
   B. Provide bonding to meet Regulatory Requirements.
   C. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
   D. Provide proper bonding of the electrical system’s grounded conductor (neutral) and the grounding electrode system sized in accordance with N.E.C. Article 250.
   E. Provide grounding type bushings at all panelboards on the panel feeder.
   F. Provide a separate insulated grounding conductor for all light fixture flexible whips.

3.3 FIELD QUALITY CONTROL
   A. Section 01 40 00 - Quality Requirements: Field inspection, testing, adjusting.
   B. Inspect and test in accordance with NETA ATS, except Section 4.
   C. Perform inspections and tests listed in NETA ATS, Section 7.13.

END OF SECTION
SECTION 26 05 29 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Conduit and equipment supports.
   2. Anchors and fasteners.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 REFERENCES


1.3 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.
B. Furnish products listed and classified by UL as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Materials and Finishes: Provide adequate corrosion resistance.
B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
C. Anchors and Fasteners:
   1. Concrete Structural Elements: Use expansion anchors, powder actuated anchors and preset inserts.
   2. Steel Structural Elements: Use beam clamps, spring steel clips and steel ramset fasteners.
   5. Wood Elements: Use wood screws.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer’s instructions.
B. Provide anchors, fasteners, and supports in accordance with NECA - Standard of Installation.
C. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
D. Obtain permission from Architect before drilling or cutting structural members.
E. Fabricate supports from structural steel as indicated on drawings. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use lock washers under all nuts.
F. Install surface-mounted cabinets and panelboards with minimum of four anchors.
G. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch off wall.
H. Install conduit supports a maximum spacing specified in the NEC.
I. Contractor shall be responsible for providing steel channel anchored supports for all disconnects serving equipment. Provide galvanized channel and submit detail prior to fabrication.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal conduit.
   2. Flexible metal conduit.
   3. Liquidtight flexible metal conduit.
   4. Electrical metallic tubing.
   5. Fittings and conduit bodies.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 01 33 00 "Submittal Procedures."
   3. Section 01 60 00 "Product Requirements."
   4. Section 01 70 00 "Closeout Procedures."
   5. Section 26 05 26 "Grounding and Bonding."
   6. Section 26 05 29 "Supporting Devices."
   7. Section 26 05 53 "Electrical Identification."

1.2 REFERENCES

A. ANSI C80.1: Rigid Steel Conduit, Zinc Coated.
B. ANSI C80.3: Electrical Metallic Tubing, Zinc Coated.
C. ANSI/NEMA FB 1: Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
E. NECA: Standard of Installation.

1.3 DESIGN REQUIREMENTS

A. Conduit Size: ANSI/NFPA 70.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00 "Submittal Procedures."
B. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, nonmetallic conduit, fittings and conduit bodies.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01 70 00 "Closeout Procedures."
B. Accurately record actual routing of conduits.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.
B. Furnish products listed and classified by UL as suitable for purpose specified and shown.
1.7 DELIVERY, STORAGE, AND HANDLING
   A. Deliver, store, protect, and handle Products to site under provisions of Section 01 60 00 "Product Requirement."
   B. Accept conduit on site. Inspect for damage.
   C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

1.8 PROJECT CONDITIONS
   A. Verify that field measurements are as shown on Drawings.
   B. Verify routing and termination locations of conduit prior to rough-in.
   C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

PART 2 - PRODUCTS

2.1 CONDUIT REQUIREMENTS
   A. Minimum Size: 3/4 inch unless otherwise specified.
   B. Wet and Damp Locations above grade: Use rigid steel or liquid tight flexible conduit.
   C. Dry Locations: Use electrical metallic tubing for concealed and exposed locations.
   D. MC Cable: Shall not be utilized on this project.
   E. Light fixture whips shall be U.L. listed for grounding or shall have a separate equipment grounding conductor.

2.2 METAL CONDUIT
   A. Manufacturers:
      1. Allied.
      2. Wheatland.
      3. Substitutions: Refer to Section 01 60 00 "Product Requirements."
   B. Rigid Steel Conduit: ANSI C80.1.
   C. Intermediate Metal Conduit (IMC): Rigid steel.
   D. Fittings and Conduit Bodies: ANSI/NEMA FB 1; all steel fittings.

2.3 FLEXIBLE METAL CONDUIT
   A. Manufacturers:
      1. Allied Tube.
      2. Electri-Flex.
      4. Substitutions: Refer to Section 01 60 00 "Product Requirements."
   B. Description: Interlocked steel construction. Aluminum is not permitted.
   C. Fittings: ANSI/NEMA FB 1 with fittings approved for steel flex.
   D. Applications: Use for final connections to motorized equipment, connections to recessed lighting fixtures located in accessible ceilings, and connections to dry type transformers. Utilization of 3/8-inch in lieu of the minimum 3/4-inch is acceptable under the limitations of the National Electrical Code.
2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:
   1. Electri-flex.
   2. Ultatite.
   3. Substitutions: Refer to Section 01 60 00 "Product Requirements."

B. Description: Interlocked steel construction with PVC jacket.

C. Fittings: ANSI/NEMA FB 1.

D. Applications: Use for final connections to motorized equipment in exterior locations and areas subjected to moisture.

2.5 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
   1. Allied
   2. Substitutions: Refer to Section 01 60 00 "Product Requirements."

B. Description: ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; all steel, compression or set screw type.

D. Applications: Do not use below grade or in exterior locations. Use only in interior locations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install conduit in accordance with NECA - Standard of Installation.

B. Install nonmetallic conduit in accordance with manufacturer's instructions.

C. Arrange supports to prevent misalignment during wiring installation.

D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

E. Group related conduits; support using conduit rack. Construct rack using steel channel.

F. Fasten conduit supports to building structure and surfaces under provisions of Section 26 05 29 "Supporting Devices."

G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports

H. Do not attach conduit to ceiling support wires.

I. Arrange conduit to maintain headroom and present neat appearance.

J. Route exposed conduit parallel and perpendicular to walls.

K. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

L. Maintain adequate clearance between conduit and piping.

M. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

N. Cut conduit square using saw or pipecutter; de-burr cut ends.

O. Bring conduit to shoulder of fittings; fasten securely.

P. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

Q. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2-inch size.
R. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
S. Provide suitable fittings to accommodate expansion and deflection where conduit crosses, control and expansion joints.
T. Provide suitable pull string in each empty conduit except sleeves and nipples.
U. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
V. Ground and bond conduit under provisions of Section 26 05 26 "Grounding and Bonding."
W. Identify conduit under provisions of Section 26 05 53 "Electrical Identification."
X. Ducts shall be cleaned with a flexible mandrel assembly.
Y. Roof penetrations for conduits shall adhere to the requirements and details as indicated on the Architectural drawings.
Z. Where conduits are shown roof-mounted, provide a conduit support system for the entire run. Utilize MAPCO or approved equal supports. Spacing shall be as recommended by the manufacturer. Ratings of the supports shall be at least 150 percent of the actual installed load.
AA. Where conduits cross building expansion joints, provide flexible type connections to facilitate crossing.
BB. Conduits installed between floors for future cabling shall be capped and filled with fire proofing material to match the surrounding rating.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions listed.
B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation.

END OF SECTION
SECTION 26 05 33.16 - BOXES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wall and ceiling outlet boxes.
   2. Pull and junction boxes.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 01 70 00 "Execution and Closeout Procedures."
   3. Section 26 05 19 "Equipment Wiring Devices."
   4. Section 26 05 53 "Electrical Identification."
   5. Section 26 27 26 "Wiring Devices" for wall plates in finished areas.

1.2 REFERENCES

A. NECA: Standard of Installation.
B. NEMA FB 1: Fittings and Supports for Conduit and Cable Assemblies.
C. NEMA OS 1: Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
D. NEMA 250: Enclosures for Electrical Equipment (1,000 Volts Maximum).

1.3 SUBMITTALS FOR CLOSEOUT

A. Section 01 70 00 "Closeout Procedures" for submittals for Project closeout.
B. Record actual locations and mounting heights of outlet, pull, and junction boxes on Project record documents.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.
B. Provide products listed and classified by UL as suitable for the purpose specified and indicated.

1.5 GENERAL

A. Boxes in the conduit system are not shown on the Drawings. Contractor shall be responsible for installing pull and junction boxes where required to limit the number of bends or as necessary to limit cable pulling tensions.

PART 2 - PRODUCTS

2.1 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
B. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include half-inch male fixture studs where required.
C. Cast Boxes: NEMA FB 1, Type FD, cast ferroalloy. Provide gasketed cover by box manufacturer.
D. Wall Plates for Finished Areas: As specified in Section 26 27 26 "Wiring Devices."

