PROJECT MANUAL
September 12, 2022 (Construction Documents)

Consolidated Utility District Phase Two Renovation

709 New Salem Road
Murfreesboro, Tennessee 37129

ARCHITECT
Southeast Venture Design
4030 Armory Oaks Drive
Nashville, TN 37204

Architect's Project No. 22014.ID

ARCHITECTURAL
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4030 Armory Oaks Drive
Nashville, Tennessee 37204
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MECHANICAL AND PLUMBING
I.C. Thomasson Associates, Inc.
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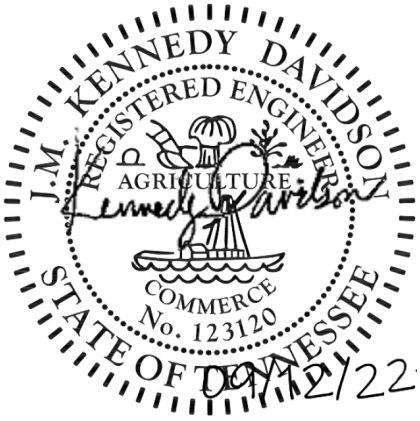

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AGREEMENTS AND BONDS

PART 1 - GENERAL

1.1 AGREEMENTS AND BONDS

A. The following documents printed by The American Institute of Architects, 1735 New York Avenue, N.W., Washington, D.C., 20006, are hereby made a part of this project by reference. A copy will be made available upon request.

1. The Standard Form of Agreement Between Owner and Contractor where the Basis of Payment is a Stipulated Sum, AIA Document A101, 2007 Edition.
2. Bid Bond Form AIA Document A312, 2010 Edition
3. Performance Bond and Payment Bond AIA Document A312, 2010 Edition

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION

GENERAL CONDITIONS

The General Conditions of the Contract for Construction, A.I.A. Document A201 2017 Edition as printed by American Institute of Architects, 1735 New York Avenue, N.W., Washington, D.C., 20006, are hereby made a part of this agreement by reference.

END OF DOCUMENT

SUMMARY OF WORK

PART 1 - GENERAL

1.1 PROJECT DESCRIPTION

A. This project includes interior renovations of Main Building and Engineering Annex of Consolidated Utility District, Murfreesboro Tennessee, defined by the Contract Documents prepared by Southeast Venture Design.

1.2 CONFLICTS OR DISCREPANCIES OR MISSING INFORMATION

A. If there are any conflicts or discrepancies within or between any of the Contract Documents involving the quality or quantity of work required, it is the intention of the Contract that the work of highest quality or greatest quantity shown or specified shall be furnished, unless such conflict or discrepancy was brought to the attention of the Architect and resolved in writing thru Addendum, ASI or Letter of Clarification. Request clarification from Architect for missing or incomplete information in the construction documents. Failure of the contractor to gain clarification on missing or incomplete information will not negate the contractor’s responsibility for complete and correct installations.

1.3 OWNER-FURNISHED PRODUCTS

A. Coordinate with the Owner for the following Owner Furnished Contractor Installed items (OFCI).

1. Furnishings as indicated on Drawings.

1.4 CONTRACTOR USE OF PREMISE

A. General: During the construction period the Contractor shall have full use of the premises for construction operations, including use of the site. The Contractor's use of the premises is limited only by the Owner's right to perform construction operations with its own forces or to employ separate contractors on portions of the project.

1.5 MISCELLANEOUS PROVISIONS

A. By execution of this Contract, Contractor acknowledges review of proposed details and specifications and agrees to provide warranties and required bonds for products and systems specified herein, detailed on drawings and as approved as a substituted or equal product or system in Division 1, Substitution Requests.

B. No material containing asbestos shall be used in the construction of this project or incorporated into the completed work.

C. Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections as indicated in the General Conditions of the Contract.

1.6 COORDINATION

A. Coordinate work of the various Sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed in other Sections.

B. Verify characteristics of elements of interrelated operating equipment are compatible; 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 conduits, as closely as practicable; make runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. Execute cutting and patching to integrate elements of Work, uncover ill-timed, defective, and non-conforming Work, provide openings for penetrations, and provide samples for testing if required. Seal penetrations through floors, walls, roofing, and voids in the building envelope.

1.7 DEFINITIONS AND EXPLANATIONS

A. Imperative language is used generally in the specifications. Except as otherwise indicated, requirements expressed imperatively are to be performed by the Contractor as if preceded by the phrase “The Contractor shall”.

B. The term “provide” means furnish and install, complete, and ready for intended use.

1. Except as otherwise defined in greater detail, the term “furnish” means supply and deliver to the project site, including unloading, unpacking, inspecting, and storing until ready for receipt by Owner, installation, etc., as applicable.
2. Except as otherwise defined in greater detail, the term “install” is used to describe operations at project site including assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations, as applicable.

C. The term “indicated” is as cross-reference to graphics, notes or schedules on drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements in contract documents. Where terms such as “shows”, “noted”, “schedules”, and “specified” are used in lieu of “indicated”, it is for purpose of helping reader locate cross-reference, and no limitations of location is intended.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

1.2 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use Section 012507 Substitution Request Form or similar for approved by Architect.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

    a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
    b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.3 QUALITY ASSURANCE

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

1.4 PROCEDURES

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

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.

e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SUBSTITUTION REQUEST FORM

Submit to: Southeast Venture Architecture
4011 Armory Oaks Drive
Nashville, TN 37204
Attention: Monika Whittenburg
Email: mwhittenburg@southeastventure.com

Date Submitted:_____

Specification Section No. and Title_____ - _____

Specified Item:_____

Paragraph No. (Example 2.3.A.)_____

Proposed Substitute:_____

Substitute Manuf. website/Direct link to product:_____

1. How will dimensions, gauges, and weights indicated in Contract Documents be changed by proposed substitute?_____
_____
_____

2. How will wiring, piping, and duct work indicated in Contract Documents by changed by proposed substitute?_____
_____
_____

3. How will other trades be effected by proposed substitute?_____
_____
_____

4. How will the construction schedule be effected by the proposed substitute?_____
_____
_____

5. How will the proposed substitute change unit costs? Circle and complete one below:
No change. Cost will decrease by _____. Cost will increase by_____.
Provide breakdown for cost changes on attached sheet.

6. How will the manufacturers warranty of proposed substitute differ from warranty indicated in Construction Documents? _____

_____
_____
_____

7. Provide a point-by-point comparison of the important salient characteristics of proposed substitute against the specified item. Attach additional pages as needed. Do not leave this section blank or use words like “no difference” or “None”.

Specified Item	Proposed Item
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

8. The undersigned makes the following certifications:
    a. The proposed substitution has been fully investigated and determined to have overall performance and longevity equal or superior to the specified product.
    b. That cost data is complete and that no claim for additional cost will be made after Substitution Request is accepted.
    c. That coordination, installation and changes associated with substitution will be complete.
    d. The proposed substitution has been fully investigated and determined to meet all codes applicable, and when used within an assembly does not alter the assembly’s ability to meet applicable codes.

General Contractor Company Name:_____
Company Representative:_____
Address:_____
Telephone Number_____ Fax Number_____
Signature & Date:_____

9. Architects Acceptance

Accepted_____ Accepted as noted _____ Rejected(See comment below)_____
Comment_____
_____
_____
_____

Architect’ Signature & Date:_____

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions or Contractor’s Standard Form if approved by Architect.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    e. Quotation Form: Use CSI Form 13.6D, "Proposal Worksheet Summary," and Form 13.6C, "Proposal Worksheet Detail or Contractor’s Standard Form if approved by Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use CSI Form 13.6A, "Change Order Request (Proposal)," with attachments CSI Form 13.6D, "Proposal Worksheet Summary," and Form 13.6C, "Proposal Worksheet Detail or Contractor’s Standard Form if approved by Architect.."

1.4 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

B. Unit-Price Adjustment: See Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.5 CHANGE ORDER PROCEDURES

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

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714 Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule. Cost-loaded Critical Path Method Schedule may serve to satisfy requirements for the schedule of values.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

    a. Application for Payment forms with continuation sheets.
    b. Submittal schedule.
    c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

    a. Project name and location.
    b. Name of Architect.
    c. Architect's project number.
    d. Contractor's name and address.

2. Arrange schedule of values consistent with format of AIA Document G703
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.

d. Name of manufacturer or fabricator.
e. Name of supplier.
f. Change Orders (numbers) that affect value.
g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

1) Labor.
2) Materials.
3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.

a. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
10. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

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

1.3 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

A. Payment Application Times: Submit Application for Payment to Architect by the 25th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

B. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

C. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

D. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

E. Transmittal: Submit signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Products list (preliminary if not final).
5. Schedule of unit prices.
6. Submittal schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. Copies of building permits.
9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
10. Initial progress report.
11. Report of preconstruction conference.
12. Certificates of insurance and insurance policies.
13. Performance and payment bonds.
14. Data needed to acquire Owner's insurance.

H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Requests for Information (RFIs).
3. Project meetings.

1.2 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1.3 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1.4 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for approval of Contractor's means and methods.
d. Requests for coordination information already indicated in the Contract Documents.
e. Requests for adjustments in the Contract Time or the Contract Sum.
f. Requests for interpretation of Architect's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

1.5 PROJECT MEETINGS

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

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

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

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Suggested Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Lines of communications.
    f. Procedures for processing field decisions and Change Orders.
    g. Procedures for RFIs.
    h. Procedures for testing and inspecting.
    i. Procedures for processing Applications for Payment.
    j. Distribution of the Contract Documents.
    k. Submittal procedures.
    l. Preparation of record documents.
    m. Use of the premises.
    n. Work restrictions.
    o. Working hours.
    p. Owner's occupancy requirements.
    q. Responsibility for temporary facilities and controls.
    r. Procedures for moisture and mold control.
    s. Procedures for disruptions and shutdowns.
    t. Construction waste management and recycling.
    u. Parking availability.
    v. Office, work, and storage areas.
    w. Equipment deliveries and priorities.
    x. First aid.
    y. Security.
    z. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Pre-Installation Meetings
1. Schedule a pre-installation meeting at the job-site prior to starting the work the following.
    a. As a minimum the following Pre-Installation Meetings shall be coordinated in a timely manner by the Contractor.
        1) Pre-Exterior Wall (Stucco, stone, clad doors and windows)
        2) Pre-Roof
        3) Pre-Exterior Paving
2. Require attendance of entities directly affecting, or affected by, the work of the Section.
3. Notify Architect four working days in advance of meeting date.

a. Prepare agenda, preside at meeting, record the minutes and distribute copies within two working days after the meeting.

4. Suggested Agenda: Review the progress of other related construction activities and preparations for the particular activity under construction, including requirements for:
   a. Contract Documents.
   b. Shop Drawings, Product Data and quality control samples.
   c. Possible conflicts.
   d. Compatibility problems.
   e. Time schedules.
   f. Weather limitations.
   g. Manufacturer's recommendations.
   h. Acceptability of substrates.
   i. Temporary facilities.
   j. Space and access limitations.
   k. Governing regulations.
   l. Inspection and testing requirements.
   m. Required performance results.
   n. Recording requirements.
   o. Protection.
   p. Review conditions of installation, preparation and installation procedures, and coordination with the related work.

D. Progress Meetings: Conduct progress meetings at monthly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Suggested Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

      1) Review schedule for next period.

   b. Review present and future needs of each entity present, including the following:

      1) Interface requirements.

2) Sequence of operations.
3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Deliveries.
6) Off-site fabrication.
7) Access.
8) Site utilization.
9) Temporary facilities and controls.
10) Progress cleaning.
11) Quality and work standards.
12) Status of correction of deficient items.
13) Field observations.
14) Status of RFIs.
15) Status of proposal requests.
16) Pending changes.
17) Status of Change Orders.
18) Pending claims and disputes.
19) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

E. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

    a. Preparation of record documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Submittal of written warranties.
    d. Requirements for preparing operations and maintenance data.
    e. Requirements for delivery of material samples, attic stock, and spare parts.
    f. Requirements for demonstration and training.
    g. Preparation of Contractor's punch list.

h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
i. Submittal procedures.
j. Owner's partial occupancy requirements.
k. Installation of Owner's furniture, fixtures, and equipment.
l. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Informational Submittals
   2. Coordination
   3. Construction Schedule
   4. Reports
   5. Special Reports

1.2 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

   1. Working electronic copy of schedule file, where indicated.
   2. PDF electronic file.

B. Startup construction schedule.

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

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

   1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
   2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
   3. Total Float Report: List of all activities sorted in ascending order of total float.
   4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

F. Construction Schedule Updating Reports: Submit with Applications for Payment.

G. Daily Construction Reports: Submit at monthly intervals.

H. Special Reports: Submit at time of unusual event.

1.3 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.

2. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
3. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
5. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    a. Structural completion.
    b. Temporary enclosure and space conditioning.
    c. Permanent space enclosure.
    d. Completion of mechanical installation.
    e. Completion of electrical installation.
    f. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.

    a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.
    g. Installation.
    h. Work by Owner that may affect or be affected by Contractor's activities.
    i. Testing.
    j. Punch list and final completion.
    k. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

    a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.

    a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
    b. Total cost assigned to activities shall equal the total Contract Sum.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.

4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

    a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

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

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.2 ACTION SUBMITTALS

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

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled date of fabrication.
    h. Scheduled dates for purchasing.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.3 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.

C. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner, containing the following information:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name of Contractor.

e. Name of firm or entity that prepared submittal.
f. Names of subcontractor, manufacturer, and supplier.
g. Category and type of submittal.
h. Submittal purpose and description.
i. Specification Section number and title.
j. Specification paragraph number or drawing designation and generic name for each of multiple items.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Related physical samples submitted directly.
n. Indication of full or partial submittal.
o. Transmittal number, numbered consecutively.
p. Submittal and transmittal distribution record.
q. Other necessary identification.
r. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:

a. Project name.
b. Number and title of appropriate Specification Section.
c. Manufacturer name.
d. Product name.

D. Options: Identify options requiring selection by Architect.

E. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

F. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

G. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

H. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as PDF electronic files.

    a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Action Submittals: Submit PDF's of each submittal unless otherwise indicated. Architect will return PDF's.
3. Informational Submittals: Submit PDF's of each submittal unless otherwise indicated. Architect will not return copies.
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:

    a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.
2. Submit Shop Drawings in the following format:

    a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.
    e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

   a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.

      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Construction Progress Documentation Section.

F. Application for Payment and Schedule of Values: Comply with requirements specified in Division 1 Payment Procedures Section.

G. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in 1 Division 1Quality Requirements Section.

H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 1 Closeout Procedures Section.

I. Maintenance Data: Comply with requirements specified in Division 1 Operation and Maintenance Data Section.

J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

K. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

L. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

M. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

Q. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

R. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

S. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

T. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

U. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

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

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Division 1Closeout Procedures Section.

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

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

1.2 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.3 SOURCE LIMITATIONS

A. Obtain each type of product, system and installation method specified, from single sources and single manufacturers.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data : For Contractor's quality-control personnel.

B. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.

C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.5 REPORTS AND DOCUMENTS

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

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

13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

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

1.6 QUALITY ASSURANCE

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

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

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

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

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

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

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

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

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

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

    a. Provide test specimens representative of proposed products and construction.
    b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.

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

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.

    a. Allow seven days for initial review and each re-review of each mockup.

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

K. Integrated Exterior Mockups: Construct integrated exterior mockup as indicated below. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.
1. Size: 8 feet wide by 8 feet high with backup system capable of properly supporting mock up for duration of project.
2. Configuration: Coordinate with Architect for sizes and configurations of component within mock-up.
3. Brick Masonry Veneer (Include running and stack bonds and rowlock and corbelling.
    a. Architect will review for coursing, bond, tooling of joints, range of color and texture of brick and color of mortar.
4. Cast Stone Window Sills
5. Painted Fiber Cement Panels (Include transitions to other materials and transitions within material).
6. Aluminum Metal Plate Wall Panels
7. Window units 2 feet wide by 3 feet tall or similar size determined by manufacturer.

1.7 QUALITY CONTROL

A. Recommend a qualified testing agency to perform quality control services. Furnish the testing agency contact information to the Architect.
1. Payment for these services will be made by the Owner who will contract with, and pay for Testing & Inspection services separately from the construction contract.
2. General Contractor will not be required to pay for the cost of the Testing & Inspection Services.

3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.

6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.8 SPECIAL TESTS AND INSPECTIONS

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities

B. Construction aids

C. Security and protection facilities.

D. Field office and storage trailers

1.2 QUALITY ASSURANCE

A. Regulations: Comply with Federal, state and local codes/regulations.

B. Standards: Comply with applicable NFPA, ANSI, and NECA requirements.

1.3 TEMPORARY ELECTRICITY AND LIGHTING

A. Arrange with utility company, provide service required for power and lighting, and pay all costs for service and for power used.

B. Provide adequate artificial lighting for all areas of work when natural light is not adequate for work, and for areas accessible to the public.

C. Lamps and Light Fixtures: Provide general service type incandescent lamps of wattage required for adequate illumination. Where exposed to breakage by construction operations, protect lamps with guard cages or tempered glass enclosures. Provide exterior type fixtures where exposed to weather or moisture.

D. Electrical Power Cords: Use only grounded extension cords: "hard-service" type where exposed to abrasion and traffic. Use single lengths or tape intermediate connections with waterproof electrical tape, or use waterproof connectors.

1.4 TEMPORARY HEAT AND VENTILATION

A. Provide temporary heat and ventilation as required to maintain adequate environmental conditions to facilitate process of the work, to meet specified minimum conditions for the installation of materials, and to protect materials and finishes from damage due to temperature or humidity.

B. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gasses.

C. Heating Units: Provide temporary heating units which have been tested and labeled by UL, FM, FIA or a recognized trade association related to fuel being consumed (AGA, NEMA, or other).

D. Pay all costs of installation, maintenance, operation and removal, and for fuel consumed.

1.5 TEMPORARY WATER

A. Arrange with utility service company, provide water for construction purposes; pay all costs for installation, maintenance and removal, and service charges for water used.

B. Install branch piping with taps located so that water is available throughout the construction by the use of hoses. Protect piping and fittings against freezing.

1.6 TEMPORARY SANITARY FACILITIES

A. Provide sanitary facilities in compliance with laws and regulations.

B. Service, clean and maintain facilities and enclosures.

1.7 DRINKING WATER FACILITIES

A. Provide containerized tap-dispenser bottled-water type drinking water units, including an adequate supply of paper cups. Use of Owner's drinking fountains is prohibited.