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2.2 PULL AND JUNCTION BOXES
A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
B. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
C. Material: Galvanized cast iron.
D. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

2.3 FLOOR BOXES
A. Stamped steel boxes with a minimum of 16-gauge steel for use in concrete slab applications.
B. 16-gauge steel powder coated finish for use with carpet inserts or without. Provide cover with cable door.
C. Provide a minimum of two duplex receptacles and two data outlet location.
D. In addition to the required power conduits, provide a spare 1-inch conduit to above an accessible ceiling. Refer to Drawings for additional conduit requirements.
E. Boxes shall be Hubbell No. HBLCFB301 BASE with covers, faceplates, devices and other accessories as noted.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Verify locations of outlets in all areas prior to rough-in.

3.2 INSTALLATION
A. Install boxes in accordance with NECA - Standard of Installation.
B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
C. Set wall mounted boxes at elevations to accommodate mounting heights specified in Section for outlet device.
D. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Adjust box location up to 10 feet if required to accommodate intended purpose.
E. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26 "Wiring Devices."
F. Maintain headroom and present neat mechanical appearance.
G. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
H. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
I. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified.
J. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes with Architectural drawings and other trades.
K. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
L. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
M. Use flush mounting outlet box in finished areas.
N. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
O. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.

P. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

Q. Use stamped steel bridges to fasten flush mounting outlet box between studs.

R. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

S. Use adjustable steel channel fasteners for hung ceiling outlet box.

T. Do not fasten boxes to ceiling support wires.

U. Support boxes independently of conduit.

V. Use gang box where more than one device is mounted together. Do not use sectional box.

W. Use gang box with plaster ring for single device outlets.

X. Use cast outlet box in exterior locations exposed to the weather and wet locations.

Y. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

Z. Coordinate with other trades for box rough-in, such that control devices are grouped (i.e., thermostats, wall switches, volume controls, etc.).

AA. Refer to Specification Section 26 05 53 "Electrical Identification" for junction box cover labeling.

BB. Provide adjustment and leveling for the flush floor mounted boxes.

CC. Boxes for use with duplex outlets shall utilize a separate box per outlet. Do not mount multiple outlets in a multi-gang box.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Coordinate installation of outlet box for equipment connected under Section 26 05 19 "Equipment Wiring Systems."

3.4 ADJUSTING

A. Section 01 70 00 "Execution" for adjusting installed work.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closures in unused box openings.

3.5 CLEANING

A. Section 01 70 00 "Execution" for cleaning installed work.

B. Clean interior of boxes to remove dust, debris, and other material.

C. Clean exposed surfaces and restore finish.

3.6 REPAIR

A. Repair any areas or surfaces damaged during conduit installation.

B. Paint (resurface) to original condition.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Nameplates and labels.
   2. Wire and cable markers.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.

1.2 REFERENCES


PART 2 - PRODUCTS

2.1 NAMEPLATES AND LABELS

A. Nameplates and Labels: Engraved 3-layer laminated plastic, white letters on black background for normal branch and white letters on red background for emergency branch.

B. Locations:
   1. Each electrical distribution and control equipment enclosure.
   2. Communication cabinets, and computer cabinets.
   3. Field disconnects, start stop stations, control panels.

C. Letter Size:
   1. Use 1/4-inch letters for identifying individual equipment and loads.
   2. Use 1/4-inch letters for identifying grouped equipment and loads.
   3. Use 3/8-inch letters for identifying Main Disconnect equipment.

D. Provide a sample for engraved receptacle wall plates for review prior to installation.

2.2 WIRE/CONDUIT/BOX MARKERS

A. Description: Brady B-321 Heat-Shrink Polyolefin markers. Typed label to identify each termination end point of the conductor. DC conductors shall identify polarity. Locations: Each conductor at wireway, pull boxes, outlet and junction boxes, and each load connection. All conduit penetrations identifying the location of each end.

B. Legend:
   1. Power and Lighting Circuits: Branch circuit or feeder number indicated on Drawings.

C. Boxes:
   1. Label each junction box in accessible locations to indicate system type (i.e., security; power circuit - 1, 3, 5, etc.; to include the type of power; lite-safety, critical, etc.).
   2. Boxes serving fire alarm system shall have box covers painted red.
PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.2 APPLICATION

A. Install nameplate and label parallel to equipment lines.
B. Secure nameplate to equipment front using screws or rivets.
C. Identify all conductors at every termination indicating endpoints of termination and tag identification as required.
D. Color coding for phase identification:

<table>
<thead>
<tr>
<th>120/208 Volts</th>
<th>Phase</th>
<th>277/480 Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>A</td>
<td>Brown</td>
</tr>
<tr>
<td>Red</td>
<td>B</td>
<td>Orange</td>
</tr>
<tr>
<td>Blue</td>
<td>C</td>
<td>Yellow</td>
</tr>
<tr>
<td>White</td>
<td>Neutral</td>
<td>Gray</td>
</tr>
<tr>
<td>Green</td>
<td>Ground</td>
<td>Green</td>
</tr>
</tbody>
</table>

E. Conductor phase and voltage identification shall be made by color-coded insulation for all conductors smaller than No. 6 AWG. For conductors No. 6 AWG and larger, identification shall be made by color-coded insulation, or conductors with black insulation may be furnished and identified by colored electrical tape. Conductor identification shall be provided within each enclosure where a tap, splice, or termination is made.

END OF SECTION
SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Distribution and branch circuit panelboards.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 26 05 00 "Basic Electrical Methods."
   3. Section 26 05 26 "Grounding and Bonding."
   4. Section 26 05 29 "Supporting Devices."
   5. Section 26 05 53 "Electrical Identification" for engraved nameplates.

1.2 REFERENCES

A. NECA: Standard of Installation.
B. NEMA AB 1: Molded Case Circuit Breakers.
C. NEMA ICS 2: Industrial Control Devices, Controllers, and Assemblies.
D. NEMA KS 1: Enclosed Switches.
E. NEMA PB 1: Panelboards.
F. NEMA PB 1.1: Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
H. UL 891: Ground Bus.

1.3 SUBMITTALS

A. Submit under provisions of General Conditions. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit amperere rating, circuit breaker and fusible switch arrangement and sizes.
B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.
C. Short circuit and circuit breaker coordination study.

1.4 PROJECT RECORD DOCUMENTS

A. Submit under provisions of General Conditions. Record actual locations of Products; indicate actual branch circuit arrangement.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of General Conditions. Maintenance Data: Include spare parts data listing; and recommended maintenance procedures and intervals.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.
1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum five years’ experience.

1.8 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

1.9 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated.

1.10 MAINTENANCE MATERIALS

A. Provide maintenance materials under provisions of General Conditions. Provide two of each panelboard key.

PART 2 - PRODUCTS

2.1 PANELBOARDS

A. Manufacturers:
   1. Square D.
   2. Eaton.
   3. GE.
   4. Siemens.
B. Description: NEMA PB-1, circuit breaker type.
C. Panelboard Bus: Copper with ratings as indicated. Provide a copper ground bus in each panelboard.
D. Minimum integrated short circuit rating: Fully rated devices with minimum levels as indicated. Series rated systems will not be allowed. Minimum calculated values are labeled on each panelboard and are indicated as “AIC.”
E. Molded Case Circuit Breakers: NEMA AB 1, bolt-on, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. All breakers rated at 100 amps or larger shall be provided with adjustable instantaneous long and short time adjustment. This requirement shall also apply to all breakers where necessary to provide selective coordination. Provide circuit breakers UL listed as type HACR for air-conditioning equipment loads and type SWD for switching applications.
F. Enclosure: NEMA PB-1, Type 1.
G. Cabinet Front: Surface or recessed type as indicated on the drawings, fastened with concealed trim clamps, hinged door with flush lock, metal directory frame, and finished in manufacturer’s standard gray enamel.
**PART 3 - EXECUTION**

### 3.1 INSTALLATION

A. Install panelboards in accordance with NEMA PB 1.1.
B. Install panelboards plumb.
C. Provide supports in accordance with Drawings and Section 26 05 29 "Supporting Devices."
D. Height: 6-foot maximum to top of panelboard.
E. Provide filler plates for unused spaces in panelboards.
F. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads. Spare slots shall be labeled as such in erasable pencil on directory.
G. Provide engraved plastic nameplates under the provisions of Section 26 05 53 "Electrical Identification."
H. Ground each panelboard in accordance with section 26 05 26 "Grounding and Bonding."
I. The panelboard installation and commissioning shall be supervised by a manufacturer’s authorized representative.
J. All panelboards shall be labeled in accordance with NFPA 70E.

### 3.2 FIELD QUALITY CONTROL

A. Field inspect and test for grounds on each circuit after installation is completed. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.
B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.
C. Verify proper operation of all circuit breakers prior to energizing switchgear.
D. All overcurrent devices in the project shall be modeled to provide with recommended setting. As a part of this project the Contractor shall provide a complete coordination study. Refer to Specification Section 26 05 00 "Basic Electrical Methods."
E. Refer to Specification 26 05 00 "Basic Electrical Methods" for additional coordination and device selectability requirements.
F. All circuit breaker 100 amps and greater shall be tested per NETA Standards.

END OF SECTION
SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wall switches.
   2. Dimmers.
   3. Receptacles.
   4. Device plates and decorative box covers.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 01 30 00 "Administrative Requirements."
   3. Section 01 33 00 "Submittal Procedures."
   4. Section 01 40 00 "Quality Requirements."
   5. Section 01 60 00 "Product Requirements."
   6. Section 01 70 00 "Execution and Closeout Procedures."
   7. Section 26 05 33.16 "Boxes."
   8. Section 26 05 53 "Electrical Identification."

1.2 REFERENCES

A. NECA: Standard of Installation.
B. NEMA WD 1: General Requirements for Wiring Devices.
C. NEMA WD 6: Wiring Device for Dimensional Requirements.

1.3 SUBMITTALS FOR REVIEW

A. Section 01 33 00 "Submittal Procedures" for submittals.
B. Product Data: Provide manufacturer catalog information showing dimensions, colors, and configurations.
C. Manufacturers with similar catalog numbers not considered as a basis for an equivalent product.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum three years’ documented experience.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.
B. Provide Products listed and classified by U.L. as suitable for purpose specified and indicated.
PART 2 - PRODUCTS

2.1 WALL SWITCHES

A. Manufacturers:
   1. Hubbell Pro 1221-I.
   2. Substitutions: Refer to Section 01 60 00 "Product Requirements."
B. Description: NEMA WD 1, 20 amp, Heavy-Duty, AC only general-use snap switch.
C. Body and Handle: nylon ivory handle.
D. Utilize equivalent series of manufacturer numbers above for three-way, four-way and two-pole applications.

2.2 DIMMERS

A. Manufacturers:
   1. Lutron Nova.
   2. Or approved equal.
B. Description: 1,500 watt, 277V, 60 HZ, slide control.
C. Device Body: Provide decorative, ivory plate kit.
D. All LED dimmers shall be compatible with LED dimming drivers; Lutron Hi-Lum or approved equal.

2.3 RECEPTACLES

A. Manufacturers:
   1. Hubbell Pro 5352.
   2. Substitutions: Refer to Section 01 60 00 "Product Requirements" or equivalent.
B. Description: NEMA WD 1, Heavy-duty hospital grade receptacle, with triple wipe contacts and grounding contacts integral with backstrap (no rivets).
C. Device Body: Ivory plastic.
D. Configuration: NEMA WD 6, type as specified and indicated.
E. Convenience Receptacle: Type 5-20.
F. GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements. Hubbell 5352-I or equivalent.

2.4 WALL PLATES

A. Decorative Cover Plate: Stainless steel.
B. Weatherproof Cover Plate: Gasketed cast metal with gasketed device cover on exterior devices.
C. Surface Mounted Plates: Galvanized steel plates.
D. Refer to specification Section 26 05 53 "Electrical Identification" for requirements of labeling receptacle plates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 31 00 "Project Management and Coordination" for verification of existing conditions prior to beginning work.
B. Verify that outlet boxes are installed at proper height.
C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
D. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
E. Verify installation location of all boxes to be installed in millwork with Architect.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.
B. Clean debris from outlet boxes.

3.3 INSTALLATION

A. Install in accordance with NECA - Standard of Installation.
B. Install devices plumb and level.
C. Install switches with OFF position down.
D. Install receptacles with grounding pole on top.
E. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
F. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
G. Connect wiring devices by wrapping conductor around screw terminal.
H. Use jumbo size plates for outlets installed in masonry walls.
I. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
J. Install blank cover plate to match other wall plates on all unused boxes.
K. Coordinate with exact equipment locations prior to rough-in.
L. Verify exact floor elevations for installation of recessed floor boxes.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 "Boxes" to obtain mounting heights specified and indicated on Drawings.
B. Install all wall switches, thermostats, fire alarm pull stations and all control operators at 42 inches above finished floor.
C. Install convenience receptacle 18 inches above finished floor unless otherwise shown on plans.
D. Install convenience receptacle 6 inches above backsplash of counter unless otherwise directed by Architect.
E. Install telephone jack 18 inches above finished floor.
F. Install telephone jack for side-reach wall telephone to position top of telephone at 52 inches above finished floor.
G. Install telephone jack for forward-reach wall telephone to position top of telephone at 42 inches above finished floor.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 "Quality Requirements" for field inspection, testing, adjusting, and balancing.
B. Inspect each wiring device for defects.
C. Operate each wall switch with circuit energized and verify proper operation.
D. Verify that each receptacle device is energized.
E. Test each receptacle device for proper polarity.
F. Test each GFCI receptacle device for proper operation.
3.6 ADJUSTING

A. Section 01 70 00 "Execution" for adjusting installed work.
B. Adjust devices and wall plates to be flush and level.

3.7 CLEANING

A. Section 01 70 00 "Closeout Procedures" for cleaning installed work.
B. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION
SECTION 26 28 16.16 - ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fusible switches.
   2. Non-fusible switches.
   3. Fuses.
B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 01 33 00 "Submittal Procedures."
   3. Section 26 05 53 "Electrical Identification."

1.2 REFERENCES

A. NEMA KS 1: Enclosed Switches.
C. UL 198C: High-Interrupting Capacity Fuses; Current Limiting Type.
D. UL 198E: Class R Fuses.
E. NEMA AB 1: Molded Case Circuit Breakers.
F. NECA: Standard of Installation.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00 "Submittal Procedures."
B. Product Data: Provide switch ratings and enclosure dimensions.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years’ documented experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.
B. Furnish products listed and classified by UL as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Eaton.
B. General Electric.
C. Square D.
2.2  ENCLOSED SWITCHES

A. Fusible or Non-fusible as indicated.
B. Switch Assemblies: NEMA KS 1, Type HD (heavy duty) load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
C. Fuse Clips: Designed to accommodate NEMA FU1, class R fuses.
D. Enclosures: NEMA KS 1.
E. Interior Dry Locations: Type 1.
F. Exterior Locations: Type 3R or 4.
G. NEMA ratings of enclosures if specified on drawings take precedence over the minimum ratings specified herein.
H. Current rating of switch to be equal to or greater than that of the circuit it is interrupting.

2.3  FUSES

A. Manufacturers:
   1. Bussman.
   2. Gould Shawmut.
   3. Littlefuse.
B. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.
C. Voltage: Provide fuses with suitable voltage ratings for phase to phase voltages.
D. Service Entrance: Class L, Bussman Low-peak or equivalent.
E. General Purpose Loads: Class RK1, Bussman Low-peak or equivalent.
F. Motor Loads: Class RK5, Bussman Fusetron or equivalent.

PART 3 - EXECUTION

3.1  INSTALLATION

A. Install in accordance with NECA Standard of Installation.
B. Install fuses in all fusible disconnects.
C. Apply adhesive tag on the inside door of all disconnects indicating the NEMA class fuse and size installed. Refer to Section 26 05 53 "Electrical Identification” for additional labeling.
D. Provide a disconnect switch for all equipment where indicated or required by the National Electrical Code. Coordinate with other disciplines to determine where disconnects are furnished with equipment.

END OF SECTION
SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Interior luminaires and accessories.
   2. Exit signs.
   3. LED fixtures.
   4. Emergency power supply.
   5. Occupancy sensors.
   6. LED Drivers/Lamps.

B. Related Requirements:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 01 33 00 "Submittal Procedures."
   3. Section 01 40 00 "Quality Requirements."
   4. Section 01 60 00 "Product Requirements."
   5. Section 01 70 00 "Execution and Closeout Procedures."
   6. Section 01 79 00 "Demonstration and Training."
   7. Section 26 05 00 "Basic Electrical Methods."

1.2 REFERENCES

A. ANSI C82.1: Ballasts for Fluorescent Lamps - Specifications.
B. NEMA WD 6: Wiring Devices-Dimensional Requirements.

1.3 SUBMITTALS FOR REVIEW

A. Section 01 33 00 "Submittal Procedures" for procedures for submittals.
B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
C. Product Data: Provide dimensions, ratings, and performance data.

1.4 SUBSTITUTIONS

A. Refer to Section 26 05 00 "Basic Electrical Methods" for requirements.

1.5 SUBMITTALS FOR CLOSEOUT

A. Section 01 70 00 "Closeout Procedures" for submittals for Project closeout.
B. Submit manufacturer's operation and maintenance instructions for each product.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years’ documented experience.
1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.
B. Conform to requirements of NFPA 101.
C. Products: Listed and classified by UL as suitable for the purpose specified and indicated.

1.8 EXTRA PRODUCTS

A. Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 LUMINAIRES

A. Furnish Products as scheduled. Refer to Section 01 60 00 "Product Requirements" for substitutions and product options.

2.2 EXIT SIGNS

A. Furnish products as scheduled.

2.3 LED FIXTURES

A. Refer to Lighting Fixture Schedule on drawings for all LED fixture requirements.

2.4 EMERGENCY POWER SUPPLY

A. Description: Emergency battery supply suitable for installation in driver compartment of luminaire.
B. Lamp Rating: Providing 1,100 lumens minimum.
C. Battery: Sealed lead calcium type, rated 10-year life.
D. Include “Test” switch and “AC on” indicator light, installed to be operable and visible from the outside of an assembled luminaire.