1.8 CONSTRUCTION AIDS

A. Furnish, install and maintain required construction aids, remove on completion of Work.

B. Comply with Federal, State and local codes and regulations.

C. Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

D. Provide construction aids and equipment required by personnel and to facilitate the execution of the Work; scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other such facilities and equipment.

E. Provide and operate drainage and pumping equipment. Maintain excavations and site free of standing water.

F. Maintain all facilities and equipment in a first class condition.

G. Provide temporary weather-tight enclosure of exterior walls for successive areas of the building as work progresses, as necessary to provide acceptable working conditions, provide weather protection for interior materials, allow for effective temporary heating, and to prevent entry of unauthorized persons.

1. Provide temporary exterior doors with self-closing hardware and padlocks.
2. Other enclosures shall be removable as necessary for work and for handling of materials.

1.9 SECURITY AND PROTECTION FACILITIES

A. General: Provide as required to prevent public entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

B. Barricades, Warning Signs and Lights: Comply with standard and code requirements. Provide barricades and temporary lighting at streets and open ditches where construction work may present hazards to vehicles and personnel. Where appropriate provide flashing red or amber lights.

1.10 FIELD OFFICE AND STORAGE TRAILERS

A. Coordinate with Owner to arrange to set up field office within building. If field office within building is not a viable option, provide a prefabricated, mobile unit or job built constructed weathertight field office with working and meeting space, electricity, running water and portable fire extinguishers.

B. Provide janitor service for the office.

C. Provide lighted, weathertight storage trailer, for tools, materials and equipment with adequate space for organized storage and access. Provide heat and ventilation for products requiring controlled conditions.

D. Locate these facilities to preclude interference with work and as directed.

1.11 TEMPORARY FIRE PROTECTION

A. Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations".

B. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one (1) extinguisher on each floor at or near each exit.

C. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, exits and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.

D. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

E. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

1.12 REMOVAL

A. Remove temporary materials, equipment, services and construction prior to Substantial Completion.

B. Clean and repair damage caused by installation or use of temporary facilities. Remove underground installations to a depth of two feet and grade as indicated or directed by the Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials may be new or used, but must be adequate in capacity for the required use. Materials used must not create unsafe conditions, and must not violate the requirements of applicable codes and standards.

PART 3 - EXECUTION – NOT USED

END OF SECTION

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements including:
   1. Action Submittals
   2. Quality Assurance
   3. Product Delivery, Storage, and Handling
   4. Product Warranties
   5. Product Selection Procedures
   6. Comparable Products

1.2 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

   1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
   2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

      a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
      b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.3 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

   1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
   2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.5 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

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

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:

a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements.
b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:

a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements..
b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

2.3 FABRICATION GENERAL NOTES

A. Complete fabrication 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.

PART 3 - EXECUTION (Not Used)

END OF SECTION

EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

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

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

1.2 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

1.3 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

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

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

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

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Proceed with patching after construction operations requiring cutting are complete.

E. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
3. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

F. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.
6. Demonstration and Training

1.2 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.4 MAINTENANCE MATERIAL SUBMITTALS

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

1.5 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
1. The Architect will not review or edit punch list until provided complete from Contractor. The Contractor will reimburse owner for additional time spent by

Architect to conduct additional review of items Contractor states to be complete which are found to be incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
5. Submit test/adjust/balance records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

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

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

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

1.6 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order..
2. Include the following information at the top of each page:

    a. Project name.

b. Date.
c. Name of Architect.
d. Name of Contractor.
e. Page number.

3. Submit list of incomplete items in the following format:
   a. PDF electronic file. Architect will return annotated file.

1.8 SUBMITTAL OF PROJECT WARRANTIES

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

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
   1. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

   1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
q. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

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

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

    a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

3.3 DEMONSTRATION AND TRAINING

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. Include a detailed review of the following:

1. Include instruction for basis of system design and operational requirements, review of documentation, emergency procedures, operations, adjustments, troubleshooting, maintenance, and repairs.

END OF SECTION

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

    a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    b. Enable inserted reviewer comments on draft submittals.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Architect.
7. Name and contact information for Commissioning Authority.
8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
9. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.

9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

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

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

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

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

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

2.4 PRODUCT MAINTENANCE MANUALS

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

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

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

1. Product name and model number.

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

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

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

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

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

C. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

D. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."

E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit copies of record Drawings as follows:

      a. Initial Submittal:
         1) Submit PDF electronic files of scanned record prints and one of file prints.
         2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

      b. Final Submittal:
         1) Submit PDF electronic files of scanned record prints and one set of prints.
         2) Print each drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Accurately record information in an acceptable drawing technique.
    c. Record data as soon as possible after obtaining it.
    d. Record and check the markup before enclosing concealed installations.
    e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations below first floor.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Construction Change Directive.
    k. Changes made following Architect's written orders.
    l. Details not on the original Contract Drawings.
    m. Field records for variable and concealed conditions.
    n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.

3. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file.

2.3 RECORD PRODUCT DATA

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

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

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

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

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION

SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 MATERIALS OWNERSHIP

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

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician if refrigerant recovery is within scope of project.

B. Predemolition Photographs or Video: Submit before Work begins.

C. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

D. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.5 QUALITY ASSURANCE

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

1.6 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

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

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

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

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

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

   1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Review 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.

E. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

F. Survey of Existing Conditions: Record existing conditions by use of measured drawings, preconstruction photographs, and preconstruction videotapes.

1. Comply with requirements specified in Section 013233 "Photographic Documentation."

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."

B. 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. Arrange to shut off indicated utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
e. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
f. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

C. Refrigerant: If mechanical equipment is selectively demolished, remove refrigerant according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

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

B. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

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

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 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

MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Plywood backing panels
   2. Wood Blocking

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. 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.
   2. 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.
   3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.3 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 lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber 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, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded 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. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less, 19 percent for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying 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 (3.2 m) beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. 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.
4. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841

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

D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

E. Application: Treat items indicated on Drawings, and the following:
   1. Wood sills, sleepers, blocking, [**furring,**] [**stripping,**] and similar concealed members in contact with masonry or concrete.
   2. Plywood backing panels.

2.3 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. For items of dimension lumber size, provide Construction or No. 2 of any species.

C. 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.

2.4 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exterior, AC fire-retardant treated 1/2-inch nominal thickness.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Metal Framing: ASTM C 1002 and ASTM C 954 length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. At typical blocking conditions, not in wet environments, provide untreated southern pine.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

D. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

E. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels

F. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

G. Provide blocking as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.

H. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
2. Attach wood blocking to meet ES-1 and FM-I-49 requirements.
3. Install blocking to withstand 200 plf of pressure in all directions.

I. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

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 wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Foam-plastic board insulation at foundation and concrete slab perimeter.
   2. Glass-fiber blanket insulation
   3. Continuous rigid insulation board

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

   1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
   3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Molded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ACH Foam Technologies (Design Basis)
   b. DiversiFoam Products.
   c. Plymouth Foam, Inc.
   d. Approved substitute.

2. Type VIII, 20 psi (138 kPa).

B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

2.2 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation.
2. Johns Manville.
3. Owens Corning.
4. Approved substitute

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.3 CONTINUOUS RIGID WALL INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation.
2. Dupont (Design Basis - STYROFOAM™ Brand Scoreboard Insulation)
3. Owens Corning.
4. Approved substitute

B. Description
1. Extruded polystyrene foam
2. Scored longitudinally on 16” and 24” centers for easy sizing to common widths.

3. R value of 5 per inch thickness
4. Compressive Strength (ASTM D1621): 25 psi, min

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION AT CONCRETE SLAB AND FOUNDATION

A. Install foam board insulation at locations indicated on wall section and section details Drawings following insulation manufacturer installation instructions.

3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For framed construction, install blankets according to ASTM C 1320.

C. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.5 PROTECTION

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

END OF SECTION

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Preformed joint sealants.
5. Acoustical joint sealants.

1.2 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each application indicated below:

    a. Each kind of sealant and joint substrate indicated.

3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

    a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
1. Provide listing of conditions for which architect is to provide color selection.

C. Qualification Data: For qualified Installer and testing agency.

D. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

F. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

1.5 ROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.6 WARRANTY

A. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Building Systems; Omniseal 50.
b. Dow Corning Corporation; 795.
c. Pecora Corporation; 895.
d. Tremco Incorporated; Spectrem 2 S.

2.3 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Building Systems; Sonolac.
b. Pecora Corporation; AC-20+.
c. Tremco Incorporated; Tremflex 834.

2.4 MILDEW RESISTANT JOINT SEALANTS

A. Mildew-Resistant, Single-Component, Nonsag, and Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

2.5 PREFORMED JOINT SEALANTS

A. Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 123 Silicone Seal.
b. Pecora Corporation; Sil-Span.

2.6 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint 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. Products: Subject to compliance with requirements, provide one of the following:
a. Pecora Corporation; AC-20.
b. USG Corporation; SHEETROCK Acoustical Sealant.
c. Approved substitute.

2.7 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type O (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and

approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:

1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

H. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory.

Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces .

1. Joint Locations:

    a. Control and expansion joints in unit masonry.
    b. Joints between different materials listed above.
    c. Perimeter joints between materials listed above and frames of doors windows.
    d. Control and expansion joints in ceilings.

2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 50.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces .

1. Joint Locations:

    a. Control and expansion joints on exposed interior surfaces of exterior walls.
    b. Perimeter joints of exterior openings where indicated.
    c. Tile control and expansion joints.
    d. Vertical joints on exposed surfaces of interior unit masonry walls and partitions.
    e. Perimeter joints between interior wall surfaces and frames of interior doors windows.

2. Joint Sealant: Latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

C. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Sealant Location:

    a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    b. Tile control and expansion joints where indicated.

2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

D. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Location:

    a. Acoustical joints where indicated.
    b. Other joints as indicated.

2. Joint Sealant: Acoustical.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION

HOLLOW METAL DOOR FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard hollow metal door frames.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:
1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
2. Locations of reinforcement and preparations for hardware.
3. Details of each different wall opening condition.
4. Details of anchorages, joints, field splices, and connections.
5. Details of accessories.
6. Details of conduit and preparations for power, signal, and control systems.

1.3 QUALITY ASSURANCE

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

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to finish of factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Do not store in a manner that traps excess humidity.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.6 COORDINATION

A. Coordinate installation of anchorages 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amweld Building Products, LLC.
2. Curries Company; an Assa Abloy Group company.
3. Fleming Door Products Ltd.; an Assa Abloy Group company.
4. Steelcraft; an Ingersoll-Rand company.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Powder-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 hollow metal frames of type indicated.

F. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as face welded unless otherwise indicated.
3. Frames for Level 2 Steel Doors: 0.042-inch- thick steel sheet.

B. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

C. Sizes and Configurations: Match existing.

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 (1.0 mm) thick.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.5 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 thickness of metal. 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. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

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. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
4. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Masonry 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) 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 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

b. 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.

5. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

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

2.6 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; 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. For the record, 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. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch , measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch , measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch , measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch , measured at jambs on a perpendicular line from head to floor.

C. Drill and tap 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 of size and profile indicated. Comply with ANSI/SDI A250.11.

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. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    c. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

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

    a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. 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.
4. 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.

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. 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.

END OF SECTION

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core, fire rated, heavy duty doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of door indicated. 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; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate doors to be factory finished and finish requirements.
3. Indicate fire-protection ratings for fire-rated doors.

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

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."

1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

B. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are 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 10B.

1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not

more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

1.5 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 on bottom rail with opening number used on Shop Drawings.

1.6 PROJECT 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 ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inc section.
b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

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. Graham; an Assa Abloy Group company.
3. Marshfield Door Systems, Inc. (Design Basis)
4. Oshkosh Architectural Door Company.

5. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. WDMA I.S.1-A Performance Grade:

1. Heavy Duty unless otherwise indicated.

B. Fire-Protection-Rated Doors: Provide mineral core as needed to provide fire-protection rating indicated.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
2. Pairs: Provide formed-steel edges and astragals with intumescent seals.

a. Finish steel edges and astragals with baked enamel of color selected by Architect from manufacturer's standard options.

C. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade A faces
2. Species, Cut: Match existing Birch
3. Exposed Vertical Edges: Veneer species to match door faces.
4. Core: Mineral Core.
5. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.
6. Finish: Clear

2.4 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 requirements in NFPA 80 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, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

2.5 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, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory.

C. Transparent Finish:

1. Grade: Custom.
2. Finish: Manufacturers standard clear.
3. Stain Color, Sheen: Match Architects sample.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that 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 Division 8, Door Hardware Section.

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

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

GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Glazed entrances and storefronts.
   2. Interior and exterior glazed openings.

1.2 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. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.3 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of the following products 12 inches (300 mm) square.
   1. Insulating glass.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturers of insulating-glass units with sputter-coated, low-e coatings.

B. Product Certificates: For glass and glazing products, from manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.

B. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

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

D. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F (250 deg C), and the fire-resistance rating in minutes.

E. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.6 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 recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.7 PROJECT 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.

1.8 WARRANTY

A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. 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 6.0 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. 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 (W/sq. m x K).
5. 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.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
   1. For uncoated glass, comply with requirements for Condition A.
   2. For coated vision glass, comply with requirements for Condition C (other coated glass).

C. Polished Wired Glass: ASTM C 1036, Type II, Class 1 (clear), Form 1, Quality-Q6, complying with ANSI Z97.1, Class C.

   1. Mesh: M1 (diamond).

2.3 INSULATING GLASS UNITS

A. Sealed Insulating-Glass Units: Factory-assembled units complying with ASTM E 774 for Class CBA units, with two sheets of separated by a 1/2-inch hermtically sealed, dehydrated space filled with air.
   1. Exterior Lite: Heat-Treated Float Glass, ¼" thick clear.
   2. Interior Lite: Heat-Treated, ¼" thick clear
   3. Low-Emissivity Coating (Second surface): PPG, Solarban 60, Low-E or approved substitute.
   4. Insulating Unit Properties:
      a. Summer Daytime U-Value: .27
      b. Solar Heat Gain Coefficient: 0.38
      c. Visible Light Transmittance: 70 percent
      d. Shading Coefficient: 0.44
      e. Locations: Exterior glazed openings.

B. Substitutions: Subject to compliance with requirements, products by the following manufacturers will be considered for substitutions:
   1. AFG Industries, Inc.
   2. Guardian Industries Corp.

2.4 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

   1. Neoprene complying with ASTM C 864.
   2. EPDM complying with ASTM C 864.
   3. Silicone complying with ASTM C 1115.
   4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

2.5 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 790.
b. Pecora Corporation; 890.
c. Tremco Incorporated; Spectrem 1.
d. Approved substitute.

C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, 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).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

H. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.7 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.

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 will 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. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. 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.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

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 (3-mm) 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.

H. 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.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. 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.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away.

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 and then to jambs. Cover horizontal framing joints by applying tapes to jambs and 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. Apply heel bead of elastomeric sealant.

G. 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.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

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 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. 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; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project 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.

END OF SECTION

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board wall assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

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. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G60, hot-dip galvanized unless otherwise indicated.

B. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.

1. Steel Studs and Runners:

a. Minimum Base-Metal Thickness: As recommended by stud manufacturer for wall heights applicable to project.
b. Web Depth: As required for wall thickness indicated on Drawings.

2. Dimpled Steel Studs and Runners:

a. Minimum Base-Metal Thickness: As recommended by stud manufacturer for wall heights as applicable to project.
b. Web Depth: As required for wall thickness indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.027 inch.

E. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch- wide flanges.

1. Depth: 1-1/2 inches.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches , 0.068-inch- thick, galvanized steel.

F. Zee-Clips: Metal

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

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

3.2 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
   1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 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: 16 inches o.c. unless otherwise indicated.
   2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
   3. Tile Backing Panels: 16 inches o.c. 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 deck.

   1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   2. 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.

      a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

END OF SECTION

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.

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 recommendations, whichever are more stringent.

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

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

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

PART 2 - PRODUCTS

2.1 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.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CertainTeed Corp.
2. Lafarge North America Inc.
3. National Gypsum Company.
4. Temple-Inland.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 1/2 inch (12.7 mm).
2. Long Edges: Tapered.

D. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

E. Impact(Abuse)-Resistant Gypsum Board: ASTM C 1629/C 1629M, **Level 1**.

1. Core: **5/8 inch (15.9 mm), Type X**.

2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

F. Tile Cement Backboard: See Division 9 Tiling Section.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc..
2. Shapes:

a. Outside Corner Trim: USG Sheetrock Brand Paper Faced Metal Outside Corner (Micro Bead).
b. Control Joint: USG Zinc Control Joint No. 093.
c. Steel Casing: USG Sheetrock Brand Paper Faced Metal “L” Shaped Tape on Trim (B4 Series).
d. Sheetrock J-Stop: Sheetrock Brand Paper Faced Metal “J” Shaped Tape on Trim (B9).

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

D. 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.

E. Acoustical Joint 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. Products: Subject to compliance with requirements, provide one of the following:
   a. Pecora Corporation; AC-20 FTR.
   b. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
   c. USG Corporation; SHEETROCK Acoustical Sealant.
   d. Approved substitute.

F. Thermal Insulation: As specified in Division 7 Thermal Insulation Section.

G. Vapor Retarder: As specified in Division 7 Thermal Insulation Section.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

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

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install 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 (1.5 mm) 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. (0.7 sq. m) 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- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) 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. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
1. Type X: Vertical surfaces unless otherwise indicated.
2. Ceiling Type: Ceiling surfaces.
3. Moisture- and Mold-Resistant Type: Walls within bathrooms and Kitchen walls behind sinks and dishwashers.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.

2. On partitions/walls, apply gypsum panels vertically (parallel to framing) 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.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. 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.
3. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.
4. (Impact) Abuse-Resistant Type: As indicated on Drawings.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to 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 unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.
4. U-Bead: Use at exposed panel edges.

3.5 FINISHING GYPSUM BOARD

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

B. Prefill open joints and damaged surface areas.

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

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 3: Not Used
4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated. Add primer/sealer specified in Division 9 paint section.

    a. Primer and its application to surfaces are specified in other Division 09 Sections.

3.6 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

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Acoustical panels and exposed suspension systems for ceilings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

   1. Acoustical Panel: Set of 6-inch-square Samples of each type, color, pattern, and texture.
   2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch-long Samples of each type, finish, and color.

1.3 CLOSEOUT SUBMITTALS

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

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Acoustical Ceiling Panels: Full-size panels equal to 1 box of quantity installed.
   2. Suspension-System Components: Quantity of each exposed component equal to1 box of quantity installed.