2.5 OCCUPANCY SENSORS

A. Sensors:
   1. Provide dual technology passive infrared/ultrasonic sensors where indicated on the Drawings.
   2. All units shall be U.L. listed.
   3. Provide adjustable sensitivity and digital time delay.
   4. Provide with swivel mounted bracket for use in ceiling mounted applications.
   5. Provide LED indication for occupancy detection of each of the two technologies.
   6. Sensors shall be capable of covering an area of approximately 1,000 square feet while detecting typical desktop motions.
   7. Sensors shall be equal to watt stopper DT-205 or approved equal.
   8. Single wall switch occupancy sensor shall be watt stopper WI-200 or approved equal.
   9. Dual wall switch occupancy sensor shall be watt stopper WI-300 or approved equal.
B. Accessories: Provide power packs and slave packs as required to power the sensors and provide interlocking and control strategies as indicated.
2.6 LED DRIVERS/LAMPS

A. General: Standard product as provided by the manufacturer with applicable certifications and listings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
B. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.
C. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure.
D. Install recessed luminaires to permit removal from below.
E. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating in locations where fire rated ceilings are present.
F. Install clips to secure recessed grid-supported luminaires in place.
G. Install accessories furnished with each luminaire.
H. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
I. Bond products and metal accessories to branch circuit equipment grounding conductor.
J. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.
K. Contractor shall be responsible for providing branch circuits, grounding and providing rough-in conduits for wall controllers for exam lights where indicated.
L. Provide a minimum of 100 hours of burn-in time at full intensity for lamps to be used on dimming systems or burn-in as recommended by ballast manufacturer.

3.2 FIELD QUALITY CONTROL

A. Section 01 40 00 "Quality Requirements" for field inspection, testing, and adjusting.
B. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.3 ADJUSTING

A. Section 01 70 00 "Execution" for adjusting installed work.
B. Aim and adjust luminaires as directed.
C. Position exit sign directional arrows as indicated.

3.4 CLEANING

A. Section 01 70 00 "Closeout Procedures" for cleaning installed work.
B. Clean electrical parts to remove conductive and excess materials.
C. Remove dirt and debris from enclosures.
D. Clean photometric control surfaces as recommended by manufacturer.
E. Clean finishes and touch up damage.

3.5 DEMONSTRATION AND INSTRUCTIONS

A. Section 01 70 00 "Demonstration and Training" for demonstrating installed work.
3.6 PROTECTION OF FINISHED WORK

A. Section 01 70 00 "Execution" for protecting installed work.
B. Re-lamp luminaires that have failed lamps at Substantial Completion.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Excavating trenches for utilities from 5 feet outside building to existing municipal utilities.
   2. Compacted fill from top of utility bedding to subgrade elevations.
   3. Backfilling and compaction.

B. Related Sections:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 33 12 00 "Water Utilities."

1.2 REFERENCES

B. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
D. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
E. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
F. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.3 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

1.4 FIELD MEASUREMENTS

A. Verify that survey bench mark, control point, and intended elevations for the Work are as shown on drawings.

1.5 COORDINATION

A. Verify work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Trench backfill in areas paved by this project shall be rock crusher fines. Trench backfill in areas not paved by this project may be rock crusher fines or the most granular material from the excavated trench spoils. Only the material passing through the 2-inch screen size, and free of organic material shall be used.
PART 3 - EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, and datum locations.
B. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
C. Protect bench marks, fences, paving, and curbs from excavating equipment and vehicular traffic.
D. Maintain and protect above and below grade utilities which are to remain.
E. Cut out soft areas of subgrade not capable of compaction in place. Backfill and compact to density equal to or greater than requirements for subsequent backfill material.

3.2 EXCAVATING

A. Excavate subsoil required for utilities.
B. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.
C. Do not interfere with 45 degree bearing splay of foundations.
E. Remove lumped subsoil, boulders, and rock.
F. Correct areas over excavated in accordance with Paragraph 3.1.E. of this section.
G. Excavate trenches to indicated gradients, lines, depths, and elevations.
H. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
I. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
   1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.3 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.
B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
C. Place and compact materials in equal continuous layers not exceeding 8 inches compacted depth.
D. Employ a placement method that does not disturb or damage existing or planned facilities.
E. Maintain optimum moisture content of fill materials to attain required compaction density.
F. Transport surplus fill materials to designated stockpile area as noted on the Plans.
G. Place backfill on subgrades free of mud, frost, snow, or ice.
H. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
I. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.
   1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
J. Place and compact final backfill of satisfactory soil to final subgrade elevation.
K. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs

3.4 TOLERANCES
   A. Top Surface of Backfilling Under Paved Areas: Plus or minus 1/2 inch from required elevations.
   B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL
   A. Compaction testing will be performed in accordance with ASTM D1557, ASTM D2922, and ASTM D 3017, and at the discretion of the Engineer the following: ASTM D 1556, ASTM D 2167.
   B. Backfill loose lifts = 12-inch maximum. Density requirements: Top 4 feet of trench below subgrade = 95 percent ASTM D 1557. Trench levels below 4 feet = 90 percent ASTM D 1557.
   C. If tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.
   D. Frequency of Tests: One test per 150 linear feet of trench, at lift level chosen by Engineer’s Representative.

3.6 PROTECTION OF FINISHED WORK
   A. Protect finished Work.
   B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pipe and fittings for site water line including domestic water line and fire protection water line.
   2. Valves and fire hydrants.

B. Related Sections:
   1. Division 01 Specification Sections apply to Work of this Section
   2. Section 31 23 16.13 "Trenching and Backfilling."
   3. Section 33 13 00 "Disinfecting of Water Utility Distribution."

1.2 REFERENCES

A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
B. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
C. ASTM B 88 - Seamless Copper Water Tube.
E. ASTM D 1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
I. ASTM D 2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
J. ASTM D 3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.
K. ASTM D 3139 - Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.
L. ASTM D 3035 - Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.
M. AWS A5.8 - Brazing Filler Metal.
O. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other liquids.
Q. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
R. AWWA C500 - Gate Valves, 3 through 48 in NPS, for Water and Sewage Systems.
S. AWWA C502 - Dry Barrel Fire Hydrants.
T. AWWA C504 - Rubber Seated Butterfly Valves.
U. AWWA C508 - Swing-Check Valves for Waterworks Service, 2 in through 24 in NPS.
V. AWWA C509 - Resilient Seated Gate Valves 3 in through 12 in NPS, for Water and Sewage Systems.
W. AWWA C600 - Installation of Ductile-Iron Water Mains and Appurtenances.
X. AWWA C606 - Grooved and Shouldered Type Joints.
Y. AWWA C900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch, for Water.
Z. AWWA C901 - Polyethylene (PE) Pressure Pipe, Tubing, and Fittings, 2 inch through 3 inch, for Water
AA. UL 246 - Hydrants for Fire - Protection Service.

1.3 SUBMITTALS FOR REVIEW
A. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

1.4 SUBMITTALS AT PROJECT CLOSEOUT
A. Record actual locations of piping mains, valves, connections, and invert elevations.
B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE
A. Perform Work in accordance with standards of local municipality.
B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Deliver, store, protect and handle products to site in such a manner as to prevent damage.
B. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 PIPE MATERIALS
A. Types and classes of pipe to be used at the various locations shall be as scheduled on the Proposal and the drawings, and shall be as specified below:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Type Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- to 2-inch Diameter</td>
<td>Seamless Tube Type K Copper, ASTM B-88 or Polyethylene Plastic Tubing, ASTM D-2737, 160 psi</td>
</tr>
<tr>
<td>3-inch Diameter</td>
<td>ASTM D-2241, SDR 26, 160 psi or ASTM D-1785 Schedule 40</td>
</tr>
<tr>
<td>4-inch to 12-inch Diameter</td>
<td>PVC Pipe, AWWA C-900, or Ductile Iron Pipe, Diameter Pressure Rating 150 psi</td>
</tr>
<tr>
<td>16-inch Diameter</td>
<td>Ductile Iron Pipe, Pressure Rating 150 psi</td>
</tr>
</tbody>
</table>

B. The pipe shall be of the best quality in materials and workmanship. All pipe shall be subjected to thorough inspection at the job site before being placed in the trench. Any piece found to be defective shall be rejected and removed from the project.
C. Ductile Iron Pipe
   1. All ductile iron pipe shall be new and manufactured in the U.S.A. in accordance
      with current AWWA Specification C 151.
   2. Pipe shall be designed for a minimum working pressure of 150 pounds per square
      inch. Thickness of ductile iron pipe shall be designed in accordance with
      Specification AWWA C 150, based on 150 pounds per square inch, working
      pressure for 10 feet of cover and laying condition Type 2.
   3. Standard Bell and Spigot, Mechanical Joint (Type III), or boltless single gasketed
      joint pipe similar to that known as "Bell-Tite," "Fastite," "Tyton," or approved
      equal, may be used for the line and at other specific locations as approved by the
      Engineer. Flange joints where noted shall be 150 psi rated.
   4. Ductile iron pipe shall be asphalt coated outside and cement lined and seal coated
      inside in accordance with AWWA Specification C 104 (ANSI A21.4). Lining shall
      be standard cement lining.