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, 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 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

A. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.

2.3 ACOUSTICAL PANELS

A. Acoustical Tile in 15/16” Grid
1. Manufacturer, Size, Pattern, Edge, as indicated on Finish Drawings.
    a. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.
2. Color of Grid and Tile: As indicated on Finish Drawings.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

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

B. 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.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch.

2.5 METAL SUSPENSION SYSTEM

A. Manufacturers: Subject to compliance with the requirements, provide products by one of the following:
1. Armstrong World Industries, Inc., www.armstrong.com
2. CertainTeed Corp., www.certainteed.com
3. USG Interiors, Inc.; Subsidiary of USG Corp. www.usgdesignstudio.com

B. Wide-Face, Capped, Double-Web, Hot-Dip Galvanized, G60 Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; hot-dip galvanized according to ASTM A 653/A 653M, G60 coating designation; with prefinished, cold-rolled, 15/16-inch-wide aluminum caps on flanges.
1. Structural Classification: Intermediate duty system.
2. Cap Material: Steel
3. Face Design: Flat, flush.
4. Face Finish: Painted white.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Subject to compliance with the requirements, provide products by manufacturer of suspension system.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

A. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:

1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for Alloy and Temper 6063-T5.
2. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
3. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.7 ACOUSTICAL SEALANT

A. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

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

3.2 PREPARATION

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

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

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

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, 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 either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. 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 and publications.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
   1. Do not use exposed fasteners, including pop rivets, on moldings and trim.

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

E. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

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

END OF SECTION

RESILIENT BASE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient base.

1.2 SUBMITTALS

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

B. Samples for selection.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

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 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Manufacturers: Subject to compliance with requirements, provide products indicated on Finish Drawings, no substitutes.

B. Description:
1. Resilient Base Standard: ASTM F 1861.
2. Material Requirement: Type TS (rubber, vulcanized thermoset)
3. Style: Cove (base with toe).
4. Minimum Thickness: 0.125 inch.
5. Height: As indicated on Finish Drawings
6. Lengths: Continuous rolls.
7. Colors and Patterns: As indicated on Finish Drawings

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant, low VOC, type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

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

3.2 PREPARATION

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

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

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

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. Corners
1. Miter inside corners.
2. Notch back of base to allow for crisp outside corners.
3. Install corners per manufacturer’s instructions for best installation.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION

RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes luxury vinyl tile.

1.2 ACTION SUBMITTALS

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

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

1. Show details of special patterns.

C. Samples for Verification: Full-size units of each color and pattern of floor tile required.

D. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

1.4 CLOSEOUT SUBMITTALS

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

1.5 MATERIALS MAINTENANCE SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.7 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 (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.8 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during floor tile installation.

D. Install floor tile after other finishing operations, including painting, have been completed.

1.9 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. Vinyl Composition Tile: 15% of the total installed amount for each type of VCT,

PART 2 - PRODUCTS

2.1 LUXURY VINYL TILE

A. Provide products shown on Finish Drawings or approved substitute.

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

C. Floor Polish: Provide protective floor polish products as recommended by flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

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

3.2 PREPARATION

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

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by manufacturer resilient tile flooring manufacturer:

5. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

    a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

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

D. Do not install floor tiles until they are same temperature as space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

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 on Finish Drawings.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).

D. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center beneath door panels.

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, nonstaining marking device.

F. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying manufacturer recommended floor polish.

1. Apply two coats.

E. Cover floor tile until Substantial Completion.

END OF SECTION

VINYL PLANK FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vinyl plank flooring.

B. Product Data: For each type of product indicated.

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

1. Show details of special patterns.

D. Samples for Initial Selection: For each type of flooring indicated.

E. Samples for Verification: Full-size units of each color and pattern of flooring required.

1.2 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of flooring to include in maintenance manuals.

1.3 MATERIALS MAINTENANCE 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. Flooring: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of flooring installed.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for flooring installation indicated.

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups for flooring including resilient base and accessories.

a. Size: Minimum 100 sq. ft.in locations directed by Architect.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store flooring 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 flooring on flat surfaces.

1.6 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive flooring during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during flooring installation.

D. Close spaces to traffic for 48 hours after flooring installation.

E. Install flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 VINYL PLANK FLOORING

A. Subject to compliance with requirements, provide products indicated on Drawings or approved substitutes.

B. Standard: ASTM F 1700.

C. Properties
1. Class: As indicated by product designations.
2. Thickness: (4 mm).
3. Size: As indicated on Finish Drawings.
4. Colors and Patterns: As indicated by on Finish Drawings.

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with installation of flooring.

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

3.2 PREPARATION

A. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

    a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft in 24 hours.
    b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.

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

C. Do not install flooring until they are same temperature as space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOORING INSTALLATION

A. Comply with manufacturer's written instructions for installing flooring.

B. Lay out flooring from center marks established with principal walls, discounting minor offsets, so planks at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half plank at perimeter.

1. Lay planks square with room axis.

C. Match flooring for color and pattern by selecting flooring from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed flooring.

D. Scribe, cut, and fit flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend flooring into toe spaces, door reveals, closets, and similar openings. Extend flooring to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on flooring as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install flooring on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor .

B. Perform the following operations immediately after completing flooring installation:
1. Sweep and vacuum surfaces thoroughly.
2. Damp-mop surfaces to remove marks and soil.

C. Protect flooring products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, and surface blemishes from flooring surfaces before applying liquid floor polish.

1. Apply two coat(s).

E. Cover flooring until Substantial Completion.

END OF SECTION

INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
   1. Metal.
   2. Gypsum board.
   3. Concrete unit masonry
   4. Insulated Pipe
   5. Exposed roof structure and underside of roof deck (Dryfall)

1.2 SUBMITTALS

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

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

   1. Submit Samples on rigid backing, 8 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.

1.3 QUALITY ASSURANCE

A. Mockups: Apply benchmark samples 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. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
      b. Other Items: Architect will designate items or areas required.

   2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
   3. Final approval of color selections will be based on benchmark samples.

      a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

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

1.5 PROJECT 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.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials (surplus stock), as indicated on Finish Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Farrell Calhoun
2. PPG Paints
3. Sherwin-Williams Company (The), www.sherwin-williams.com (Design Basis)

2.2 PAINT, GENERAL

A. 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.

B. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
4. Floor Coatings: VOC not more than 100 g/L.
5. Shellacs, Clear: VOC not more than 730 g/L.
6. Shellacs, Pigmented: VOC not more than 550 g/L.
7. Flat Topcoat Paints: VOC content of not more than 50 g/L.
8. Nonflat Topcoat Paints: VOC content of not more than 150 g/L.
9. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
10. Floor Coatings: VOC not more than 100 g/L.
11. Shellacs, Clear: VOC not more than 730 g/L.
12. Shellacs, Pigmented: VOC not more than 550 g/L.
13. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
14. Dry-Fog Coatings: VOC content of not more than 400 g/L.
15. Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.
16. Pre-Treatment Wash Primers: VOC content of not more than 420 g/L.

C. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
2. Restricted Components: Paints and coatings shall not contain any of the following:

    a. Acrolein.
    b. Acrylonitrile.
    c. Antimony.
    d. Benzene.
    e. Butyl benzyl phthalate.
    f. Cadmium.
    g. Di (2-ethylhexyl) phthalate.
    h. Di-n-butyl phthalate.
    i. Di-n-octyl phthalate.
    j. 1,2-dichlorobenzene.
    k. Diethyl phthalate.
    l. Dimethyl phthalate.
    m. Ethylbenzene.
    n. Formaldehyde.
    o. Hexavalent chromium.
    p. Isophorone.
    q. Lead.
    r. Mercury.
    s. Methyl ethyl ketone.
    t. Methyl isobutyl ketone.
    u. Methylene chloride.

v. Naphthalene.
w. Toluene (methylbenzene).
x. 1,1,1-trichloroethane.
y. Vinyl chloride.

D. Colors: As selected by Architect from manufacturer's full range.

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 work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

E. Verify that no drywall seams are a visible before applying primer/sealer.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that 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.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers 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.

E. Concrete Masonry Substrates: Remove 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.

F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

G. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

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.

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 Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1. Mechanical Work:

a. Uninsulated metal piping.
b. Uninsulated plastic piping.
c. Pipe hangers and supports.

d. Tanks that do not have factory-applied final finishes.
e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:

a. Switchgear.
b. Panelboards.
c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

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

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. Gypsum Board
   1. Satin Latex (Wall and Ceilings)
      a. Gypsum Board Primer: S-W: Builders Solution Interior Primer / Surfacer,
      b. First Coat Paint: S-W ProMar 200 0 VOC Interior Latex Primer Series (4 mils wet, 1.5 mils dry)
      c. Second Coat: S-W ProMar 200 0 VOC Interior Latex Satin
   2. Epoxy
      a. High Build Primers: Builders Solution Interior Primer / Surfacer, A63W100 First Coat: ProMar 200 0 VOC Interior Latex Primer, B28-2600
      b. Second Coat: Pro Industrial Waterbased Catalyzed Epoxy, B73 Series (EgShel, B73-360 Series)
      c. Third Coat: Pro Industrial Waterbased Catalyzed Epoxy, B73 Series, (Eg-Shel, B73-360 Series)

B. Built-in Items: Paint expansion joints, grilles, and fire extinguisher cabinets occurring in gypsum wallboard to match surrounding wall.

C. Concrete Masonry Units
   1. Eg-shell/Satin:
      a. 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal)
      b. 2nd Coat: S-W Low VOC Co-industrial, pre-catalyzed, water-based epoxy, eggshell.S-W ProMar 200XP Eg-shel Coating, B20 Series

D. Exposed roof structure and underside of roof deck (Dryfall)
   1. First Coat: If deck is galvanized or rusty apply primer recommended by paint manufacturer.
   2. Second Coat: S-W Dry Pro Industrial™ Waterborne Acrylic Dryfall

E. Ferrous Metal Structural Steel Columns, Steel Deck, Joists, Trusses, Beams, Railing):
   1. First Coat: S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series (2-4 mils dry.)
   2. Second Coat: S-W ProMar® 200 Latex Semi-Gloss, B31W2200 Series.

F. Nonferrous Metal (Aluminum, Galvanized)
   1. First Coat: S-W Pro Industrial Pro-Cryl Primer, B66-310 Series (2-4 mils dry)
   2. Second Coat: S-W ProGreen™ 200 Interior Latex Semi-Gloss, B31-600 Series

G. Insulated Pipe:
   1. First Coat: ProMar 200 Latex Semi-gloss, B31W200 Series
   2. Second Coat: ProMar 200 Latex Semi-gloss, B31W200 Series

END OF SECTION

SECTION 210100 - FIRE PROTECTION GENERAL PROVISIONS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and services for a complete installation of equipment and systems contained in contract documents.

B. Principal features of work included are:

1. Fire Protection system.
2. Demolition of existing piping.

1.2 RELATED WORK

A. Electrical power and interlock and control wiring and conduit.

B. Field painting of exposed pipe.

1.3 GENERAL

A. The contract documents form a guide for a complete system. Provide all items necessary to provide a complete system but not specifically mentioned, such as hangers, transitions, offsets, and drains.

B. Layouts indicated on drawings are diagrammatical only. Coordinate exact location of equipment, ductwork, and piping to eliminate conflict with other divisions. Designer reserves right to make reasonable changes in location of equipment, and piping prior to construction.

C. Should Contractor find during progress of work that in his judgment existing conditions make desirable a modification, report such item promptly to Designer for instructions. Do not make deviations from contract documents without review of Designer.

D. Supervise all work with a competent mechanic specifically qualified in fire protection work.

E. The installing sprinkler contractor shall be licensed or permitted by the state and local authority having jurisdiction to perform fire protection installations. This shall be in compliance with all applicable state and local laws.

1.4 PERMITS

A. Secure and pay for permits, licenses, and inspections for work under this Division, including water connections.

1.5 CODES

A. Comply with all pertinent local, state, and national codes.

1.6 STANDARDS

A. Comply with all pertinent standards. This list is provided as a convenience to the contractor and is not to be considered all inclusive.

1. NFPA 13: Standard on automatic sprinkler systems.

1.7 SUBMITTALS

A. Submit for review complete brochures and shop drawings for materials and equipment proposed.

1. Brochures: Submit complete descriptions, illustrations and specification data for materials and equipment proposed. Clearly indicate proposed items when other items are shown on same sheet. Submit samples on request and/or set up for inspection. Samples will be returned to Contractor.
2. Shop Drawings: Complete equipment, and piping systems.

1.8 PROJECT MAINTENANCE MANUALS

A. Prior to final acceptance of project, provide Owner with bound maintenance manuals.

1.9 PROJECT TECHNICAL INSTRUCTION

A. Prior to final inspection of project, provide technical instruction to Owner as follows:

1. Field Instruction: Provide explanation of how systems and equipment are to operate.
2. Field Demonstration: Demonstrate operation and routine maintenance for systems and equipment.

1.10 CONSTRUCTION RECORD DOCUMENTS

A. Provide construction record documents. Keep at the project one set of drawings and daily record changes at the time they are made. Give drawings to Owner at project completion.

1.11 EXISTING SERVICES

A. Maintain existing services in operation during construction. Coordinate and schedule all service interruptions with Owner.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Provide materials and equipment of domestic manufacturer bearing the U.L. and F.M. label when such label is available.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate location of fire protection piping with equipment, ductwork, and other piping to eliminate conflict with other divisions.

B. Provide proper chases and openings. Place sleeves and supports prior to pouring concrete or installation of masonry.

3.2 CUTTING AND PATCHING

A. Repair or replace routine damage caused by cutting in performance of contract.

B. Correct unnecessary damage caused due to installation of fire protection work.

C. Perform repairs with materials that match existing in accordance with the appropriate sections of these specifications.

3.3 TRENCHING, EXCAVATION AND BACKFILLING

A. Provide trenching, excavation and backfilling necessary for performance of fire protection work in accordance with the appropriate section of these specifications.

3.4 IDENTIFICATION

A. Identify exposed or accessible piping with stenciling contents indicating pipe contents and direction of flow on piping not more than 20 feet apart, at valves, at access panels, and at least once above each space.

B. Contractors option to identify exposed or accessible piping with snap-on or strap-on type markers. Color code markers in accordance with ANSI. Indicate pipe contents and direction of flow on marker. Install markers on piping not more than 20 feet apart, at valves, at access panels, and at least once above each space.

C. Color code piping exposed in equipment rooms. Paint to be Sherwin Williams Metalatex fire protection red.

D. Identify all mechanical equipment with engraved brass, aluminum, or stainless steel nameplates or tags. Use equipment names and numbers appearing in schedules on drawings. Fasten nameplates to equipment using screws. Glue or adhesive is not acceptable. Fasten tags to equipment using brass, aluminum or stainless steel chains.

E. Identify each valve with engraved brass, aluminum, or stainless steel identification tag indicating valve service and sequential identification number. Attach tag to valve handle with brass, aluminum or stainless steel chain. Provide two bound manuals to Owner listing each valve sequentially and indicating valve manufacturer, style, size, service, normal position, and specific location for each valve.

F. Frame and mount control diagrams and sequences in each equipment room. Use non-fading black and white prints encased in aluminum frame with plexiglass cover.

3.5 CLEANING

A. Repair damaged factory finishes covering all bare places and scratches.

3.6 FOUNDATIONS AND PADS

A. Provide foundations, pads, and bases required for equipment. Concrete to be in accordance with concrete division of specifications.

B. Coordinate proper sizes and locations of foundations, pads, bases, anchors, supports, and other items to be built into structure.

3.7 TESTING

A. Test all installed equipment and systems and demonstrate proper operation. Correct and retest work found defective when tested.

B. Thoroughly check piping system for leaks. Do not add any leak-stop compounds to the system. Make repairs to piping system with new materials. Peening, doping, or caulking of joints or holes is not acceptable.

END OF SECTION

SECTION 211313 - AUTOMATIC SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish materials, accessories, equipment, tools, and transportation and performance of all services and labor required to completely execute the sprinkler and fire protection work for this project, as indicated on the drawings and as herein specified.

1.2 SCOPE OF WORK

A. Shop drawings.

B. Pipe, fittings, interior.

C. Hangers, supports and sleeves.

D. Sprinkler heads, extra sprinkler cabinet.

E. Testing and flushing.

F. Hydraulically calculate sprinkler system, wet and/or dry as required by drawings. Maximum water velocity shall be 25 feet per second for interior piping.

G. Cutting of holes necessary for the installation of work specified under this Section. Coordinate cutting of material with other Divisions. Employ services of other trades for patching of concrete, masonry, and other material. Use same material for patching and finish neatly.

H. Unless otherwise noted on the drawings or these specifications, the entire project shall be fully protected, excluding no spaces.

I. In an area of renovation and existing systems that are converted and/or extended to include the use of quick-response sprinklers, all existing sprinklers in a compartmented space shall be changed to quick response type. A compartmented space is defined as the entire smoke compartment.

1.3 DESIGN REQUIREMENTS

A. Install system(s) in accordance with the drawings, specifications, and requirements of NFPA 13.

B. Furnish material and labor necessary to fully comply with the drawings and specifications and with the rules, regulations, and ordinances.

C. Reduction of the system area of operation as allowed per NFPA 13 is not acceptable on this project.

D. Small room rule as allowed per NFPA 13 is not acceptable on this project.

E. Extended coverage heads are not acceptable on this project.

F. Include in sprinkler system design the following requirements:

1. Light Hazard Occupancies (offices, corridors, lobbies and similar areas) shall be 0.10 GPM/sq. ft. over 1500 sq. ft.
2. Ordinary Hazard Group 1 Occupancies (electrical rooms, mechanical rooms, storage rooms, and similar areas) shall be 0.15 GPM/sq. ft. over 1500 sq. ft.
3. Provide hose streams as required by NFPA 13.
4. Provide a minimum of 18 inches clearance between bottom of sprinkler deflector and top of storage.
5. Provide the results of a Contractor independently performed flow test in accordance to NFPA 291 within 6 months to determine the adequacy of the water supply before construction begins. The Contractor shall use this data obtained to hydraulically design the system. Submit this with sprinkler system drawings and calculations.
6. The hydraulic calculations shall be carried to the city water supply taking into account all fittings, valves, etc. The contractor shall be responsible for hydraulically sizing all new piping not sized on the drawings and shall take into consideration the existing piping to remain.

    a. Design calculations shall have a minimum of 5% difference of system demand including hose stream and the available water supply flow and pressure.

1.4 QUALITY ASSURANCE

A. Materials bearing UL and FM approval, where such approval is applicable or required by the agencies having jurisdiction over fire protection work.

B. The installing sprinkler contractor shall be licensed or permitted by the state and local authority having jurisdiction to perform fire protection installations. This shall be in compliance with all applicable state and local laws.

C. All sprinkler piping from “Point of Service” including underground used for sprinkler or standpipe system shall be installed by a Registered Sprinkler Contractor. Underground mains and hydrants must be installed and in service prior to starting construction.

D. All castings used for coupling housings, fittings and valve bodies shall be date stamped for quality assurance and traceability.

1.5 SUBMITTALS AND SHOP DRAWINGS

A. Prepare complete detailed working drawings for Fire Protection System. Submit drawings to Designer for approval. After receiving this approval, submit shop drawings to State Fire Marshal for his review and approval prior to starting installation. Prior approval by above listed authorities is required before sprinkler installation is begun.

B. The Sprinkler Contractor shop drawings and calculations shall be stamped and signed by a firm employee who has a minimum NICET III level certification and signed by a Responsible Managing Employee. Shop drawings and calculations shall be submitted by a licensed and registered fire protection contractor.

C. Equipment submittal drawings and data are required on all items named by manufacturer, including the following:

1. Sprinkler Heads - Type and Manufacturer. The mixing of sprinkler manufacturer shall not be permitted.
2. Valves - Type and Manufacturer, interior and exterior. Sprinkler devices (alarm check valves, dry pipe valves, etc. shall be listed and approved as component packages and no intermixing of valve manufacturers shall be allowed.
3. Water Flow, Pressure and Tamper Switches - Type and Manufacturer.
4. Piping and fittings.

D. The sprinkler system shall be hydraulically designed by industry standard computer software. The Contractor shall submit computer calculations and copy of original water flow test report with working plans. Include in calculations allowance for outside hose streams and domestic water as required.

E. Contractor will supply as-built drawings to the Owner, the Owner’s Insurer, the Architect, the Engineer and other entities as required by the Owner or the Authority Having Jurisdiction.

1.6 SPRINKLER SYSTEM COORDINATION

A. The contractor will be responsible for ensuring that the reflected ceiling plan shown on the working drawings is the latest revision from the Architect before commencing work.

B. The contractor shall be responsible for providing to the Architect notification for any drawing changes resulting from movement of sprinkler piping or heads during installation.

C. Failure to coordinate sprinkler system and building systems (including, but not limited to: ductwork, mechanical piping, and lighting fixtures) prior to fabrication or installation of sprinkler systems shall be corrected, modified, or changed as necessary at the expense of the contractor.

D. The contractor is to completely investigate, PRIOR TO BID, all requirements of local water utility and fire department. Devices such as ADT and/or local alarm systems, double check valve assemblies, detector checks, tamper switches shall be provided complete, wired, connected, and installed in accordance with local authorities by this Contractor. In the event the authorities have no installation details, the Contractor shall submit for approval proposed installation.

1.7 APPLICABLE CODES

A. NFPA 13

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Interior Pipe and Fittings

1. Piping for wet pipe systems shall be Schedule 40 black steel pipe 2” and smaller conforming to ASTM A135 or ASTM A53 and Schedule 10 black steel pipe 2-1/2” and larger conforming to ASTM A135.
2. Fittings for wet pipe systems

    a. Fittings shall be threaded or grooved for 2 inch and smaller and flanged or grooved for pipe 2-1/2 inch and larger.
    b. Ductile iron threaded fittings, ANSI B16.3 Class 300.
    c. Cast iron threaded fittings, ANSI B16.4 Class 125 and 300 (extra heavy).
    d. Cast iron flanged fittings, ANSI B16.1 Class 125 and 300.
    e. Grooved couplings and fittings, as manufactured by Tyco, Anvil, Victaulic or equivalent. All groove couplings and fittings shall be furnished by a single manufacturer. Associated piping shall be roll-grooved.
    f. Weldolet pipe outlets for branch connections shall be of approved manufacturer.

3. Flexible sprinkler drops shall be UL Listed and FM approved. The maximum length shall not exceed 4’-0” and the minimum bend radius shall not exceed the more stringent of the UL and FM guidelines. Flexible drops shall be installed per manufacturers printed instructions with mounting brackets supplied by the same manufacture. Hydraulic calculations shall allow for length of flexible drop used. Submit all product data including manufacturers mounting instructions with shop drawings submitted.
4. Mechanical tees are not allowed on this project. Where connection to existing sprinkler system, mechanical tees are acceptable for branch line and sprinkler main extension but should not include the addition of individual sprinklers where the pipe size is below 1-1/4 inch in size. Holes shall be cut in a manner which provides for disc retrieval. Disc shall be attached next to mechanical tee.

B. Hangers, Supports, and Sleeves

1. Support piping with UL and FM approved hangers. Acceptable manufacturers: Anvil, B-Line, Fee & Mason.
2. Adjustable Clevis: Anvil Fig. 260.
3. Adjustable Swivel: Anvil Fig. 69. Beam Clamp with Anvil Fig. 92 or Anvil Fig. 218 with retaining strap. If Fig. 218 is used provided Fig. 157 rod attachment. Concrete Fasteners: Anvil steel shell and expander plug.
4. Concrete Insert: Anvil Fig. 152.
5. Riser Clamp: Anvil Fig. 261.
6. Powder-driven inserts shall not be accepted.
7. All pipes passing through rated floors or walls shall be sleeved and/or firestopped to an equivalent rating of the floor or wall assembly. Firestop materials shall meet ASTM E814 requirements.
8. All piping hangers shall be listed for use with sprinkler systems. All hangers, bracing, etc., shall be designed to constrain the sprinkler discharge resulting from a system pressure of 175 psig at the base of the riser.

2.2 SPRINKLER HEADS, EXTRA SPRINKLER CABINET

A. Provide the following sprinkler heads of proper types, ratings, and spacings for areas involved. Provide appropriate finishes compatible with space finishes being served. Acceptable manufacturers: Tyco, Viking, Victaulic and Reliable.

1. Quick Response Type

a. Pendent and upright brass or chrome: Tyco TY-FRB (UL and F.M. approved). K-Factor = 5.6
b. Recessed, chrome: Tyco TY-FRB (UL and F.M. approved). K-Factor = 5.6.
c. Fully concealed: Tyco-RF II, white or custom color as selected by Architect coverplate. Coordinate with Architect for quantity of custom colors required and location of custom color coverplates (UL approved). K-Factor = 5.6

B. Pendent heads in ceilings shall have one-piece, non-adjustable escutcheons. Two-piece or slip type escutcheons shall not be accepted. This does not apply to recessed heads. Escutcheon shall be approved for use and supplied by the sprinkler manufacturer.

C. Sprinkler body shall be integrally cast with a hex-shaped wrench boss to reduce the risk of damage during installation. Wrenches shall be provided by the sprinkler manufacturer which directly engages the wrench boss.

D. Provide sprinkler cabinet equal to Tyco with spare sprinkler wrench.

E. Drainage

1. System branch lines shall be pitched at least ½ inch per 10 feet.
2. Mains shall be pitched at least ¼ inch per 10 feet.

3. Auxiliary Drains:

   a. Located in areas subject to freezing shall be readily accessible.
   b. If capacity of trapped section is less than 5 gallon drain shall consist of valve not less than ½ inch and drain plug.
   c. If capacity of trapped section more than 5 gallon drain shall consist of two 1 inch valves and one 2 inch by 12 inch condensate nipple and shall be accessibly located.

4. Test connection shall be located on end of most distant sprinkler pipe and equipped with readily accessible shut off valve and plug not less than 1 inch, at least one of which shall be brass.
5. Gridded systems are not acceptable.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate installation with other Divisions to ensure there are no conflicts. Fire protection piping shall not take priority in routing over HVAC ductwork.

B. Attach hangers to structural steel work as specified above, except that structural work shall not be drilled and punched. Wherever necessary, furnish, install, and securely anchor to or between building members suitable angle iron or other steel members to support sprinkler work.

C. Provide support for grooved piping in conformance with requirements of MSS-SP-69, "Pipe Hangers and Supports - Selection and Application". In addition to these requirements, leave no horizontal pipe unsupported between any two couplings nor shall any pipe be left unsupported whenever a change in direction of flow takes place. Provide supports meeting the requirements stated above, but ensure that the distance between supports does not exceed the following:

PIPE SIZE	MAXIMUM SPAN BETWEEN HANGERS
1 Inch	8 Feet
1-1/4 through 2 Inch	10 Feet
2-1/2 through 4 Inch	12 Feet
5 through 8 Inch	14 Feet
10 through 12 Inch	15 Feet

D. Support vertical piping at every other floor or every other pipe length, whichever is most frequent. Set the base of the riser or base fitting on a pedestal or foundation.

E. Piping Above Grade:

1. In areas with no ceilings, run piping as high as possible. Minimum head room shall be 10'-0".
2. Grooved joint shall be installed in accordance with the manufacture's written recommendations. Grooved ends shall be clean and free from indentations, projections or roll marks. The gasket shall be molded and produced by the coupling manufacturer of an elastomer suitable for the intended service. The coupling manufacturer's factory trained representative shall provide on-site training for the Contractor's field personnel in the use of grooving tools and installation of product. The representative shall periodically visit the job site to ensure the best practices in grooved product installation are being followed. (A distributor's representative is not considered qualified to conduct the training.)

F. All sprinkler piping shall be hydrostatically tested at 200 psi and shall maintain that pressure with no loss for 2 hours or as required by NFPA 13 for normal pressure in excess of 150 psi.

G. Provide drain valves, pipes and test connections as required by NFPA 13. Pipe drain lines and test connections to outside building as shown on the drawings and details. Test lines must originate from the most hydraulically remote point of each sprinkler zone. All drain piping and fittings shall be galvanized coated, no exception.

H. Cross mains and feed mains shall not pass through electrical rooms or similar spaces. Only the branch line serving such spaces shall be permitted within the boundaries of these rooms.

I. Drain plugs shall be installed on trapped sections of piping between 5 and 50 gallons. Auxiliary drain valves, 1 inch or larger, shall be installed on trapped sections of pipe greater than 50 gallons, and piped to an accessible location.

3.2 SPRINKLERS

A. Install sprinkler heads and required piping in areas such as concealed spaces, and spaces as required by NFPA 13, NFPA 101, applicable state and local codes.

B. Install sprinkler heads centerline of corridors and locate in the center of the ceiling tiles. Install sprinkler heads in other designated spaces in the center of the ceiling tiles and symmetrically locate with other heads within the ceiling. (Refer to Architectural reflected ceiling plans.) Do not install sprinkler heads in other locations any closer than six (6) inches to any ceiling grid or wall.

C. Pendant sprinklers below ceiling shall be in alignment and parallel to ceiling features, walls, etc.

D. When the light fixtures extend below the ceiling, the sprinklers shall be spaced so that the sprinkler spray pattern is not obstructed. Refer to electrical plans for light fixture layout and types.

E. Provide guards on sprinkler heads where within 7’-6” of finished floor or wherever sprinklers may be subject to mechanical injury.

F. Do not install sprinklers which have been dropped, damaged or show a visible loss of fluid. Never install sprinklers with cracked bulb.

G. Furnish one sprinkler cabinet complete with 24 sprinklers of assorted temperature ratings of the type necessary and in use throughout the installation, including one sprinkler wrench. Locate and mount adjacent to riser.

3.3 GUARANTEE

A. The fire protection installation, as specified under this section of the specifications, shall be guaranteed for one year against defective equipment, materials, and workmanship.

B. Guarantee shall not be construed as requiring the sprinkler contractor to render service or maintenance required in the normal operation of the equipment or to make repairs that may be needed due to normal wear and tear or the Owner’s negligence, abuse, or breakage.

3.4 INSPECTION SERVICE

A. After completion of the fire protection installation and at the start of the guarantee year, the Contractor shall execute the National Fire Sprinkler Association., Standard form of “Inspection Agreement,” without charge to the Owner, calling for four inspections of the sprinkler system during the guarantee year. These inspections will, at a minimum, comply with the provisions and requirements of NFPA 25. During the guarantee year, the inspections shall be made as per the inspection agreement, plus the following maintenance to be performed during the course of the fourth inspection.

B. Operation of all control valves.

C. Lubrication of operating stems of all interior control valves.

D. Operation of water motor gong and/or electric alarms.

E. Cleaning of alarm valves.

F. Cleaning of dry pipe valves.

G. Lubrication of Fire Department Connection inlets.

H. The Standard Form of the National Fire Sprinkler Association., “Report of Inspection” shall be filled out in triplicate after each inspection and the copies sent to the Owner, Insurance Carriers, Fire Department, or other authorities that the Owner may designate.

END OF SECTION

SECTION 220100 - PLUMBING GENERAL PROVISIONS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and services for a complete installation of equipment and systems contained in contract documents.

B. Principal features of work included are:

1. Plumbing system.
2. Demolition of existing equipment, and piping.

C. Electrical power and interlock and control wiring and conduit.

1.2 GENERAL

A. The contract documents form a guide for a complete system. Provide all items necessary to provide a complete system but not specifically mentioned, such as hangers, transitions, offsets, and drains.

B. Layouts indicated on drawings are diagrammatical only. Coordinate exact location of equipment, ductwork, and piping to eliminate conflict with other divisions. Designer reserves right to make reasonable changes in location of equipment, ductwork, and piping prior to construction.

C. Should Contractor find during progress of work that in his judgment existing conditions make desirable a modification, report such item promptly to Designer for instructions. Do not make deviations from contract documents without review of Designer.

D. Supervise all work with a competent mechanic specifically qualified in mechanical discipline.

E. All products used for dispensing potable drinking water must be lead free and meet the requirements of NSF 61 and NSF 372 test standards via third party testing and certification.

1.3 PERMITS

A. Secure and pay for permits, licenses, and inspections for work under this Division, including water and sewage connections.

1.4 CODES

A. Comply with all pertinent local, state, and national codes.

1.5 STANDARDS

A. Comply with all pertinent standards. This list is provided as a convenience to Contractor and is not to be considered all inclusive.

1. American Gas Association (AGA).
2. CISPI Standard 301.
3. ASTM A 74.

1.6 SUBMITTALS

A. Submit for review complete brochures and shop drawings for materials and equipment proposed.

1. Brochures: Submit complete descriptions, illustrations and specification data for materials and equipment proposed. Clearly indicate proposed items when other items are shown on same sheet. Submit samples on request and/or set up for inspection. Samples will be returned to Contractor.
2. Submittals shall be submitted in line by line format. Each submittal shall be provided with a cover letter and supporting documentation indicating how the submittal meets each line of the referenced specification section. All discrepancies between the construction documents and the submitted product shall be clearly identified for engineer evaluation.
3. If a product other than the basis of design is rejected by the engineer for any reason, the Contractor shall provide the basis of design product at no additional cost to the Owner.

a. Firestop systems.

1.7 PROJECT MAINTENANCE MANUALS

A. Prior to final acceptance of project, provide Owner with bound maintenance manuals.

1.8 PROJECT TECHNICAL INSTRUCTION

A. Prior to final inspection of project, provide technical instruction to Owner as follows:

1. Field Instruction: Provide explanation of how systems and equipment are to operate during each season and during emergencies.
2. Field Demonstration: Demonstrate operation and routine maintenance for systems and equipment.
3. Videotape: Provide videotape or DVD of field instruction and demonstration to Owner at completion.

1.9 CONSTRUCTION RECORD DOCUMENTS

A. Provide construction record documents. Keep at the project one set of drawings and daily record changes at the time they are made. Give drawings to Owner at project completion.

1.10 EXISTING SERVICES

A. Maintain existing services in operation during construction. Coordinate and schedule all service interruptions with Owner.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Provide materials and equipment of domestic manufacturer bearing the U.L. label when such label is available.

B. Cast Iron Soil Pipe and Fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute ® and listed by NSF® International.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate locations of equipment and piping to eliminate conflict with other divisions.

B. Carefully examine contract documents to be thoroughly familiar with items which require plumbing or mechanical connections and coordination.

C. Provide proper chases and openings. Place sleeves and supports prior to pouring concrete or installation of masonry.

3.2 CUTTING AND PATCHING

A. Repair or replace routine damage caused by cutting in performance of contract.

B. Correct unnecessary damage caused due to installation of plumbing work.

C. Perform repairs with materials that match existing in accordance with the appropriate section of these specifications.

3.3 IDENTIFICATION

A. Identify exposed or accessible piping with stenciling contents indicating pipe contents and direction of flow on piping not more than 20 feet apart, at valves, at access panels, and at least once above each space.

B. Contractor’s option to identify exposed or accessible piping with snap-on or strap-on type markers. Color code markers in accordance with ANSI. Indicate pipe contents and direction of flow on marker. Install markers on piping not more than 20 feet apart, at valves, at access panels, and at least once above each space.

C. Sanitary waste, storm and buried lines need not be marked.

D. Identify each valve with engraved brass, aluminum, or stainless steel identification tag indicating valve service and sequential identification number. Attach tag to valve handle with brass, aluminum or stainless steel chain. Provide two bound manuals to Owner listing each valve sequentially and indicating valve manufacturer, style, size, service, normal position, and specific location for each valve.

3.4 CLEANING

A. Repair damaged factory finishes covering all bare places and scratches.

B. Cleaning Domestic Water System: Flush domestic water system progressively by opening building outlets and permitting flow to continue from each until water runs clear. Sterilize system in accordance with requirements of State Department of Public Health by the following method or other method acceptable to local authorities:

1. Introduce chlorine or a solution of calcium or sodium hypochlorite, filling lines slowly and applying sterilizing agent at a rate of 50 ppm of chlorine as determined by residual chlorine tests at ends of lines. Open and close all valves while the system is being chlorinated.
2. After sterilizing agent has been applied and left standing for 24 hours, test for residual chlorine at ends of lines. If less than 25 ppm is indicated, repeat sterilizing process.
3. After standing for 24 hours and tests show at least 25 ppm of residual chlorine, flush out system until all traces of chemical used are removed.

3.5 TESTING

A. Test all installed equipment and systems and demonstrate proper operation. Correct and retest work found defective when tested.

B. Thoroughly check piping system for leaks. Do not add any leak-stop compounds to the system. Make repairs to piping system with new materials. Peening, doping, or caulking of joints or holes is not acceptable.

C. Test hot and cold domestic water piping systems upon completion of rough-in and before connection to fixtures at a water pressure of 125 psig for two hours without leaks.