D. PVC Pipe
   1. PVC pipe shall conform to the requirements of AWWA C900 pressure pipe, 4-
      inch through 12-inch for water distribution pressure class 150, DR18. PVC pipe shall be
      of the rubber gasketed push on joint type and shall meet the requirements of
      ASTM D 1784 and ASTM D 2241.
   2. All PVC pipe shall be approved by the National Sanitation Foundation Testing
      Laboratories, or other accredited laboratory for use in the transportation of potable
      water and shall bear the seal of approval of the National Sanitation Foundation
      Testing Laboratories (NSF).
   3. When non-metallic pipelines are to be installed the Contractor shall furnish and lay,
      above the pipeline, a continuous strip of metallic identification tape.
   4. Tape Material:
      a. The metallic identification tape shall be at least 2 inches in width and shall be
         of corrosive resistant metal of sufficient thickness to be stable and reflect
         electronic signals to electronic pipeline detector when buried to a depth of
         24 inches below normal ground level.
      b. The metallic tape shall be colored blue on one side and shall have 1-inch-high
         letters painted continuously on the same side of the tape which read,
         “CAUTION: BURIED WATER LINE BELOW” or other words to this effect.
      c. The marking tape shall be “Detectable Warning Tape,” as manufactured by
         the Omega Marking Company, or equal approved by the Engineer.

E. Schedule 40 and 80 PVC Pipe
   1. The Schedule 40 and 80 PVC Pipe shall be manufactured in accordance with the
      latest edition of ASTM D 2241, D1785 and shall conform to NSF standard #14 and
      ANSI/NSF Standard 61, using a PVC Compound having a minimum cell
      classification 12454B as defined by ASTM D 1784. The bell ends shall conform to
      ASTM D 2672, “Joints for PVC Pipe using Solvent Cements” when installed per
      ASTM D 2855.
2.2 PIPE FITTINGS

A. General
1. Pipe fittings shall be ductile iron of a type and design especially suitable for use with the type of piping with which they are installed. Fittings for PVC pipe shall also be of ductile iron. Pressure rating of fittings shall not be less than that of the pipe.
2. All mechanical joint fittings shall be ductile iron with retainer gland. The fittings shall be produced in accordance with ANSI/AWWA C153/A21.53 and ANSI/AWWA C111/A21.11 and be cement lined and seal coated in accordance with ANSI/AWWA C104/A21.14. The retaining gland set screws shall be square-heads with Type C knurled cup points manufactured of 4140 grade alloy steel and heat treated to Rockwell “C” 45/53 core hardness.
3. All flanged fittings shall be faced and drilled in accordance with the standard drilling for ANSI B16.1 Class 125 flanges. Bolts for flanged joints shall be of the length and diameter required by the ANSI Specification. Bolts and nuts shall be of best quality mild steel and shall be provided with hexagonal heads. Suitable 1/8-inch-thick rubber ring gaskets shall be provided for all flanged joints.

B. Ductile Iron Pipe Fittings
1. Fittings shall be ductile iron and shall conform to AWWA C 110. Flanged fittings shall be used for fire hydrant valve leads or where indicated on the plans. All other fittings shall be ductile iron mechanical joint or push-on joint unless otherwise shown on the drawings. All fittings shall have a pressure rating equal to that of the pipe with which they are used but in no case less than 250 psi.
2. Unless otherwise indicated, all ductile iron fittings shall have an external bituminous coating and shall be cement-lined in accordance with the specifications for coating and lining the pipe.
3. All ductile iron fittings shall be cast from the same quality of metal used in casting the ductile iron pipe and shall be subjected to the same test requirements. Marking and weighing shall be as required for the ductile iron pipe.
4. Where flanged fittings are used the flanges shall be of the same material as the fitting. Where bell or mechanical joint fittings are used, the bells shall be cast integrally with the fitting. Screwed-on bells will not be acceptable.

C. Schedule 40 and 80 Fittings
1. Schedule 40 and Schedule 80 fittings shall conform to ASTM D 2467, D1784, NSF Standard 61 and/or 41 Plastic Fittings for potable water. The PVC material shall meet or exceed cell classification 12454, as manufactured by Spears Manufacturing Company or an approved equal.

2.3 PIPE JOINTS

A. Push-on Joints: Push-on joints shall be as specified in AWWA Standard C 111.
B. Mechanical Joints: Mechanical joints shall be as specified in AWWA Standard C 111.
C. Flanged Joints: Flanged joints shall meet the requirements of AWWA C110 and be faced and drilled in accordance with ANSI B16.1. Bolts shall be of the length and diameter required by the ANSI Specification for Class 125 flanges. Bolts and nuts shall be of best quality mild steel and shall be provided with hexagonal heads, except where other types of bolts are specified. Suitable gaskets shall be used in all flanged joints.
D. Miscellaneous Joints: Miscellaneous types of joints shall be made as specified in other paragraphs or as recommended by the manufacturer. All joints shall be made using materials and methods as required to produce joints that will function satisfactorily under the various conditions encountered.

2.4 VALVES

A. General: Valves that are 12-inch and smaller shall be gate valves and valves that are 14-inch and larger shall be butterfly valves, unless otherwise noted on the plans or specified herein. All valves shall be designed for a working pressure of at least 150 psi.

B. Gate Valves

1. All gate valves shall be resilient seat, iron body, bronze mounted throughout and shall meet all requirements of AWWA C 509. The valves shall be of the type of joint used in the piping. All valves shall open by turning to the left, and unless otherwise specified, shall have non-rising stem and be furnished with a two-inch operating nut when valves are outside of buildings, and shall be furnished with hand wheels when inside of buildings or valve vault. Gate valves shall be furnished with O-ring stem packing.

2. All gate valves shall be designed to withstand a working pressure of 150 pounds per square inch. All valves shall be Mueller Company A-2370 or approved equal.

3. Valves required in lines smaller than 3 inches in diameter shall be 150 psi water pressure, heavy duty, brass or bronze gate valves, double disc or wedge type, Crane, Walworth or approved equal. Valves in copper lines shall have solder-joint ends.

4. All interior cast iron surfaces shall be epoxy coated in accordance with the appropriate paragraphs of this section.

C. Tapping Sleeves and Valves

1. Tapping sleeves shall be designed for a working pressure of 150 psi, and shall be mechanical joint, or as required to make the connection. Tapping sleeves shall be Mueller, ductile iron, with duck-tipped gaskets or approved equal.

2. All interior cast iron surfaces shall be epoxy coated in accordance with the appropriate paragraphs of this section.

3. Tapping valves shall be resilient seat Mueller mechanical joint valves designed for a working pressure of 150 psi or approved equal.

D. Valve Boxes and Extension Stems

1. Extension stems shall be furnished on buried valves where the top of the operating nut is more than 36-inches below finished grade. Top of the extension stem shall not be more than 9-inches below the top of the valve box.

2. Buried valves shall be provided with cast iron valve boxes. The boxes shall be designed to fit over a section of 6-inch C900 PVC riser pipe which will be used as an extension from the top of the valve to within 8-inches of the ground surface. The box shall have a heavy cast iron cover. The box shall have a flange type base, with the base being approximately 4 inches larger in diameter than the outside diameter of the barrel of the box. The necessary length of 6-inch C900 PVC riser pipe required for the extension shall be considered as a part of the box.

E. Internal Epoxy Coating for Valves

1. All interior wetted ferrous surfaces of all types of valves will be coated with an epoxy. The coating shall be a two part, thermal setting epoxy protective coating and shall function as a physical, chemical and electrical barrier between the base metal to which it is applied and the surroundings. The coating shall be nontoxic and shall not impart taste of water. The coating must be formulated from material deemed
acceptable per the Food and Drug Administration document title 21 of the Federal Regulations on food additives, Section 121.2514 is entitled, Resin and Polymeric Coatings. The coating shall have a satin finish and shall be suitable for field overcoating and touch-up with the same coating material without sanding or special surface preparation, or application of heat in excess of room temperature. The coating shall have a successful record of performance in valves, pipe or other allied equipment for a minimum of two years. The coating adhesion to the substrate shall exceed the cohesion of the coating film as demonstrated by the following test:

a. Prepare test panel and apply coating as per manufacturer's recommendation.

b. After sample has properly cured as per manufacturer's recommendation, scribe an "X" through the coating to the metal substrate using a sharp knife or scalpel.

c. At the juncture of the two scribes, use the point of the knife to attempt to lift off the coating. The coating should not lift off the substrate or between coats readily, but should break up leaving coating material on the substrate of this damaged area.

d. No disbondment of the film shall be noted as tested above after immersion in tap water for 1500 hours at 100° F.