D. Test drainage and venting system with necessary openings plugged to permit system to be filled with water and subjected to a minimum water pressure of 10 feet head at top of system. System to hold water for two hours without a water level drop greater than 4" in a 4" standpipe and without visible leakage. Test system in sections if minimum head can be maintained in each section.

END OF SECTION

SECTION 220719 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Contractor shall provide all necessary labor, materials, tools, and equipment to perform work required on the drawings and specified herein.

B. Certain equipment and/or systems to be factory insulated by manufacturer. Factory insulation materials to be as specified in applicable sections of the specifications.

C. All pipe fittings, valves in insulated pipe systems to be insulated.

D. Thermal resistance "R" values used herein are expressed in units of "Hour, Degrees F., Sq. Ft./BTU per Inch of Thickness" on a flat surface at a mean temperature of 75 degrees F.

1.2 DEFINITIONS

A. "Exposed" equipment, and piping are areas which will be visible without removing ceilings or opening access panels.

B. Outdoors is considered exposed to the weather.

C. Underground is buried, whereas in a trench below grade is considered concealed.

1.3 CERTIFICATION/QUALITY ASSURANCE

A. Products shall meet applicable national, state, and local building codes and be U.L. (or other recognized testing lab) listed for intended service.

B. All insulations, jackets, adhesives, coatings, sealers, and tapes shall have a flame spread rating of 25 or less and smoke development rating of 50 or less when tested in accordance with ASTM E-84, NFPA 225, U.L. 723, and further must meet the requirements of NFPA 90-A and applicable building, and plumbing, codes.

C. All insulation materials shall be delivered and stored in manufacturers’ containers and kept free from dirt, water, chemical, and mechanical damage.

D. Insulation shall be applied in a workmanlike manner by experienced, qualified tradesmen.

E. Insulation shall not be applied until all pressure testing has been completed, inspected, and released for insulation application.

F. Surfaces shall be clean and dry.

G. Insulation joints shall be butted firmly together and all jackets and tapes shall be smoothly and securely installed.

H. Insulation for duct, pipe, and equipment for above grade exposed to weather outside building shall be certified as being self-extinguishing for 1" thickness in less than 53 seconds when tested in accordance with ASTM D-1692.

1.4 APPLICABLE CODES AND STANDARDS

A. ASTM E-84.

B. U.L. 723.

PART 2 - PRODUCTS

2.1 MATERIALS FOR PIPE AND EQUIPMENT

A. Materials for Pipe and Equipment: Provide factory pre-molded or shop or site mitered segment type insulation for pipe, pipe fittings, and valves. Fitting insulation to be of same thickness and material as adjoining pipe insulation. All insulation and related materials such as tape and mastic to meet applicable building code requirements for fire and smoke development.

1. Fiberglass: Provide factory-formed, factory-jacketed fiberglass piping insulation. Product to be Manville "Micro-Lok 650" with "Type AP-T" jacketing or equivalent product manufactured by CertainTeed, Knauf, or Owens-Corning. Product to have continuous operational temperature limit of 850 degrees F and a minimum "R" value of 3.6 per inch (K=0.28) at 100 degrees F mean temperature. Jacket to be fiberglass reinforced kraft paper with aluminum foil and pressure sensitive closure system. Vapor-barrier mastic for application to below ambient pipe insulation shall be fungus resistant per ASTM D 5590 with 0 growth rating; Water based; Permeance per ASTM E 96, Procedure B, 0.013 perm or less at 43-mil dry film thickness suitable for indoor and jacketed outdoor use. Products: Foster 30-80 AF. Color: White. A breather mastic for application to above ambient pipe insulation (fittings, tees, valves, etc.) shall be water based Foster 46-50 mastic or Childers CP-10 / CP-11. Use fiberglass piping insulation for the following services:

a. Domestic hot water supply without recirculating system: 1-1/4" and under - 1" thick; 1-1/2" and greater – 1-1/2" thick.
b. Domestic hot water supply and recirculating return piping: 1-1/4 and under – 1” thick, 1-1/2” and greater 1-1/2 thick.
c. Domestic cold water piping: 1/2" thick.

2.2 MATERIALS FOR FITTINGS, VALVES, AND SPECIAL COVERINGS

A. Provide coverings and finishes for specific items hereinafter specified.

1. Use pre-molded insulation fabricated by the manufacturer of insulation material or shop or site mitered segment type insulation for all pipe fittings, elbows, tees, valves, and couplings.
2. PVC fitting covers over blanket fiberglass are NOT acceptable.
3. Contractor's option to provide factory pre-molded one-piece PVC insulated fitting covers, precut fiberglass insulation inserts, and necessary installation materials for all pipe fittings. Materials to be equal to Manville Zeston white, U.V. resistant, 25/50 rated, 20 mil thickness insulated PVC fitting covers and insulation inserts.

B. For flexible tubular pipe and fitting insulation when exposed-to-view inside building finish with two coats of paint, custom color blended to match surrounding surfaces.

C. When specifically approved by designer, when it is impossible to completely insulate pipe, fittings, or valves with specified insulation, Armstrong Armaflex insulation tape may be used to prevent condensate drip on small piping. Use of cork insulation tape is prohibited.

PART 3 - EXECUTION

3.1 GENERAL

A. No insulation shall be cut where a hanger is located. If hangers have been installed by pipefitter tradesmen which violates this strict requirement, notify Designer immediately.

B. Piping systems shall be tested and found free of all leaks prior to installation of insulation covering.

C. All surfaces shall be clean and dry when covering is applied. Covering to be dry when installed and during application of any finish, unless such finish specifically requires a wetted surface for application.

D. All adhesives, cements, and mastics shall be compatible with materials applied and shall not attack materials in either wet or dry state.

E. Install insulation using professional insulators who have adequate experience and ability.

F. Exposed-to-view insulation shall have a well tailored appearance.

G. Treat insulated pipe in equipment rooms and where exposed to normal view, so surfaces may be painted with water base latex paint. Use of mastics, adhesives, or jacketing which cause "bleeding" is prohibited.

3.2 INSTALLATION OF PIPE AND EQUIPMENT COVERING

A. Where fiberglass or flexible tubular insulation is used on piping sized 2" and larger, insert a section of foamglass insulation at hanger or support points between pipe and metal shield for full length of shield to prevent crushing of insulation. Insulation thickness to be same as adjoining insulation. Where insulation passes through pipe hangers and across trapeze supports, 12" long metal saddles shall be used. On cold pipe, vapor barrier should be carried through the hanger and sealed.

B. Apply insulated fitting covers and precut insulation inserts as follows:

1. Installation for hot systems:

a. Place the precut fiberglass insert around the fitting, positioning the points of the insert on the inside radius of the elbow.
b. Butt the ends of the fiberglass insert against the ends of the pipe covering. Tuck and fold the insulation so that it covers all bare surfaces. Keep the fiberglass fluffed up to the thickness of the adjacent pipe insulation to assure maximum thermal efficiency.
c. Insert two stainless steel serrated tacks approximately 1/4" from one of the lap edges of the fitting cover. Then snap the cover in place over the fiberglass insulation.
d. After the fitting cover is in position, push the tacks into the overlapping throat seam. Apply color-matched, pressure-sensitive tape to the butt joints.

2. Installation for cold systems:

a. Position, tuck, and fold the fiberglass insulation insert as described above in steps (a) and (b) for hot systems.
b. Apply a vapor barrier mastic around the edges of the adjoining pipe insulation. Apply the mastic along the inside of the fitting cover throat overlap seam.
c. Place the fitting cover over the insulation, lapping the mastic-covered edge over the other side of the throat seam.
d. Apply color-matched, pressure-sensitive tape over the circumferential joints. The tape should extend over the adjacent pipe insulation and overlap itself by at least 2" on the downward side of the lap.

END OF SECTION

SECTION 221116 - DOMESTIC WATER PIPING AND VALVES

PART 1 - GENERAL

1.1 SYSTEM REQUIREMENTS

A. Submit pipe, valves, and fittings and have approved before starting installation. Pipe, valves, and fittings to be new, manufactured domestically, and marked clearly with manufacturers' name, weight, and classification or working pressure.

B. Piping to run approximately as shown on drawings or as structural and architectural conditions permit.

C. All products used for dispensing potable drinking water must be lead free and meet the requirements of NSF 61 and NSF 372 test standards via third party testing and certification.

PART 2 - PRODUCTS

A. Unions to be Class 150 malleable iron with bronze-to-iron ground joint conforming to ANSI B16.39, ANSI B1.20.1, and ASTM A-197.

B. Bolting materials to be semi-finished carbon steel bolts and hex nuts conforming to ASTM A-307. Threads and dimensions to be in accordance with ANSI B1.1 and B18.2.

C. Thread lubricant to be Crane "Formular 425" or equal. Approved Teflon tape may be used at Contractor's option.

D. Gaskets to be 1/8" thick "Sepco" or equal.

2.2 COPPER PIPES

A. Type "L" hard-drawn seamless copper tubing, ASTM B-88: Domestic hot and cold water 4" O.D. and smaller.

B. Type "K" hard-drawn seamless copper tubing:

1. Domestic water lines located under slab.

C. Copper Pipe Fittings:

1. Provide sweat fittings, ASTM B-62, dimensions conforming to ANSI B16.22, wrought copper, with sweep patterns for copper tubing.

2. Dielectric connection: Provide Epco Sales, lead free dielectric couplers at junction of steel pipe and equipment with copper piping systems. Use of steel or cast iron fittings in copper piping systems prohibited. T-drill branch tee connections shall not be allowed for domestic water piping.

D. Unions to be brass ground joint, 250-pound working pressure.

E. Nipples used in conjunction with copper pipe to be brass.

2.3 VALVES

A. Valves are specified by Manufacturer and Model Numbers to establish quality levels unless otherwise noted. Crane, Milwaukee, Hammond, Nibco, Stockham, Centerline, Apollo, Kitz, or Watts are considered equal manufacturers. Provide clamp lock hand lever operators on valves less than 8 inches. Provide hand wheel and closed housing worm gear on valves 8 inches and larger unless indicated otherwise below. Provide chain operators for all equipment room and powerhouse valves 4 inch and larger which are located over 6 feet 6 inches above the finish floor. All valves shall meet NSF-61 requirements.

1. Gate Valves:

   a. Gate valves for 2-1/2" and larger steel piping systems to be Class 125, cast iron body, bronze mounted, flanged ends, Nibco F-607-RW. Valves to have solid wedge disc, outside stem and yoke with rising stem, and bolted bonnet. Provide dielectric bolt protectors at all flanges when connecting dissimilar metals.
   b. Gate valves for copper piping 2” and smaller systems to be Class 125, bronze body, solder ends, Nibco S-113 LF. Valve to have either solid or split wedge disc, inside screw, non-rising stem, and screwed bonnet.

2. Globe Valves:

   a. Globe valves 2-1/2" and larger to be Class 150, cast iron body, bronze mounted, flanged ends, Watts M6115-74 lead free. Valves to have renewable seat and disc, outside stem and yoke with rising stem, and bolted bonnet.
   b. Globe valves 2" and smaller to be Class 150, bronze body, screwed ends, Apollo 121T-LF. Valve to be plug type with renewable seat and disc, rising stem, and union bonnet.

3. Ball Valves:

   a. Ball valves for copper water piping systems 2" O.D. and smaller to be equal to Apollo "3" S-585-66LF, solder ends, and for 2-5/8" thru 3-1/8" O.D. to be equal to Nibco T T-585-66LF, threaded ends. Valves to have bronze body, chromium plated bronze ball, PTFE seats, stuffing box ring and seals, and

quarter turn on-off. Valves to be rated for 400-psi WOG at 200 degrees F. Install threaded end valves with lead free brass adapters.

b. Ball valves for copper water piping systems to be T-585-66LF threaded ends with bronze body chromium plated bronze ball, PTFE seats, stuffing box ring, and seals, and quarter turn on-off. Valves to be rated for 400-psi WOG at 200 degrees F. Install threaded end valves with lead free brass adapters.

4. lever lock handle suitable for on-off and manual throttling service. All operators to have valve position indicator and memory stop.
5. Check Valves:

   a. Check valves for copper water piping systems to be swing type, Class 125, bronze body, screwed ends, Nibco T-413-Y-LF.

6. Flow balancing valves for domestic hot water service shall be Bell & Gossett lead free Circuit Setter Plus or approved equal. Valve shall provide flow balancing, flow measuring, and positive shutoff service. Provide valve with memory stop, capped differential pressure readout ports with internal check valves and preformed insulation. Valve construction to be bronze body and brass ball rated for 200 psig at 250 degrees F.

2.4 HANGERS

A. Non-insulated copper tubing 1/2" O.D. thru 4" O.D. with no longitudinal movement to be Grinnell Figure CT-99C, MSS SP-69 TYPE 9, plastic coated adjustable tubing ring hanger.

B. Insulated copper piping 1/2" O.D. thru 2-1/8" O.D. with longitudinal movement to be Grinnell Figure 171, MSS SP-69 TYPE 41, pipe roll complete with Figure 167, MSS SP-69 TYPE 40, galvanized steel insulation protection shield sized for maximum 10' span on 4 psi compressive strength insulation.

C. Support copper pipe risers by Grinnell Figure CT-121C, MSS SP-69 TYPE 8, plastic coated riser clamps at floor penetrations.

D. Support three or more parallel lines by trapeze hangers utilizing Unistrut channel or equal in bottom mounting arrangement with rod hanging support.

E. Adequately size hangers on insulated piping for insulation to pass continuously through hangers. Insulated piping to be supported outside insulation covering.

F. Provide concrete inserts, Grinnell Figure 282, MSS SP-69 TYPE 18, universal concrete insert, for attaching hangers to building structure. Inserts to be adequately sized and correctly positioned to support piping, valves, etc., when full of water and system is in operation.

G. Provide C-clamps with locknut, Grinnell Figure 86, MSS SP-69 TYPE 23, where piping is to be hung from steel beams. Welding hanger rods to steel members is not permitted. Provide malleable beam clamps, Grinnell Figure 218, MSS SP-69 TYPE 30, with extension piece, Grinnell Figure 157, where piping is hung from bar joist.

H. Attention is called to pipe spring isolation specified to be furnished by this Contractor.

I. Support all piping by heavy steel, adjustable hangers, or brackets suitably fastened to structural portion of building. Place hangers in accordance with following tables.

COPPER TUBING SUPPORTS	
SIZE (IN.)	DISTANCE BETWEEN SUPPORTS (FT.)
5/8	6
7/8 - 1-1/8	8
1-3/8 - 2-1/8	10
2-5/8 - 5-1/8	12
6-1/8 - 8-1/8	14

J. Perforated metal, strap iron, or band iron hangers are not permitted. Offsets in hangers are not allowed. Pipe risers to be supported at regular intervals in pipe shafts within the limits of good practice.

K. See Insulation Section for requirements at pipe hangers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install piping not to interfere with opening of doors or other moving parts. Do not install piping near or directly over any portion of electrical equipment.

3.2 PIPE SLEEVES

A. Pipe sleeves shall be provided at non-rated partitions and floor penetrations. Pipe sleeves to be Schedule 40 or 18 gage steel. Sleeves to extend 1-1/2" in excess of partition depth on each side. Sleeves penetrating floors in wet areas, including all mechanical rooms, shall extend a minimum of 1 inch above the floor.

1. Piping requiring sleeves: Copper pipes thru masonry walls

B. Provide chromium-plated escutcheon plates for exposed uninsulated pipes projecting through floors or walls in finished spaces. Mechanical rooms and janitor closets are not considered "finished" spaces.

C. Hang piping so equipment, flanges, and connections do not bear weight of piping.

D. Adequately support vertical lines at their bases or by a suitable hanger placed in horizontal line near riser or by a base fitting set on pedestal.

E. Pipes not to be hung or supported by pumps. No torque to be applied to pumps by connecting pipes. After final pipe adjustments and initial operation of the pumps, this Contractor to recheck alignment of pumps and realign as required.

F. Run piping in straight lines; riser lines to be plumb with such offsets only as indicated or necessary. No sagging of lines permitted.

G. Unless otherwise shown on drawings, lines to be installed to drain to sumps or sewer.

H. Ream pipe after cutting to full bore. Remove foreign matter from inside of pipe before installing. Keep installed piping free from dirt and scale and protect open ends from foreign matter. Use temporary plugs or other approved methods of open end closure.

I. Threads to be right-hand, pipe standard, clean cut, full depth, and tapered. Joints to be made tight without caulking. Approved pipe joint lubricant to be used, applied in thin layer to the male thread only.

J. Install copper fittings with suitable flux and 95/5 lead free solder. Type K copper pipe to be joined by means of suitable flux and silver or phos-copper.

K. Piping to have sufficient number of flanges or unions for convenient installation and removal of piping and equipment.

L. Remake or replace defective, leaking, or otherwise unsatisfactory joints or material. Peening, caulking, or doping of piping is not permitted.

M. Install piping to prevent stresses and strains to piping and hangers from expansion or contraction. Provision for proper loops, offsets, or expansion joints to be responsibility of Contractor. Make provision for servicing and removal of equipment without dismantling piping.

3.3 PIPING IN TRANSFORMER, ELECTRICAL, AND ELEVATOR EQUIPMENT ROOMS

A. Refer to drawings. No water piping permitted in transformer, electrical, or elevator equipment rooms.

3.4 VALVE ACCESS

A. Locate all shutoff and control valves for easy access and operation. Where valves must necessarily be located in enclosed spaces, they shall be provided with access panels of sufficient size for operation. Furnish these access panels to proper trades for installation.

END OF SECTION

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Submit pipe and fittings and have approved before starting installation. Pipe and fittings to be new, manufactured domestically, and marked clearly with manufacturers' name, weight, and classification or working pressure.

B. Bolting materials to be semi-finished carbon steel bolts and hex nuts conforming to ASTM A-307. Threads and dimensions to be in accordance with ANSI B1.1 and B18.2.