2. A falling sand abrasion test using ASTM D-968 shall produce an abrasion coefficient of 25.30 liters per mil. As an alternative, a Taber Abrader Test should find 3.5-3.7 milligrams of coating loss per 100 cycles when using a CSFS #10 wheel (1000 gram weight).

2.5 FLEXIBLE COUPLINGS AND FLANGED COUPLING ADAPTERS

A. Flanged coupling adapters and flexible couplings shall be provided at the locations shown on the drawings and at other location required for installation of the piping system. Flanged coupling adapters shall be provided with anchoring studs. Epoxy coated steel construction shall be used for couplings larger than 12-inch. Couplings smaller than 12-inch shall be cast iron.

2.6 FIRE HYDRANTS

A. Fire hydrants shall conform to the requirements of AWWA C-502 dry-barrel type. The fire hydrants shall be designed for a bury length of 5'-0"; however, the length may vary according to field conditions and the Contractor will be required to add extensions to position the top of the flange at the elevation noted on the plans or as directed by the Engineer. Extensions shall be considered incidental to the fire hydrant installation and no direct payment shall be given.

B. The hydrants shall have a 5-1/4-inch valve opening, two 2-1/2-inch hose nozzles and one 4-1/2 inch pumper nozzle. A swivel flange shall be used to face the hydrant nozzles in any position.

C. Hose threads shall be National Standard Threads

D. The hydrants shall be sized for 6-inch mains and shall have an inlet connection compatible with the type pipe used. All gaskets, nuts, bolts and other jointing materials shall be considered part of the fire hydrant installation.

E. Operating nut shall be standard 1-1/2-inch pentagon opening counterclockwise. The hydrant shall close with the pressure.

F. Hydrants shall be painted in accordance with the standards of the local municipality.
G. Fire hydrants shall be located at points shown on the plans, the exact location of the hydrant to be established by the Engineer. All hydrants shall be set plumb to the grade as established by the Engineer, and shall have their nozzles parallel with and/or at right angles to the curb, with the pumper nozzle facing the curb in accordance with the details shown on the plans.

H. The hydrants shall be supported in such a manner as not to cause a strain on the fire hydrant lead or branch. The bowl of the hydrant shall be well braced against unexcavated earth at the end of the trench with concrete backing. The concrete backing shall be placed so as not to interfere with the hydrant drains and so that the joints or flanges are accessible.

I. Each hydrant shall be connected to the main with a 6-inch PVC branch controlled by an independent 6-inch resilient seat gate valve. Each hydrant shall be set upon a stone or concrete slab not less than four inches thick and not less than one square foot of surface area. Where solid rock exists in the bottom of the trench and same is excavated to the proper depth to form a foundation for the hydrant, the slab of stone or concrete may be omitted.

J. There shall be placed round the base of the hydrant not less than seven cubic feet of sound broken stone or clean gravel or other suitable material to provide reservoir capacity so that the hydrant will completely drain when closed. The gravel or broken stone shall reach from the bottom of the trench to at least six inches above the waste opening in the hydrant. Each hydrant shall be operated by the Contractor to prove to the inspector that the drain hole has not been plugged with concrete or other material.

K. The hydrants shall have a breakable safety flange, located approximately 2 inches above the ground, and breakable stem coupling and barrel which breaks cleanly upon impact. The main valve shall also remain closed without loss of water.

L. The hydrants shall be AWWA improved type hydrants and shall be Mueller Centurion Hydrants or approved equal, and shall have self-oiling reservoirs, and shall be internally epoxy coated as described in VALVES AND VALVE BOXES paragraph of this section.

PART 3 - EXECUTION

3.1 WATER SERVICE CONNECTIONS

This specification covers the requirements of installing services on public right-of-way, from the main line to the meter box.

A. Service Taps
   1. Tapping saddles shall be Smith-Blair Taper Seal Style 313 or DMD Dresser Style 194 or approved equal. Service taps on PVC water lines shall be made using hinge type or double strap saddles. Tapping saddles shall support the full circumference of the pipe and shall have a bearing area of sufficient width along the pipe axis to prevent pipe distortion when the saddle is tightened.

B. Polyethylene Plastic Tubing
   1. Service lines shall be constructed with polyethylene plastic tubing as specified in ASTM D-2737 with a rating of 160 psi unless otherwise noted on the plans. The service line shall be that pipe from the water distribution line to the water meter. The pipe shall be sized to match the nominal water meter size.
C. Copper Tubing
   1. Service lines may be constructed with seamless copper water tube ASTM B 88, Type K, of the sizes required.

D. Meter Boxes, Meter Stop and Corporation Stop
   1. Meter boxes shall be corrugated metal pipe with locking cast iron lids as specified on the plans. Meter stops, corporation stops and service clamps for service connections of various sizes shall be as specified on the plans. Corporation and meter stops shall be compatible with pipe material furnished.

3.2 EXCAVATION, TRENCHING AND BACKFILLING

A. The trench shall be excavated to the lines and grades as established by the Engineer and as shown on the plans. The depth of cover for all pipe lines on which the grades and elevations are not shown on the plans, shall be 42 inches. The amount of cover may vary over or under 42 inches as directed by the Engineer.

B. The minimum width of the trench shall be the outside diameter of the pipe plus 12 inches and the maximum width shall be the outside diameter of the pipe plus 18 inches. The trenching equipment shall be maintained on a sufficiently level road bed to provide substantially vertical trench walls. The maximum horizontal offset of the trench wall from bottom of trench to the top of the trench (undercutting) shall be 4 inches.

C. The trench shall be excavated to an even grade so that the bottom of the pipe will rest on the bottom of trench throughout the entire length of the pipe. In order to obtain a true even grade, the trench shall be fine graded by hand. On lines that are to be laid to established grades, batter boards shall be set at fifty foot intervals and the trench graded to the established grade.

D. Any part of the trench excavated below grade shall be corrected by filling with approved material and thorough compacting.

E. If large rock, rock fragments or other unyielding material is encountered in the bottom of the trench it shall be removed to a depth of 3 inches below grade, refilled with selected material, and thoroughly compacted.

F. Bell holes of ample dimensions shall be dug at each joint to permit the jointing of pipe to be made properly, and of sufficient depth to prevent the bell of the pipe from resting on undisturbed materials.

G. Wherever necessary to prevent caving, the trench shall be adequately braced and sheeted.

H. In all trench excavation, where the depth of excavation is 5 feet or more the trench wall shall be shored, sheeted or braced in accordance with OSHA requirements.

I. Trench digging machinery may be used to make the trench excavations except in places where operation of same would cause damages to trees, buildings or other existing structures either above or below ground; in such instances hand methods shall be employed.

J. All excavated material shall be piled in a manner that will not endanger the work or existing structures and that will cause the least amount of obstructions to walks and driveways.

K. There will be no classification of the excavated materials and the term excavation shall include all materials encountered in excavating the trenches or structural excavations.

L. The Contractor shall take all necessary precautions for protecting paved areas from being damaged by the trenching and backfilling equipment. Any damage done to any paved area outside of the area set forth in the plans as a result of the construction work shall be repaired by the Contractor at his own expense.
M. Where the lines are located behind curbs, the Contractor shall take special precautions to protect trees and shrubs. Care shall be exercised to cause as little damage to lawns as possible. Where lines cross under curbs, gutters or curbs and gutters, tunneling will be required.

N. As soon as practicable after laying and jointing of the pipe, the completion of bedding, and the completion of structures, the trench shall be backfilled in accordance with the trench backfill detail in the plans.

O. All pipe shall be backfilled in accordance with the specifications and the details shown on the plans. All bedding and backfill material shall be crushed and shall have at least two broken faces. Pea gravel will not be allowed.

P. The pipe shall be laid on a six-inch-thick cushion of crushed rock bedding material. ASTM C 33 Grade No. 8, or as approved by the Engineer. After the pipe is laid, the bedding material shall be placed simultaneously on both sides of the pipe and shall be shovel sliced around the pipe haunches. The bedding material shall be placed in 6-inch maximum lifts in accordance with the details shown on the plans. This material shall be thoroughly consolidated and compacted by tamping.

Q. Under pavements and slabs the backfill material used above the pipe bedding to the approved base course shall be either one) Rock Crus her Fines, or two) Cement Stabilized Backfill.

R. Rock Crusher Fines used for backfill operations shall be sharp grained particles of crushed stone and shall meet the following gradation:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 inch</td>
<td>100</td>
</tr>
<tr>
<td>#4</td>
<td>35 - 100</td>
</tr>
<tr>
<td>#10</td>
<td>20 - 100</td>
</tr>
<tr>
<td>#40</td>
<td>5 - 35</td>
</tr>
<tr>
<td>#200</td>
<td>4 - 10</td>
</tr>
</tbody>
</table>

S. All crushed stone shall be installed in accordance with the details shown on the plans and consolidated in place by rolling.