C. Thread lubricant to be Crane "Formular 425" or equal. Approved Teflon tape may be used at Contractor's option.

D. Gaskets to be 1/8" thick "Sepco" or equal.

1.2 CAST IRON SOIL PIPE

A. Standard weight cast iron soil pipe with drainage fittings:

1. Waste, drainage, and vent lines 2" and larger. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute ® and listed by NSF® International.
2. Drain lines under concrete or other paving and under buildings, including to a distance of not less than 5'-0" from building. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute ® and listed by NSF® International.
3. Manufacturers: Charlotte Pipe and Foundry, Tyler Pipe, AB&I Foundry.
4. Joints in cast iron soil pipe may be hub and spigot with neoprene compression gaskets conforming to ASTM C564 or "No-hub". No-hub shall not be permitted on underground systems. No-hub couplings shall be standard CISPI 310 couplings manufactured with 300 series stainless steel and neoprene rubber sleeve.
5. No-hub couplings shall be heavy-duty as manufactured by Husky HD 2000 or Clamp-All 80. Coupling shall be constructed of stainless steel type 304, 26 gauge or thicker, with neoprene rubber gasket, ASTM C564. Install per manufacturer's torque requirements.

1.3 PVC PIPE

A. Schedule 40 PVC DWV pipe, ASTM D-2665 solid wall Type 1, Grade 1. Schedule 40 DWV waste and drainage piping below grade ONLY. PVC piping not permitted within Boiler Room, Central Sterile or Food Prep/Dishwashing areas.

B. TYPE PSM SDR-35 PVC sewer pipe with gasket slip joints, ASTM D-3034. Outside gravity, underground sanitary sewer drainage, from 5'-0" outside building to connection to local sewer.

C. Fittings to match piping system. Fittings to have manufacturer's trademark permanently identified in accordance with MSS-SP-25. Supplier to include with submittal data certification that fittings and flanges have met requirements.

D. Joints for piping to be made with tetrahydrofuron solvent cement. Joints to be in accordance with manufacturer's recommendations.

E. Pipe, fittings, and cement to all be supplied by single manufacturer for entire project.

F. All solvent cements shall be low emitting VOC at 510 g/L or less.

1.4 HANGERS

A. Non-insulated cast iron soil pipe thru 8" to be Grinnell Figure 104, MSS SP-69 TYPE 6, adjustable swivel ring, split ring type, and pipe 10" thru 15" Grinnell Figure 260, MSS SP-69 TYPE 1, adjustable clevis hanger.

B. Non-insulated PVC pipe 1/2" O.D. thru 4" O.D. with no longitudinal movement to be Grinnell Figure CT-99C, MSS SP-69 TYPE 9, plastic coated adjustable tubing ring hanger.

C. Support PVC pipe risers by Grinnell Figure CT-121C, MSS SP-69 TYPE 8, plastic coated riser clamps at floor penetrations.

D. Support three or more parallel lines by trapeze hangers utilizing Unistrut channel or equal in bottom mounting arrangement with rod hanging support.

E. Adequately size hangers on insulated piping for insulation to pass continuously through hangers. Insulated piping to be supported outside insulation covering.

F. Provide concrete inserts, Grinnell Figure 282, MSS SP-69 TYPE 18, universal concrete insert, for attaching hangers to building structure. Inserts to be adequately sized and correctly positioned to support piping, valves, etc., when full of water and system is in operation.

G. Provide C-clamps with locknut, Grinnell Figure 86, MSS SP-69 TYPE 23, where piping is to be hung from steel beams. Welding hanger rods to steel members is not permitted. Provide malleable beam clamps, Grinnell Figure 218, MSS SP-69 TYPE 30, with extension piece, Grinnell Figure 157, where piping is hung from bar joist.

H. Support all piping by heavy steel, adjustable hangers, or brackets suitably fastened to structural portion of building. Place hangers in accordance with following.

1. PVC and Cast Iron Supports: Support each fitting, at intervals of not more than 5 feet, and at least at each joint.

I. Perforated metal, strap iron, or band iron hangers are not permitted. Offsets in hangers are not allowed. Pipe risers to be supported at regular intervals in pipe shafts within the limits of good practice.

PART 2 - EXECUTION

2.1 INSTALLATION

A. Install piping not to interfere with opening of doors or other moving parts. Do not install piping near or directly over any portion of electrical equipment.

B. Piping to have sufficient number of flanges or unions for convenient installation and removal of piping and equipment.

C. Remake or replace defective, leaking, or otherwise unsatisfactory joints or material. Peening, caulking, or doping of piping is not permitted.

D. Install piping to prevent stresses and strains to piping and hangers from expansion or contraction. Provision for proper loops, offsets, or expansion joints to be responsibility of Contractor. Make provision for servicing and removal of equipment without dismantling piping.

2.2 PIPING IN TRANSFORMER, ELECTRICAL, AND ELEVATOR EQUIPMENT ROOMS

A. Refer to drawings. No water piping permitted in transformer, electrical, or elevator equipment rooms.

2.3 GRADES AND ELEVATIONS

A. Uniformly grade sanitary drainage lines to elevations shown. If no elevations are given, pitch sewers not less than 1/8" per foot.

END OF SECTION

SECTION 230100 - GENERAL PROVISIONS OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and services for a complete installation of equipment and systems contained in contract documents.

B. Principal features of work included are:

1. Heating, ventilating, and air-conditioning system.
2. Control system including line and low voltage control wiring and conduit.
3. Demolition of existing equipment, ductwork, and piping.
4. Seismic bracing and anchorage for equipment, ductwork, and piping.

1.2 RELATED WORK

A. Electrical power and interlock and control wiring and conduit.

B. Field painting of equipment, ductwork, and piping.

1.3 GENERAL

A. The contract documents form a guide for a complete system. Provide all items necessary to provide a complete system but not specifically mentioned, such as hangers, transitions, offsets, and drains.

B. Layouts indicated on drawings are diagrammatical only. Coordinate exact location of equipment, ductwork, and piping to eliminate conflict with other divisions. Designer reserves right to make reasonable changes in location of equipment, ductwork, and piping prior to construction. Coordination drawings shall be submitted prior to any equipment/systems being installed to ensure that installation conflicts between trades are minimized.

C. Should Contractor find during progress of work that in his judgment existing conditions make desirable a modification, report such item promptly to Designer for instructions. Do not make deviations from contract documents without review of Designer.

D. Supervise all work with a competent mechanic specifically qualified in mechanical discipline.

1.4 PERMITS

A. Secure and pay for permits, licenses, and inspections for work under this division.

1.5 CODES

A. Comply with all pertinent local, state, and national codes. Refer to Division 01.

1.6 STANDARDS

A. Comply with all pertinent standards. This list is provided as a convenience to Contractor and is not to be considered all inclusive.

1. Sheet Metal and Air-Conditioning Contractors National Association (SMACNA).
2. American Gas Association (AGA).
3. Air Moving and Conditioning Association (AMCA).
4. Air-Conditioning, Heating and Refrigeration Institute (AHRI).
5. American Society of Mechanical Engineers (ASME).

1.7 SUBMITTALS

A. Submit for review complete brochures and shop drawings for materials and equipment proposed in accordance with Division 01.

1. Brochures: Submit complete descriptions, illustrations and specification data for materials and equipment proposed. Clearly indicate proposed items when other items are shown on same sheet. Submit samples on request and/or set up for inspection. Samples will be returned to Contractor.
2. Submittals shall be submitted in line by line format. Each submittal shall be provided with a cover letter and supporting documentation indicating how the submittal meets each line of the referenced specification section. All discrepancies between the construction documents and the submitted product shall be clearly identified for engineer evaluation.
3. If a product other than the basis of design is rejected by the engineer for any reason, the Contractor shall provide the basis of design product at no additional cost to the Owner.
4. Shop Drawings:

    a. Control systems.
    b. Complete equipment, ductwork, and piping systems in equipment rooms.
    c. Complete equipment, ductwork, and piping systems in entire building.
    d. Underground steam distribution and chilled water system.
    e. Owner furnished equipment rough-in layouts.
    f. Kitchen hood and grease exhaust ductwork systems.
    g. Firestop systems.

1.8 PROJECT MAINTENANCE MANUALS

A. Prior to final acceptance of project, provide Owner with bound maintenance manuals in accordance with Division 01.

1.9 PROJECT TECHNICAL INSTRUCTION

A. Prior to final inspection of project, provide technical instruction to Owner as follows:

1. Field Instruction: Provide explanation of how systems and equipment are to operate during each season and during emergencies.
2. Field Demonstration: Demonstrate operation and routine maintenance for systems and equipment.
3. Video: Provide digital video of all field instruction and demonstration to Owner at completion.

1.10 PROTECTION

A. Protect all materials and equipment in accordance with Division 01.

B. The contractor must take appropriate precautions, during construction, to prevent unnecessary dust and debris from getting into air and water handling systems by covering equipment, controls and open-ended ducts and pipes as the installation progresses.

1.11 CONSTRUCTION RECORD DOCUMENT

A. Provide construction record documents in accordance with Division 01. Keep at the project one set of drawings and daily record changes at the time they are made. Give drawings to Owner at project completion.

B. The contractor shall maintain an appropriate maintenance log, where applicable, of all interim maintenance tasks performed on all started-up equipment, so that the manufacturer's warranties are not voided prior to the equipment being turned over to the Owner. This log shall be submitted when the equipment is officially released to the Owner.

1.12 EXISTING SERVICES

A. Maintain existing services in operation during construction. Coordinate and schedule all service interruptions with Owner.

1.13 OWNER NOTIFICATION

A. Notify Owner two weeks prior to activation of central chilled water and steam service to project.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Provide materials and equipment of domestic manufacture bearing the U.L. label when such label is available.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate work in accordance with Division 01. Coordinate locations of equipment, ductwork, and piping to eliminate conflict with other divisions.

B. Carefully examine contract documents to be thoroughly familiar with items which require plumbing or mechanical connections and coordination.

C. Provide proper chases and openings. Place sleeves and supports prior to pouring concrete or installation of masonry.

3.2 CUTTING AND PATCHING

A. Repair or replace routine damage caused by cutting in performance of contract.

B. Correct unnecessary damage caused due to installation of mechanical work.

C. Perform repairs with materials that match existing in accordance with the appropriate section of these specifications.

3.3 FLASHING, COUNTERFLASHING, AND SEALING

A. Flash, counterflash, and seal ductwork and piping at penetrations of roofs and outside walls.

3.4 TRENCHING, EXCAVATION AND BACKFILLING

A. Provide trenching, excavation, and backfilling necessary for performance of mechanical work accordance with Division 02.

B. Trenching and excavation of rock to be as described in Division 02.

C. Excavate to a depth at least 6" below bottom of pipe and a minimum of 36" above top of pipe. Fill below pipe, around pipe, and minimum of 12" above pipe with sand or Class "B" crushed stone tamped firm and even. Provide topsoil for final layer of dirt (12" minimum). Provide 6" spacing between pipes and between pipe and trench sides. Hand-grade with batterboards placed every 25'. Backfill by hand. Do not use rock or stone above sand or Class "B" crushed stone.

3.5 CONNECTION TO EQUIPMENT

A. Rough-in and connect to sterilizers, lab equipment, kitchen equipment, and Owner furnished equipment and provide a shutoff valve and union at each connection. Provide steam strainer and steam trap for steam equipment. Operating valves and/or controls for this equipment will be provided as an integral part of the equipment. Do not rough-in until shop drawings showing rough-in locations have been reviewed by Designer.

3.6 FOUNDATIONS AND PADS

A. Provide foundations, pads, and bases required for equipment. Concrete to be in accordance with concrete division of specifications.

B. Coordinate proper sizes and locations of foundations, pads, bases, anchors, supports, and other items to be built into structure.

3.7 IDENTIFICATION

A. Identify exposed or accessible piping with stenciling contents indicating pipe contents and direction of flow on piping not more than 20 feet apart, at valves, at access panels, and at least once above each space.

B. Contractors option to identify exposed or accessible piping with snap-on or strap-on type markers. Color code markers in accordance with ANSI. Indicate pipe contents and direction of flow on marker. Install markers on piping not more than 20 feet apart, at valves, at access panels, and at least once above each space.

C. Color code piping exposed in equipment rooms in accordance with the following schedule. Paint to be Sherwin Williams Metaltex or approved substitute.

1. Chilled water - pale green.
2. Hot water - pink.
3. Condenser water - blue green.
4. Steam - dark orange.
5. Steam condensate - light orange.

D. Include design operating pressures in psig for steam and compressed air services.

E. Control compressed air and buried lines need not be marked.

F. Identify all mechanical equipment with engraved brass, aluminum, or stainless steel nameplates or tags. Use equipment names and numbers appearing in schedules on drawings. Fasten nameplates to equipment using screws. Glue or adhesive is not acceptable. Fasten tags to equipment using brass, aluminum or stainless steel chains.

G. Identify each valve with engraved brass, aluminum, or stainless steel identification tag indicating valve service and sequential identification number. Attach tag to valve handle with brass, aluminum or stainless steel chain. Provide two bound manuals to Owner listing each valve sequentially and indicating valve manufacturer, style, size, service, normal position, and specific location for each valve.

H. Frame and mount control diagrams and sequences in each equipment room. Use non-fading black and white prints encased in aluminum frame with plexiglass cover.

3.8 CLEANING

A. Thoroughly clean ductwork and equipment casings before fans and filters are operated.

B. Repair damaged factory finishes covering all bare places and scratches.

C. Cleaning HVAC Systems Water Piping:

1. Clean all equipment and piping of iron cuttings and other foreign matter as they are installed.
2. [Thoroughly flush HVAC water systems with precleaning chemicals designed to remove depositions such as pipe dope, oils, rust, mill scale, and other extraneous materials. Provide dosages of precleaner chemicals recommended by water treatment supplier and add and circulate throughout the water systems. Drain, refill, and flush water systems thoroughly until no foreign matter is observed and total alkalinity of the drain water is equal to that of the make-up water.]
3. Do not install devices in which foreign matter could become lodged, such as control valves, until cleaning and flushing are completed. Position valves to bypass chiller, boiler and heat exchanger. Connect supply and return runouts together at each coil location. Make connection of supply and return runouts with short lengths of high

pressure rubber hose and brass fittings. One fitting shall be swivel type to eliminate turning fitting in hose.

4. Fill system at city water make-up connection with all air vents open. After filling, close vents.
5. Start main pump with pressure reducing valve makeup open. Check vents in sequence to bleed off any trapped air in order to assure circulation through all components of system. Verify pumps are properly aligned and bolted down before start-up to prevent damage to seals or couplings. Circulate water for at least two hours and then drain completely to flush out foreign matter.
6. Remove, clean, and replace all strainer baskets. Clean all dirt legs. If indications are found of excessive dirt, repeat the above flushing.
7. Fill the system with fresh water, adding precleaning chemicals designed to remove depositions such as pipe dope, oils, rust, mill scale, and other extraneous materials. Provide dosages of precleaner chemicals recommended by water treatment supplier. Alternate operation of primary and standby pumps, and circulate the cleaning solution for 24 hours. Then turn off the pump and completely drain the system.
8. Remove, clean, and replace all strainer baskets. Clean all dirt legs. Replace suction diffuser start-up strainer with conventional strainer. Refill the system with clean water, venting all high points and equipment of air and gases. Bring water systems to operating temperature. Recheck all vent points during this process and remove all air.
9. After the system has been completely cleaned, test system by litmus paper or other dependable method and leave system on slightly alkaline side (ph 7.5 to 8.5). If system is still on acid side (ph 7.0 or lower), add water conditioner.

D. Cleaning Steam Supply and Steam Condensate Return Systems: Thoroughly clean using 5 psig steam allowing condensate to be wasted to drains for 8 hours.

3.9 TESTING

A. Test all installed equipment and systems and demonstrate proper operation. Correct and retest work found defective when tested.

B. Thoroughly check piping system for leaks. Do not add any leak-stop compounds to the system. Make repairs to piping system with new materials. Peening, doping, or caulking of joints or holes is not acceptable.

C. Conduct air or smoke test if in opinion of Designer reasonable cause exists to suspect leakage or low quality workmanship.

D. Test compressed air piping with Nitrogen at 100 psi for two hours without leaks.

E. Test HVAC systems water piping and steam supply and steam condensate return piping at a water pressure of 125 psig for two hours without leaks.

F. Vibration Tests:

1. Test vibration isolation system in accordance with methods and procedures described in the Testing, Adjusting, and Balancing Chapter in the latest edition of ASHRAE Applications Handbook.
2. Verify all vibration isolation systems are free floating and not short circuited by any connection between equipment and building structure.
3. Operate mechanical systems and verify visually and audibly that there is no excessive vibration or noise generated by the system.

3.10 SYSTEM TESTING, ADJUSTING, AND BALANCING (TAB)

A. Procure services of an independent testing, adjusting, and balancing agency to test, adjust, and balance mechanical systems. Submit TAB agency for review. Provide references of at least five completed projects of similar size and scope. TAB agency to be certified member of Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB).

B. Begin TAB after system has been completed and is in full working order. Place mechanical systems into operation and continue operation during each working day of TAB. Work performed by TAB agency to be under direct supervision of qualified TAB technician. Accurately calibrate and maintain in good working order instruments used in performance of TAB.

C. Air System Testing, Adjusting, and Balancing:

1. Set controls so air terminal units are operating at maximum design airflow.
2. Verify proper fan rotation.
3. Adjust fan RPM to design requirements.
4. Record rated and actual motor full load amps.
5. Make pitot tube traverse of main ducts and obtain design CFM at fans.
6. Record system suction and discharge static pressures.
7. Adjust system for design CFM supply air.
8. Adjust system for design CFM return air.
9. Adjust system for design CFM outside air.
10. Adjust system for design CFM exhaust air.
11. Verify maximum and minimum supply cfm for each air terminal unit and adjust as required to design cfm.
12. Adjust each air device to within 10% of design cfm. Adjust air devices to minimize drafts and noise. Identify each air device location and area served.
13. After adjustment of air terminal units and air devices, recheck fan cfm, static pressures, and motor full load amps.
14. Record design, initial, and final readings for each fan, air terminal unit and air device.
15. As recommended by TAB agency, Contractor to make changes in fan drives and add balancing dampers at no additional cost to provide proper balance.

D. Water System Testing, Adjusting, and Balancing:

1. Open valves to full open position. Set mixing valves to full coil flow.
2. Set controls so coils are operating at maximum design water flow.
3. Verify proper pump rotation.
4. Examine water system and determine if system has been treated and cleaned as previously specified.
5. When determined system water is clean, charge expansion tank.
6. Set pumps to design gpm. Pump manufacturer to trim pump impellers as necessary to set pump to design gpm at actual head.
7. Record pump suction, discharge, and total head.
8. Record rated and actual motor full load amps.
9. Check and set operating temperatures of chiller, boiler and heat exchanger to design requirements.
10. Adjust each chiller, boiler and heat exchanger to within 10 percent of design gpm.
11. Check water temperatures at inlet side of coils. Note rise or drop of temperature from source.
12. Adjust each zone and coil to within 10 percent of design gpm using flow balancing and measuring devices. Set pressure drop across coil bypass to match coil pressure drop.
13. After adjustment of zones and coils, recheck settings at pumps, chillers, boilers and heat exchangers.
14. Record design, initial, and final readings for each pump, chiller, heat exchanger zone, and coil.