T. Crushed stone screening (crusher fines) shall be wetted uniformly throughout with sufficient moisture to assure proper compaction before placing the material in the pipe trench. The material shall be placed in 12-inch loose lifts and compacted in place using approved compaction equipment. All approved backfill material placed in the top four feet of a trench located in a public right-of-way, parking lot or in a location where, in the opinion of the Engineer, excessive settlement would jeopardize a future structure shall be backfilled in 12-inch loose lifts and compacted to ninety-five percent (95 percent) density as determined by ASTM D 1557. All other approved backfill material shall be placed in 12-inch loose lifts and compacted to ninety percent (90 percent) density as determined by ASTM D 1557. All areas in the public rights-of-way where grass will be planted shall have topsoil placed in the top 12 inches.

U. Portland cement stabilized backfill shall consist of caliche base material, blow sand or native soil stabilized by the addition of Portland cement. Crushed stone or concrete aggregate shall NOT be used.

V. The Contractor shall submit a mix design prepared by an approved Commercial Laboratory that will produce a minimum seven day compressive strength of 150 psi. In no case shall the minimum cement content of the mix be less than 1 sack per cubic yard.
W. Cement used in Portland cement stabilized backfill shall be Type I or Type II conforming to the requirements of ASTM C 150.

X. Caliche used for Portland cement stabilized backfill shall be crushed material conforming to Texas State Department of Highways and Transportation 1982 Standard Specifications for Construction of Highways, Streets and Bridges Item 248 Type F, Grade 2.

Y. Blow sand used for Portland cement stabilized backfill shall be clean, free from organic matter, clay lumps, rock and other deleterious matter.

Z. Native soil used for Portland cement stabilized backfill shall be clean, free from clods and organic matter, and rock in excess of 2 inches.

AA. Portland cement stabilized caliche backfill or Portland cement stabilized native soil backfill may be constructed using either the "dry" method or the "wet" method.

BB. The dry method of stabilized backfill construction consists of dry mixing of the cement and caliche, sand or soil to produce a homogenous mixture then adding and mixing sufficient water for proper compaction and hydration of the cement. The water content of the mixture will be approximately one to two percent above the optimum moisture for soil compaction. The mixing may be accomplished by using batch mixers or on the job site by "blade mixing" or other suitable method to produce the desired backfill material. The mixed material shall be placed in lifts of up to a maximum of 12 inches and compacted to 95 percent in accordance with ASTM D 1557 density by use of suitable compacting equipment.

CC. In the "wet" method of cement stabilized backfill construction, the materials shall be mixed in an approved concrete batching plant or mixer to the consistency of concrete and placed as concrete would be placed. The slump of the backfill material shall be such that all voids will be filled, approximately 4 to 6 inches. The backfill shall be consolidated by rodding or by the use of mechanical vibrators.

DD. The mix design used must be for the method of placement chosen.

EE. Portland cement stabilized blow sand backfill shall be mixed and placed by the "wet" method as described above.

FF. The minimum number of compaction tests to be conducted on backfilled material shall be as follows: one test per 40 cubic yards of backfill, or one test per 150 linear feet of trench.

GG. The Contractor will be required to locate all known utility lines, including consumer service lines, far enough in advance of the trenching to make proper provisions for protecting the lines and to allow for any deviations that may be required from the established lines and grades.

HH. The Contractor shall not be allowed to disrupt the service on any utility lines except consumers' service lines, which may be taken out of service for short periods of time if the Contractor obtains permission from the Engineer and from the Owner of the premises being served by the utility.

II. The Contractor shall immediately notify the proper utility company of any damage to utility lines, in order that service may be established with the least possible delay. Any damage to existing lines and the repair of consumer lines which are authorized to be cut or temporarily taken out of service shall be repaired or replaced by the Contractor at his own expense, and as directed by an official representative of the utility company involved.

JJ. All utility lines shall be properly supported to prevent settlement or damage to the line both during and after construction.

KK. Any permanent relocations of existing utility lines shall be done by the proper utility company without expense to the Contractor.
LL. Metallic Tape
1. The Contractor shall backfill over non-metallic pipelines to a depth which is less than 24 inches and not more than 12 inches from the top of the cut of the ditch section in which the pipeline is laid. Contractor shall stop the backfilling material at a generally uniform level. All machine tamping, jetting and other compaction activities shall be accomplished up to this point of height in the backfilling before the marking tape is placed in the trench.
2. The Contractor shall then lay the marking tape in the pipe trench and tape shall be held in position by the spot placement of backfill materials over it to keep it from sliding to the sides and/or from being blown about in the ditch by the wind. The tape shall be laid with the painted side which shall also be the side with the identification lettering on it, in the “up” position. The tape shall be laid in the flat position and kept there until backfill is accomplished.
3. The Contractor shall then complete the backfilling operation in such a manner that the marking tape is not cut, crimped, ruptured or separated by the backfilling work.
4. No separate payment item will be provided for furnishing and placing the marking tape. This item shall be considered subsidiary to the non-metallic pipe being placed.

3.3 PIPE INSTALLATION - WATER LINES

A. General
1. All pipe and accessories shall be unloaded, handled, laid, jointed, tested for defects and for leakage and disinfected in the manner herein specified.

B. Inspection
1. The pipe, fittings, valves, and accessories shall be inspected upon delivery and during the progress of the work and any material found to be defective will be rejected by the Engineer, and the Contractor shall remove such defective material from the site of the work.

C. Responsibility for Materials
1. The Contractor shall be responsible for all material furnished by him and he shall replace at his own expense all such material that is found to be defective in manufacture or has become damaged in handling after delivery.

D. Handling Pipe and Accessories
1. All pipe, fittings, valves, and other accessories shall, unless otherwise directed, be unloaded at the point of delivery, hauled to and distributed at the site of the work by the Contractor. In loading and unloading, they shall be lifted by hoists or slid, or rolled on skidways in such a manner as to avoid shock or damage to the materials. Under no circumstances shall they be dropped. Pipe handled on skidways must not be skidded or rolled against pipe already on the ground.
2. The pipe, fittings and accessories shall be placed along the site in such a manner as to be kept as free as possible from dirt, sand, mud and other foreign matter.

E. Alignment and Grade
1. All pipe shall be laid and maintained to the lines and grades shown on the plans or as established on the ground by the Engineer.
2. Wherever it is necessary to deflect pipe from a straight line either in a vertical or horizontal plane to avoid obstructions, to plumb valves, or where vertical or horizontal curves are shown or permitted, the degree of deflection at each joint shall not exceed one-half the maximum deflection recommended by the manufacturer of the particular kind of pipe being laid and the degree of deflection shall be approved by the Engineer.
F. Manner of Handling Pipe and Accessories Into Trench
   1. After the trench grade has been completed, all bell holes dug and the grade inspected, the pipes and accessories may be placed in the trench. All pipe, fittings, and valves shall be carefully lowered into the trench piece by piece by means of derricks, ropes, or other suitable tools or equipment, in such a manner so as to prevent damage to the material in any way. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

G. Cleaning and Inspecting
   1. Before lowering into the trench, the pipe shall be again inspected for defects and the pipe, while suspended, shall be lightly hammered to detect cracks. Any defective, damaged or unsound pipe and materials shall be rejected.
   2. All foreign matter or dirt shall be removed from the inside of the pipe and from all bells, spigots or parts of the pipe used in forming the joint, before the pipe is lowered into the trench, and it shall be kept clean by approved means during and after laying.

H. Laying and Jointing PVC Pipe
   1. PVC pipe shall be handled and installed in strict accordance with the recommendations of the manufacturer. Special care shall be exercised in handling PVC pipe, in preparing the trench for pipe laying, and in compacting and bedding under and around each side of the pipe.
   2. The ring groove shall be clean before installation of the rubber ring. The ring shall be carefully installed in the groove as recommended by the manufacturer. The spigot end of the pipe shall be wiped clean and lubricated using the recommended lubricant. The spigot end shall be carefully inserted into the bell end until the reference mark on the spigot end is flush with the end of the bell.
   3. Cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or the cement lining.
   4. The jointing shall be completed for all pipe laid each day, in order not to leave open joints in the trench overnight. At times when pipe laying is not in progress, the open ends of pipe shall be closed by approved means, and no trench water shall be permitted to enter the pipe.
   5. No pipe shall be laid in water, or when the trench conditions or weather is unsuitable for such work, except by permission of the Engineer.
   6. Flanged joints shall be used where shown on the plans. Mechanical joint, or other approved joints shall be installed with materials furnished by the manufacturer and in accordance with the manufacturer's specifications.
   7. Flanged joints where used shall be bolted with Flange bolts of best quality mild steel and of the size and length required by American Standards Association; bolts and nuts shall be provided with standard hexagonal heads. Gasket rings shall be used and shall be made of best quality rubber composition sheet packing 1/16-inch-thick, or a brand and quality approved by the Engineer.
   8. The pipe and fittings shall be properly aligned and free to move in any direction while bolting, and the bolts shall be gradually tightened at a uniform rate around the entire flange.
I. Setting Valves, Valve Boxes and Fittings
   1. Valves and fittings shall be set at the locations shown on the plans or at locations as established by the Engineer, and shall be set and jointed to the pipe in the manner heretofore specified for pipe installations. All valves buried in the ground shall have a valve box set over the valve with a concrete pad around the valve box as shown on the drawings. All valves shall be thoroughly inspected and checked for operation before installation. Concrete blocking shall be provided for all buried valves.
   2. Valve boxes shall be firmly supported and maintained centered and plumb over the wrench nut of the valve, with box cover flush with the surface of the ground or at such level as directed.