E. Perform work, record data, and submit complete TAB report to Designer for review upon completion.

F. Designer may request a recheck or resetting of any item listed in report. Provide tests Designer may request.

G. Designer will accept job on basis of tests and inspections. A representative of TAB agency and control system manufacturer is to be in attendance to assist final inspection. Furnish necessary mechanics to operate system, make any necessary adjustments, and assist with final inspection. In addition to requirements of Division 01, complete the following before requesting a final inspection.

1. Work required under this division of specifications.
2. System testing, adjusting, and balancing.
3. Control system commissioning.
4. Furnish required project maintenance manuals and control diagrams and sequences.

END OF SECTION

SECTION 230549 - BASIC MATERIALS AND METHODS FOR HVAC

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Work required under this section of the specifications consists of basic materials and methods applicable to work under Division 23.

PART 2 - PRODUCTS

2.1 FLEXIBLE PIPE CONNECTIONS

A. Provide double sphere, neoprene flexible pipe connectors with flanged or union connections as manufactured by Metraflex or approved substitute in the following locations:

1. Piping connections to pumps.
2. Piping connections to air handling units.

2.2 V-BELT DRIVES

A. Provide all fan drives with V-belts rated for 150% of nameplate motor horsepower. Provide adjustable pitch motor sheaves for motor sizes through 20 hp. For motor sizes 25 hp and larger provide fixed pitch motor sheaves after balancing to within plus 5% of design air quantity. Select motor sheaves so centerline does not extend past end of motor shaft and such that motor bearing grease fitting and relief port is not obstructed.

B. Provide belt guards for all belt driven equipment. Provide expanded metal cover with access to driven shaft for tachometer.

2.3 FOUNDATIONS AND PADS

A. Provide foundations, pads, and bases required for equipment. Concrete to be in accordance with concrete division of specifications.

B. Coordinate proper sizes and locations of foundations, pads, bases, louvers, anchors, supports, and other items to be built into structure.

2.4 FASTENINGS TO STRUCTURES

A. Provide structural fastening devices for equipment, materials, piping and ductwork. Devices to be concrete inserts, expansion shields and lag bolts, and through bolts-washers-nuts. All bolted devices to use jamb nuts. Inserts to be continuous type as manufactured by Unistrut or approved substitute. Install per manufacturer's published installation instructions in lengths to suit specific application, complete with spring nuts, end caps, and plastic coated filler to prevent concrete seepage.

B. Use of power drive "shot-pins" is permitted only for ducts 20" in width and smaller and single pipes 1" and smaller.

2.5 ACCESS PANELS

A. Provide ceiling and wall access panels for installation by other Divisions. Coordinate locations so panels will provide proper access to equipment served. Notify Designer of proposed wall or ceiling access panel locations prior to installation of such panels. Minimum size: 24" x 24".

B. Panels shall be manufactured by Bilco or approved substitute. Provide panels with minimum 16 gauge steel construction with screwdriver operated locks and primer finish.

C. Provide fire-rated panels for installation in fire-rated partitions.

2.6 ROOF CURBS

A. Provide prefabricated metal roof curbs at all roof ductwork and piping penetrations and for support of all roof-mounted equipment, fans and ductwork. Construct curbs according to National Roof Contractor's Association guidelines. Prefabricated metal roof curbs shall be manufactured by ThyCurb, Custom Curb, or approved substitute.

B. Construct curbs with minimum 18 gauge galvanized steel (14 gauge for curbs with any side longer than 4'-0" and for all curbs supporting equipment) with fully mitered and welded corners, raised 3" integral cant for roof deck insulation, integral base plate, internal reinforcing with 1" x 1" x 1/8" steel angle for curbs with any side longer than 3'-0", factory installed 1-1/2" thick, 3-pound density fiberglass insulation and factory installed pressure treated wood nailer. Minimum height of curb shall be 12" above finished roof surface. (Consult architectural plans for roof type and thickness.) Curbs for kitchen hood exhaust fan shall be height necessary to provide 40" minimum height from finished roof surface to fan discharge. Construct curbs to match slope of roof and provide a level top surface for mounting of mechanical equipment.

C. Curb types shall be as follows:

1. Duct penetration curbs with standard curb construction as described above - ThyCurb Model TC.
2. Equipment and ductwork support curbs with minimum 18 gauge galvanized steel shell, base plate and counterflashing, wood nailer, and internal bulkhead reinforcement - ThyCurb Model TEMS.

D. Install curbs in strict accordance with manufacturer's published installation instructions and as detailed on the drawings. Coordinate proper curb size, construction, and base prior to fabrication.

PART 3 - EXECUTION - NOT APPLICABLE

END OF SECTION

SECTION 230710 - INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Contractor shall provide all necessary labor, materials, tools, and equipment to perform work required on the drawings and specified herein.

B. Certain equipment and/or systems to be factory insulated by manufacturer. Factory insulation materials to be as specified in applicable sections of the specifications.

C. All pipe fittings and valves, in insulated pipe systems to be insulated.

D. Thermal resistance "R" values used herein are expressed in units of "Hour, Degrees F., Sq. Ft./BTU per Inch of Thickness" on a flat surface at a mean temperature of 75 degrees F.

E. Note that where electric cable wrap is called for, insulation is to be applied over cable.

F. "Contractor's Option" referred to in Materials below indicates optional materials which may be used as equals.

1.2 DEFINITIONS

A. "Exposed" equipment, ducts, and piping are areas which will be visible without removing ceilings or opening access panels.

B. Outdoors is considered exposed to the weather.

C. Underground is buried, whereas in a trench below grade is considered concealed.

1.3 CERTIFICATION/QUALITY ASSURANCE

A. Products shall meet applicable national, state, and local building codes and be U.L. (or other recognized testing lab) listed for intended service.

B. All insulations, jackets, adhesives, coatings, sealers, and tapes shall have a flame spread rating of 25 or less and smoke development rating of 50 or less when tested in accordance with ASTM E-84, NFPA 225, U.L. 723, and further must meet the requirements of NFPA 90-A and applicable building, plumbing, and mechanical codes.

C. All insulation materials shall be delivered and stored in manufacturers' containers and kept free from dirt, water, chemical, and mechanical damage. Under no circumstances shall insulation applied to exterior ductwork be allowed to get wet prior to final material covering.

D. Insulation shall be applied in a workmanlike manner by experienced, qualified tradesmen.

E. Insulation shall not be applied until all pressure testing has been completed, inspected, and released for insulation application.

F. Surfaces shall be clean and dry.

G. Insulation joints shall be butted firmly together and all jackets and tapes shall be smoothly and securely installed.

H. Insulation for duct, pipe, and equipment for above grade exposed to weather outside building shall be certified as being self-extinguishing for 1" thickness in less than 53 seconds when tested in accordance with ASTM D-1692.

1.4 APPLICABLE CODES AND STANDARDS

A. ASTM E-84.

B. U.L. 723.

C. NFPA 90-A.

D. State of 2018 Energy Code.

PART 2 - PRODUCTS

2.1 MATERIALS FOR DUCTS

A. Blanket Type Duct Insulation: Provide minimum 3/4 pound per cubic foot density, flexible blanket fiberglass duct insulation with FSKL aluminum foil vapor barrier facing and 2" tab. Insulation shall have minimum 'R' value of 3.4 per inch (K=0.29) at 75 degrees F mean temperature. Product to be Manville "Microlite" or equivalent standard duct wrap by CertainTeed, Knauf, or Owens-Corning. Use blanket type duct insulation for the following:

1. Unlined heating and/or cooling supply and return air ductwork concealed from view: 2" thick.
2. Unlined outside air ductwork concealed from view: 2" thick.
3. Unlined heating and/or cooling supply and return air ductwork located in attic: 2-1/2" thick.
4. Lined heating and/or cooling supply and return air ductwork located in attic: 2" thick.
5. Unlined return air ductwork located in attic: 2-1/2" thick.

B. Board Type Duct Insulation: Provide minimum 3 pound per cubic foot density, semi-rigid fiberglass duct insulation with FSKL aluminum foil vapor barrier facing. Insulation shall have a minimum ‘R’ value of 3.8 per inch (K=0.26) at 75 degrees F mean temperature. Product to be Manville "800 series Spin-Glas" or equivalent by CertainTeed, Knauf, or Owens-Corning. Use board type duct insulation for the following services:

1. Unlined exposed heating and/or cooling supply air ducts: 1-1/2" thick.
2. Unlined exposed outside air ducts: 1-1/2" thick.
3. Unlined exposed return ducts: 1-1/2" thick.
4. Unlined exposed supply, return and outside air ducts within equipment rooms or located in unconditioned space: 1-1/2" thick.
5. Apparatus casing: 1-1/2" thick.
6. Unlined supply air and return air ducts outside exposed to weather: 2" thick.
7. Unlined air-handling plenums within equipment rooms: 1-1/2" thick.
8. Side access filter housings: 1-1/2" thick.

C. Flexible Sheet: Provide 25/50 rated, closed-cell, flexible sheet type insulation, having a minimum "R" value of 3.7 per inch (K=0.27) at 75 degrees F mean temperature and continuous operational temperature limit of 200 degrees F. Product to be Armstrong "Armaflex II" or approved equal. Use flexible sheet insulation for the following services. Ductwork outside exposed to weather: 2.25" thick (3 layers of 3/4" each).

2.2 MATERIALS FOR FITTINGS, VALVES, AND SPECIAL COVERINGS

A. Provide coverings and finishes for specific items hereinafter specified.

1. Use pre-molded insulation fabricated by the manufacturer of insulation material or shop or site mitered segment type insulation for: All pipe fittings, elbows, tees, valves, and couplings.
2. Contractor's option to provide factory pre-molded one-piece PVC insulated fitting covers, precut fiberglass insulation inserts, and necessary installation materials for all pipe fittings. Materials to be equal to Manville Zeston white, U.V. resistant, 25/50 rated, 20 mil thickness insulated PVC fitting covers and insulation inserts.
3. PVC fitting covers over blanket fiberglass are not acceptable for steam, gravity steam condensate, and steam boiler/deaerator piping services.

B. For heat exchangers, air separators, large pipes, etc., in systems operating over 60 degrees F., when exposed-to-view inside building or in equipment rooms, cover insulation with a smoothing coat of Keane Powerhouse cement, one layer of white colored glass mesh embedded and finished with Foster 46-50 mastic or Childers CP-10 / CP-11 mastic.

C. For pipe fittings, valves, strainers, air separators, and other irregular surfaces, in systems operating below 60 degrees F., when exposed to view inside building or in equipment rooms, cover insulation with white colored glass mesh embedded in white, fungus resistant vapor barrier coating Foster 30-80 AF. Coating shall meet ASTM D 5590 with 0 growth rating.

D. Fabricate and install readily removable insulation caps to facilitate service and maintenance accessibility to all strainers including suction diffusers in systems operating below 60 degrees F.

E. For any service when above grade exposed-to-the-weather outside building and exposed in equipment rooms, cover straight pipe insulation with 0.016" thick aluminum jacket equivalent to ITW or RPR and cover valves and fittings with .024" thick aluminum factory formed covers equivalent to Childers Ell-Jacs.

F. For any service when above grade exposed-to-the-weather outside building and exposed in equipment rooms, cover pipe insulation with 20 mil thick white, U.V. resistant, 25/50 rated PVC jacketing equivalent to Manville Zeston PVC jacketing and fitting covers. All joints to be made with solvent welding adhesive equivalent to Manville Perma-Weld to create a permanent chemical bond between the PVC members.

G. For externally insulated sheet metal ducts when above grade exposed-to-the-weather outside building, cover duct insulation with Alumaguard 60 self-adhering weather and vapor barrier membrane by Polyguard or equal by FlexClad having proven ability to withstand a wide range of temperatures without cracking or crazing and that is highly resistant to damage by bumping and abrasion. Product color to be white unless otherwise noted. Apply in accordance with manufacturers' published instructions.

H. When specifically approved by designer, when it is impossible to completely insulate pipe, fittings, or valves with specified insulation, Armstrong Armaflex insulation tape may be used to prevent condensate drip on small piping. Use of cork insulation tape is prohibited.

I. When exposed to view inside building or in equipment rooms, cover external duct insulation with a smoothing coat of Keane Powerhouse cement and one layer of white colored woven glass fabric embedded in white, fungus resistant lagging adhesive/coating, Foster 30-36 AF or Childers CP-137 AF. Coating shall meet ASTM D 5590 with 0 growth rating.

PART 3 - EXECUTION

3.1 GENERAL

A. No insulation shall be cut where a hanger is located. If hangers have been installed by pipefitter tradesmen which violates this strict requirement, notify Designer immediately.

B. Piping and ductwork systems shall be tested and found free of all leaks prior to installation of insulation covering.

C. All surfaces shall be clean and dry when covering is applied. Covering to be dry when installed and during application of any finish, unless such finish specifically requires a wetted surface for application.

D. All adhesives, cements, and mastics shall be compatible with materials applied and shall not attack materials in either wet or dry state.

E. Install insulation using professional insulators who have adequate experience and ability.

F. Exposed-to-view insulation shall have a well tailored appearance.

G. Stop all duct coverings, including jacket and insulation, at fire and smoke dampered penetrations of partitions. "Fan-Out" or extend jacketed insulation at least 2" beyond angle frames of dampers and secure insulation to partition. Maintain vapor barrier. Where insulated duct access door is not used, install covering over damper access panel so as to be readily removable and identifiable.

H. Treat insulated pipe and duct surfaces in equipment rooms and where exposed to normal view, so surfaces may be painted with water base latex paint. Use of mastics, adhesives, or jacketing which cause "bleeding" is prohibited.

I. Pipe hanger insulation shields and/or saddles shall be properly centered inside the pipe hanger to ensure that the piping insulation is not damaged.

J. Pipe hanger insulation shields shall be fabricated with a minimum metal gauge thickness in compliance with MSS SP-69.

3.2 INSTALLATION OF DUCT COVERING

A. Apply jacketed blanket type fiberglass covering to ducts pulled snug but not so tight as to compress corners more than 1/4". Use insulation having 2" tab, or cut insulation long enough to allow for "peel off" of insulation from jacket to effect a minimum overlap of 2". Secure 2" jacket laps using equivalent of Foster 85-75 or CP-82 adhesive and staple lap with flare type staples on 2" centers. Cover standing seams, stiffeners, and braces with same insulation blanket, using 2" jacket lap and staple lap as hereinbefore outlined. Cover and seal all staples with Foster 30/80 AF, fire resistant vapor barrier coating reinforced with glass cloth.

B. For duct 24" or wider, mechanically fasten insulation to duct bottom, using weld pins or nylon "stick-clip" base plates having self-locking coated metal or nylon discs. Locate fasteners on not over 12" centers laterally and longitudinally. Seal pins as above.

C. For ducts more than 20” deep, mechanically fasten insulation to duct sides, using one row of pins, plates, or discs located on not over 12" centers longitudinally and equidistant laterally between duct top and bottom. For ducts over 24" deep, apply fasteners as before only using minimum of two rows.

D. Apply jacketed board type fiberglass covering to ducts using weld pins or nylon "stick-clip" base plates having self-locking coated metal or nylon discs. Locate fasteners on not over 12" centers laterally and longitudinally. If insulation is grooved to fit around corners, in order to eliminate as many joints as possible, pin as required to hold insulation tight to duct, especially on bottom of duct. Seal pins and joints with Foster 30-80 AF reinforced with glass mesh.

E. Cover all joints, rips, tears, punctures, disc heads, staples, or breaks in vapor barrier jacket with 4" wide woven glass fabric tape embedded in Foster 30-80 AF fire resistant vapor barrier coating. PRESSURE SENSITIVE TAPE NOT ALLOWED.

F. Prior to application of flexible sheet insulation, thoroughly clean all metal surfaces, making sure that all dirt, scale, loose paint, plaster, and oil have been removed and that surfaces are dry. If surface has been primed, test a 2 square foot section using adhesive equivalent to Armstrong 520, Foster 85-75 or Childers CP-82 in order to determine whether solvent in adhesive will loosen or lift the primer. If primer is loosened, then remove it. When testing proves acceptable, adhere insulation with smooth side out, using thin but adequate coating of same adhesive. Follow manufacturers' instructions. Coat all butt edges of each sheet. Stagger all joints. Insulate all standing seams or flanges with same thickness of insulating material as that used on main surface. Seal all butt joints, miter joints, and torn or damaged insulation with adhesive.

G. Ductwork manual volume damper (MVD) handles, airflow station pressure ports, access door handles, duct-mounted instrumentation, etc., shall be left exposed and/or accessible above the insulation vapor barrier.

END OF SECTION

SECTION 233110 - SHEET METAL DUCTWORK - LOW PRESSURE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Low pressure ductwork refers to systems operating at 2.00" w.g. total static pressure with velocities up to 2000 FPM. It is the intent of this specification to provide an installed duct system which will supply the air quantities indicated by the plans and have the lowest possible friction loss with the least possible leakage loss. Friction loss for each system shall not exceed that which is indicated in the A.C. unit schedule as external static pressure or in the fan schedule as static pressure and shall include the losses of all accessories. Friction losses shall be minimized by reduction in the number of offsets and elbows by pre-planning the duct system installation and coordination with other trades to prevent interferences. Access to all accessories requiring maintenance, service and inspection shall be maintained. Radius elbows are preferred for all turns to minimize friction, noise and vibration; and, especially, for sections having large volume or higher velocities and sections which may have turbulences.

B. The contractor shall provide and/or construct all materials, ductwork, joints, transitions, splitters, dampers, access doors, etc., as set forth in these specifications necessary to install the Low Pressure Sheet Metal Ductwork required by the Mechanical Drawings.

C. Low pressure ductwork shall be constructed to meet the following pressure class:

1. Supply ductwork downstream of terminal units: 1.0" pressure class.
2. Supply and return duct connections to fan coil units or single zone air systems (ESP ≤1.0"): 1.0" pressure class.
3. Supply and return duct connections to fan coil units or single zone air systems (ESP >1.0", ≤2.0"): 2.0" pressure class.
4. Exhaust and return ductwork (Fan ESP ≤2.0"): 2.0" pressure class.