J. Setting Fire Hydrants
   1. Fire hydrants shall be located at points shown on the plans, the exact location of the hydrant to be established by the Engineer. All hydrants shall be set plumb to the grade as established by the Engineer, and shall have their nozzles parallel with and/or at right angles to the curb, with the pumper nozzle facing the curb in accordance with the details shown on the plans.
   2. The hydrants shall be supported in such a manner as not to cause a strain on the fire hydrant lead or branch. The bowl of the hydrant shall be well braced against unexcavated earth at the end of the trench with concrete backing. The concrete backing shall be placed so as not to interfere with the hydrant drains and so that the joints or flanges are accessible.
   3. Each hydrant shall be connected to the main with a 6-inch PVC branch controlled by an independent 6-inch resilient seat gate valve. Each hydrant shall be set upon a stone or concrete slab not less than four inches thick and not less than one square foot of surface area. Where solid rock exists in the bottom of the trench and same is excavated to the proper depth to form a foundation for the hydrant, the slab of stone or concrete may be omitted.
   4. There shall be placed around the base of the hydrant not less than seven cubic feet of sound broken stone or clean gravel, or other suitable material to provide reservoir capacity so that the hydrant will completely drain when closed. The gravel or broken stone shall reach from the bottom of the trench to at least six inches above the waste opening in the hydrant. Each hydrant shall be operated by the Contractor to prove to the inspector that the drain hole has not been plugged with concrete or other material.

K. Plugging Dead Ends
   1. Standard plugs shall be inserted into the bells of all dead ends and pipes, tees, or crosses and spigot ends shall be capped. Plugs or caps shall be jointed to the pipe or fittings in the same manner used in jointing the pipe. All plugs and caps shall have horizontal to thrust blocks.

   1. Where pipes, conduits or concrete curbs, gutters or other obstructions are encountered in the construction, the cost of tunneling under such obstructions shall be included as a part of the cost of the pipe line, or other pay items, complete in place.
3.4 ANCHORAGE OF BENDS, TEES AND PLUGS, ETC.

A. Reaction or thrust blocking shall be applied to all pipe lines at all tees, plugs, caps and bends. Concrete shall be used for blocking the pipe and fittings and shall have a minimum 28 day compressive strength of 2,500 psi but shall otherwise conform to Item 421, Class B of the 2004 TxDOT Standard Specifications. The blocking shall be placed between solid ground and the fitting to be anchored in accordance with the details on the plans. The blocking shall be so placed that the pipe and fitting joints will be accessible for repair.

3.5 DISINFECTION OF PIPE LINES

A. The Contractor shall furnish all labor, equipment, and materials necessary for the disinfection of the new pipe lines which shall be disinfected before being placed in service. The lines shall be disinfected by the application of a chlorinating agent. The chlorinating agent may be a liquid chlorine, liquid chlorine gas-water mixture, or a calcium hypochlorite solution, which shall be fed into the lines through a suitable solution-feed device, or other methods approved by the Engineer. The chlorinating agent shall be applied at or near the point from which the line is being filled. The water being used to fill the line shall be controlled to flow into the section to be disinfected very slowly, and the rate of application of the chlorinating agent shall be in such proportion to the rate of water entering the pipe that the chlorine dose applied to the water entering the line shall be at least 50 parts per million. The treated water shall be retained in the pipe lines for a period of not less than 24 hours. At the end of the retention period, all treated water shall be thoroughly flushed from the lines until the replacement water in the lines shall have chlorine residual of not more than 0.5 parts per million; the Engineer will designate blowoff valves in the area around the project site that may be used to purge the lines. Where it is necessary to place the new lines in service in less than 24 hours, the concentration of chlorine may be increased to 300 ppm and the lines flushed and placed in service in three hours. Disinfection procedures shall conform to AWWA C 651, latest revision.

B. After final flushing and before any section of water line is placed into service, the Contractor shall collect samples as directed by the Engineer in accordance with AWWA C 651, latest revision. A minimum of one bacteriological sample shall be collected for each 1,000 feet of completed water line to check efficiency of disinfection procedures and shall be repeated if contamination persists. The samples shall be submitted by the Contractor to an independent testing lab. The samples shall be tested in accordance with AWWA C 651, latest revision.

3.6 HYDROSTATIC TESTS

A. All water pipe lines constructed under this contract, prior to acceptance, shall be tested as described in the following paragraphs. This test shall apply to all newly laid pipe or any valved sections thereof. The Contractor shall bear all costs of providing all equipment, materials, labor and other incidentals required to test pipe lines. Water of sufficient pressure to test the pipe lines will not be available and the Contractor shall provide suitable means for developing the required pressure in lines.

B. Each valved section of the line shall be tested for leakage as soon as practical after laying. Sufficient backfill shall be placed prior to testing to prevent any movement of the pipe, but all joints shall be left exposed. The Contractor shall furnish water for filling the line and shall furnish the necessary means for pressuring the line. Duration of the test shall be not
less than four hours. The line shall be carefully checked for any evidence of leakage. The cause of any leaks shall be found and corrected and the line retested.

C. The pipeline shall be tested so that the pressure at the lowest point in the test section is at least 100 percent but not greater than 120 percent of the pipe pressure class of the pipe, and the minimum pressure at the highest point in the test section is not less than 85 percent of the pipe pressure class of the pipe. The maximum allowable leakage for push-on joints is the number of gallons per hour as determined by the following formula:

\[ L = \frac{ND(P)^{1/2}}{7400} \]

Where:

- \( L \) = Allowable leakage in gallons per hour
- \( N \) = Number of rubber-ring gasket joints in the length of the pipe tested
- \( D \) = Nominal diameter of the pipe in inches
- \( P \) = Average of the maximum and minimum pressures within the test section in psi.

3.7 CLEANING UP

A. After the construction work is completed and before final acceptance by the Owner, the Contractor shall remove all rubbish, excess materials, excess materials from excavations and other debris from the site of the work, and all trench surfaces shall be bladed as heretofore specified. The cost of cleanup shall be included in the proposal prices for the various units of work.

END OF SECTION
SECTION 33 13 00 - DISINFECTING OF WATER UTILITY DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Disinfection of potable water distribution system.
   2. Testing and reporting results.
B. Related Sections:
   1. Division 01 Specification Sections apply to Work of this Section.
   2. Section 33 12 00 "Water Utilities."

1.2 REFERENCES

A. AWWA B300 - Standard for Hypochlorites.
B. AWWA B301 - Standard for Liquid Chlorine.
C. AWWA B302 - Standard for Ammonium Sulfate.
D. AWWA B303 - Standard for Sodium Chlorite.
E. AWWA C651 - Standards for Disinfecting Water Mains.

1.3 SUBMITTALS FOR INFORMATION

A. Test Reports: Indicate results comparative to specified requirements.
B. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.

1.4 PROJECT RECORD DOCUMENTS

A. Submit test results to Engineer.
B. Disinfection report:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and time of completion.
   3. Test locations.
   4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
   5. Date and time of flushing start and completion.
   6. Disinfectant residual after flushing in ppm for each outlet tested.
C. Bacteriological report:
   1. Date issued, project name, and testing laboratory name, address, and telephone number.
   2. Time and date of water sample collection.
   3. Name of person collecting samples.
   4. Test locations.
   5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
   6. Coliform bacteria test results for each outlet tested.
   7. Certification that water conforms, or fails to conform, to bacterial standards of the local health department.
1.5 QUALITY ASSURANCE
   A. Perform Work in accordance with AWWA C651.
   B. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in
      this Section with minimum three years experience.
   C. Testing Firm: Company specializing in examining potable water systems, approved by the State
      of Texas.
   D. Submit bacteriologist's signature and authority associated with testing.

1.6 REGULATORY REQUIREMENTS
   A. Conform to applicable code or regulation for performing the work of this Section.
   B. Provide certificate of compliance from authority having jurisdiction indicating approval of
      water system.

PART 2 - PRODUCTS

2.1 DISINFECTION CHEMICALS
   A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302,
      Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Verify that piping system has been cleaned, inspected, and pressure tested.
   B. Perform scheduling and disinfecting activity with start-up, testing, adjusting and balancing,
      demonstration procedures, including coordination with related systems.

3.2 EXECUTION
   A. Provide and attach required equipment to perform the work of this Section.
   B. Introduce treatment into piping system.
   C. Maintain disinfectant in system for 24 hours.
   D. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.
   E. Replace permanent system devices removed for disinfection.
   F. Pressure test system to 150 psi. Repair leaks and re-test.

3.3 FIELD QUALITY CONTROL
   A. Test samples in accordance with AWWA C651.

END OF SECTION