1.2 QUALITY CONTROL AND REGULATORY STANDARDS

A. SMACNA Manual: Sheet Metal Tradesman is to have access on the construction site to the Latest Edition of SMACNA "HVAC Duct Construction Standards", (Metal and Flexible). The Manual is referred to in specifications for required construction methods and details. Contractor shall comply with provisions of the SMACNA Manual and more stringent requirements of this specification.

B. Quality control involves not only the general performance requirements for all air ducts, but also quality workmanship which includes layout preplanning so that offsets, rises, falls, elbows, fittings, etc., are minimized or eliminated. General performance requirements for all ducts include:

1. Dimensional stability (shape deformation and strength).
2. Containment of the air being conveyed (leakage control).
3. Vibration (fatigue and appearance).
4. Noise (generation, transmission or attenuation).
5. Exposure (to damage, weather, temperature extremes, flexure cycles, wind, corrosive atmospheres, biological contamination, flow interruption or reversal, underground or other encasement conditions, combustion, or other in-service conditions).
6. Support (alignment and position retention).
7. Thermal conductivity (heat gain or loss and condensation control).

C. Provide galvanized duct materials which meet applicable requirements of SMACNA manual and local and state codes, whichever is the most stringent.

D. Support ductwork in accordance with applicable requirements of SMACNA manual, local and state codes, and details on plans, whichever is the most stringent.

E. Emboss fittings with material gauge, manufacturer, and type material.

F. Ductwork shall be installed to comply with the roof ceiling assembly for this project shown on Architectural Drawings, in accordance with the UL Fire Resistance Index Catalog.

G. Materials used as sealers, liners, pre-insulated jackets and flexible ducts shall comply with a flame spread rating of 25 or less and a smoke developed rating of not over 50.

H. Joint sealer shall meet the requirements of UL181A or UL181B as applicable.

I. Duct sealant classification: Seal all transverse joints, longitudinal joints and duct wall penetrations in accordance with SMACNA Class A.

1.3 SUBMITTALS AND SHOP DRAWINGS

A. Submit material/product data to designer for approval ONLY when it deviates from products specified in Part 2 herein.

B. Shop Drawings: Contractor to submit to owner for approval complete sheet metal shop drawings of all ductwork, including equipment rooms, shafts, and especially congested areas and areas with possible conflicts. No installation shall proceed without owner stamped approval of shop drawings. Submittal to reflect space requirements coordinated with other trades such as Electrical, Plumbing, Mechanical and Structural. Prior to submission to owner, shop drawings to have stamped approval of all major trades which occupy ceiling space (HVAC, plumbing, piping, sprinkler, and electrical), to substantiate adequate coordination as to space, accessibility and to ensure no conflict exists between contractors.

C. The General Contractor shall be responsible for coordination between trades and shall stamp and sign the duct drawings to substantiate that the coordination has been accomplished. Non-critical piping and conduit shall give way to ducts.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Sheet Metal, Angles, Bar Slips, Hangers, and Straps: Galvanized steel.

B. Screws: Cadmium plated.

C. Joint Sealer: Manufactured by Hardcast, Inc., Two-Stage Sealant Process.

1. Stage 1: Apply fiber DT tape.
2. Stage 2: Brush on RTA-50 sealant over fiber tape.

2.2 FABRICATION

A. Provide a rectangular or round duct where required on drawings of prime quality galvanized steel sheets, thickness and reinforcement as required by the following schedule, SMACNA, or local and state codes, whichever is more stringent. When fabricating low pressure ductwork, largest duct dimension governs the entire duct and complete joint.

DUCTWORK GAUGE AND REINFORCEMENT SCHEDULE				
MAXIMUM DUCT DIMENSION (IN.)	DUCT GAUGE	SLIP GAUGE	STANDINGS	REINFORCEMENT
Up thru 18	24	24	- -	- -
19 - 30	24	24	1 x 24 ga.	No
31 - 42	22	22	1 x 24 ga.	No
43 - 54	22	22	1-1/2 x 20 ga.	1-3/8 x 1/8 Band Iron
55 - 60	20	20	1-1/2 x 20 ga.	1-3/8 x 1/8 Band Iron
61 - 84	20	20	1-1/2 x 18 ga.	1-1/2 x 1-1/2 x 1/8 Angle
85 - 96	18	20	1-1/2 x 18 ga.	1-1/2 x 1-1/2 x 3/16 Angle
Over 96	18	20	2 x 18 ga.	2 x 2 x 1/4 Angle

B. Duct dimensions shown on drawings indicate inside clear dimensions. Make allowances in sheet metal size for duct requiring internal duct liner to provide "inside clear" dimensions.

C. In addition to the requirements above, add supplemental bracing as necessary to prevent sagging, drumming, and vibration.

D. Round prefabricated 26 gauge slip joint duct may be used on exhaust and return duct 12" and smaller and for runout duct to boxes, diffusers, registers, and grilles.

1. Secure duct sections and fittings with sheet metal screws.
2. Make connections of round duct to rectangular duct using "spin-in" collars with manual volume damper.
3. Transverse and longitudinal slip joints shall be sealed with approved sealer.

E. Provide transverse joints of "s" and drive construction at least every eight feet on duct whose larger side is less than 18". Seal all transverse joints with joint sealant material.

F. Provide transverse joints, or equivalent supplemental angle reinforcing on 4 foot centers on duct whose larger side is greater than 18". At the contractor's option, duct mate or equal joint system may be substituted for "s" and drive construction. Seal all transverse joints with joint sealant material.

G. Longitudinal seams shall be Pittsburg Lock or grooved seams closed tightly and evenly. Button punch snap lock longitudinal seam construction shall not be allowed. Seal longitudinal joints which prove to leak with joint sealant material.

H. Cross break ductwork over 10" dimension, either side.

I. Do not exceed 20 degree angle of slope for increase-in-area transitions.

J. Do not exceed 20 degree angle of slope for decrease-in-area transitions.

K. Do not exceed 30 degrees on the entering side or 45 degrees on the leaving side for angle of transitions at connections to equipment without the use of approved vanes. 20 degree angle is preferred and should be used space permitting.

L. Provide Ells fabricated to one of the following specifications in order of preference (SMACNA Figures 4-2 through 4-4 and Figure 4-9 and Chart 4-1):

1. Unvaned elbow with the throat radius equal to 3/4 of the width of the duct and with a full heel radius.
2. Six inch throat radius with full radius, single thickness vanes and full heel radius. Maximum unsupported length of vanes shall be 36". Vanes shall be securely fastened to runners. All vanes shall be secure and stable in installed operating position. Construct vane edges to project tangents parallel to duct sides.
3. Square elbows with single thickness turning vanes. Maximum unsupported length of vanes shall be 36". Vanes shall be securely fastened to runners. All vanes shall be secure and stable in installed operating position. Construct vane edges to project tangents parallel to duct sides.
4. Radius elbows are the preferred fitting. Square elbows are to be used only when available space prevents the use of radius elbows.

M. Provide offsets as necessary in accordance with SMACNA Figure 4-7.

N. Make branch connections and tees in one of the following manners:

1. Converging radius elbow with MVD. (SMACNA Figure 4-5).
2. 45-degree entry with MVD. (SMACNA Figure 4-6).
3. Round spin-in fitting with MVD.

O. Space duct joints to avoid cutting them for branch take offs and outlet collars.

2.3 INTERNAL DUCT LINER

A. Liner: 1" thick (unless otherwise indicated on drawings), UL listed, neoprene coated, mat faced, flexible fiberglass of one pound per cubic foot density.

2.4 SPECIAL DUCTWORK

A. Aluminum Ductwork: Where indicated on drawings, provide rectangular sheet metal ducts constructed of aluminum sheets made of aluminum base alloy having not more than .4 percent copper (for corrosion resistance), a minimum tensile strength of 16,000 psi and ability to satisfactorily make a Pittsburgh lock seam. Provide aluminum ductwork of rigidity, class, thickness, and reinforcement equivalent to steel duct as permitted by SMACNA manual pages 2.123 through 2.125 based on static pressure class of 2" w.g. Provide aluminum sheet metal cleaned and free of grease, dirt, scale, and oxidation. Dielectrically isolate aluminum from uncoated steel or copper. See the drawings for ductwork to be constructed of aluminum alloy sheets.

PART 3 - EXECUTION

3.1 INSTALLATION, APPLICATION, ERECTION

A. Support ductwork on each side of the duct with suitable sheared strips of galvanized metal or 1" x 1/8" galvanized steel band iron hangers.

B. Attach hangers to the ductwork using sheet metal screws.

C. Secure hangers to concrete structure with approved anchor shields and to steel structure by means of C-clamps.

D. Space hangers approximately eight feet along the duct except as noted below.

E. For ducts 60" and larger and heavy sections, such as welded duct and sound absorbers, space hangers at approximately four foot intervals.

F. Obstructions shall not be located within ducts.

G. Do not exceed 45 degrees for easement transition angle.

H. Seal all transverse joints with approved sealer in accordance with manufacturers' directions. Also, seal longitudinal joints which prove to leak.

I. Insulation: Where drawings and insulating specifications indicate that ducts are to be insulated make provisions for neat insulation finish around damper operating quadrants, splitter adjusting clamps, access doors, and similar operating devices. Metal collar equivalent in depth to insulation thickness and of suitable size to which insulation may be finished to be mounted on duct.

J. Counterflashing: Counterflash all ducts where they pierce the roof.

K. Pitot Ports: Pitot ports for measuring airflow to be located in each main duct at the downstream end of the straightest run of the main and before the first branch take-off. Pitot ports to be formed by drilling 7/16" holes in the duct, lined up perpendicular to airflow on maximum 8" centers and at least three to a duct, evenly spaced. Holes to be plugged with plastic plugs. Provide access to these for future rebalancing.

L. Apparatus Casing:

1. Rivet or bolt casing panels at floor line to a continuous 2"x2"x1/4" galvanized angle attached on 18" centers by expansion shields and bolts to concrete pad.
2. Join casing to walls and roof similarly or by flanging casing and attaching to masonry by bolts and expansion shields on 24" centers.
3. Seal standing seam joints and attachment joints with duct sealant, mastic, or caulking compound applied so that pressure differential drives sealant into joint.
4. Seal piping and conduit penetrations with sealant plates and gaskets.
5. Duct liner in casing to be installed as follows:

    a. Adhere liner to the casing with a continuous coating of approved adhesive and with adhesive clips or welded studs on 16" centers.
    b. Provide coating of Foster 30-30 on air entering side and seal other joints with metal or fiberglass cloth so that liner will be smooth to air flow.

3.2 CLEANING

A. Clean ductwork thoroughly to assure all foreign matter, dirt, etc. is removed.

3.3 LEAKAGE TESTING OF INSTALLED SYSTEMS

A. Test Low Pressure Ductwork as follows:

1. Follow procedure published by United Sheet Metal Division of United McGill Corporation entitled "System Pressure Testing for Leaks" using prescribed test kit containing test blower, two U-tube manometers, and calibrated orifice tube.
2. Installed low pressure duct system to be pressurized to 50 percent over design operating pressure or 2" w.g. whichever is greater. Air leakage at test pressure to be measured by a calibrated orifice type flow meter. Total allowable leakage of

system shall not exceed 1/2 of 1 percent of system air handling capacity. If system is tested in sections, leakage rates to be added to give performance of whole system.

3. Leakage concentrated at one point may result in objectionable noise even if system passes leakage rate criteria; correct to satisfaction of Designer.
4. Orifice flow measurement device to be individually calibrated against a primary standard and calibrated curve permanently attached to orifice tube assembly.
5. Leak testing shall be observed by the General Contractor's on-site quality control representative. The contractor shall have on site at all times the duct leak test training video distributed by the Owner. Maintain on site a set of prints to identify, in different colors, the duct sections isolated for each test, as well as the date of the leak test and final leakage rate recorded for each duct section.

END OF SECTION

SECTION 233111 SHEET METAL DUCTWORK - MEDIUM PRESSURE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The contractor shall provide and/or construct all materials, ductwork, joints, transformations, fittings, access doors, etc., as set forth in these specifications necessary to install the medium pressure sheet metal ductwork required by the drawings.

B. Medium pressure - sheet metal ductwork with air velocity greater than 2000 feet per minute and static pressure 6" or less, but greater than 2".

C. It is the intent of this specification to provide an installed duct system which will supply the air quantities indicated by the plans and have the lowest possible friction loss with the least possible leakage loss. Leakage shall not exceed one percent of the respective system capacity. Friction loss for each system shall not exceed that which is indicated in the A.C. unit schedule as external static pressure or in the fan schedule as static pressure and shall include the losses of all accessories. Friction losses shall be minimized by reduction in the number of offsets and elbows by pre-planning the duct system installation and coordination with other trades to prevent interferences. Access to all accessories requiring maintenance, service, and inspection shall be maintained. Radius elbows are preferred for all turns to minimize friction, noise and vibration; and, especially, for sections having large volume or higher velocities, and sections which may have turbulences.

D. Medium pressure ductwork is required from the outlet of AHU to each variable volume terminal box and shall be constructed to meet a 4.0" pressure class minimum or higher as required to meet air handling unit design external static pressure.

1.2 QUALITY CONTROL AND REGULATORY STANDARDS

A. SMACNA Manual: Sheet metal tradesman to have access, on the construction site, to "HVAC Duct Construction Standards, Metal and Flexible, Second Edition, 1995". The Manual is referred to in the specifications for required construction methods and details. The Contractor shall comply with applicable provisions of the SMACNA Manual and the more stringent requirements of this specification.

B. Quality control involves not only the general performance requirements for all air ducts; but also, quality workmanship, which includes layout preplanning so that offsets, rises, falls, elbows, fittings, etc., are minimized or eliminated. General performance requirements for all ducts include:

1. Dimensional stability (shape deformation and strength).
2. Containment of the air being conveyed (leakage control). (See Part 3 of this specification for leakage testing.)

3. Vibration (fatigue and appearance).
4. Noise (generation, transmission or attenuation).
5. Exposure (to damage, weather, temperature extremes, flexure cycles, wind, corrosive atmospheres, biological contamination, flow interruption or reversal, underground or other encasement conditions, combustion, or other in-service conditions).
6. Support (alignment and position retention).
7. Thermal conductivity (heat gain or loss and condensation control).

C. Provide galvanized duct materials which meet requirements of SMACNA manual and local and state codes, whichever is the most stringent.

D. Support duct in accordance with SMACNA manual, local and state codes, and details on plans, whichever is the most stringent.

E. Emboss fittings and duct sections with material gauge, manufacturer, and type material.

F. Materials used as sealers, liners, pre-insulated jackets and flexible ducts shall comply with a flame spread rating of 25 or less and a smoke developed rating of 50 or less.

G. Joint sealer shall meet the requirements of UL181A or UL181B as applicable.

H. Duct sealant classification: Seal all transverse joints, longitudinal joints and duct wall penetrations in accordance with SMACNA Class A.

1.3 SUBMITTALS AND SHOP DRAWINGS

A. Submit material/product data to owner for approval.

B. Shop Drawings: The Contractor is to submit to Owner for approval complete sheet metal shop drawings of all ductwork, including equipment rooms, shafts, and especially, congested areas and areas with possible conflicts. No installation shall proceed without owner stamped approval of shop drawings. Submittal to reflect space requirements coordinated with other trades such as Electrical, Plumbing, Mechanical, and Structural. Prior to submission to Owner, shop drawings to have stamped approval of major trades which occupy ceiling space (HVAC, plumbing, piping, sprinkler, and electrical), to substantiate adequate coordination as to space and accessibility and to ensure no conflict exists between contractors.

C. The General Contractor shall be responsible for coordination between trades and shall stamp and sign the duct drawings to substantiate that the coordination has been accomplished. Noncritical piping, low pressure ducts, and conduit shall give way to medium pressure ducts.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Sheet Metal, Angles, Bar Slips, Hangers and Straps: Galvanized steel.

B. Screws: Cadmium plated.

C. Joint Sealer: Manufactured by Hardcast, Inc., Two-Stage Sealant Process.

1. Stage 1: Apply fiber DT tape.
2. Stage 2: Brush on RTA-50 sealant over fiber tape.

2.2 GENERAL FABRICATION REQUIREMENTS

A. Medium-pressure duct and fittings to be manufactured by a company who has had as its principal business the manufacture of spiral duct and welded fittings for at least five years.

B. Medium-pressure fittings to be manufactured by same manufacturer of ductwork to assure tight fit of all ductwork and components.

C. Supplier of medium-pressure ductwork to provide to Designer certified copies of test data made by independent United States laboratory covering all duct and fittings as manufactured by supplier.

D. Duct test data to cover leakage rate, bursting strength, collapsing strength, seam strength, and friction loss. Friction loss test data to cover both duct and assembled coupling joints. Fitting test data to cover friction loss tests of all fittings shown on drawings.

E. Installation manuals to be included by the Contractor with submittals. Manuals to provide detailed instructions on assembly, joint sealing, erection, reinforcement of flat-oval duct, and system pressure testing for leaks.

2.3 SPECIFIC FABRICATION REQUIREMENTS

A. Round Duct and Fittings:

1. Round duct to be manufactured using galvanized steel meeting ASTM A-525. Construction shall be in accordance with SMACNA manual and manufacturer's standards.
2. Round duct is to have appropriate seams made to eliminate leakage based on pressures for which the system has been designed. Longitudinal seam duct to have fusion welded butt seam.
3. Fittings and couplings shall have the minimum gauges specified by SMACNA Manual. Fittings to have continuous welds along all seams.

4. Divided flow fittings (90 degree and 45 degree branches, wyes, crosses, etc.) to be manufactured as a separate fitting, not as a tap collar or saddle tap welded into spiral duct sections. Entrances to be free of weld buildup, burrs, or irregularities.
5. Elbows in diameters 3" thru 8" to be stamped elbows. Other elbows to be gored construction with all seams continuously welded. Elbows to be fabricated to center line radius of 1.5 times the cross-sectional diameter. Two-piece mitered elbows shall not be used unless specifically shown on plans.
6. Spun bellmouth connections to be used at each round take-off from medium pressure plenum.
7. Galvanized areas damaged by welding to be coated with corrosion resistant aluminum paint.

2.4 COUPLINGS FOR ROUND MEDIUM-PRESSURE DUCT

A. Diameters up to 60":

1. Duct-to-Duct joints to be sleeve couplings, reinforced by rolled beads.
2. Duct-to-fitting joints to be slip-fit of projecting collar fitting into duct.
3. Insertion length of sleeve coupling and fitting collar to be 2" minimum.

B. Flat-Oval Duct and Fittings:

1. Provide flat-oval duct and fittings where indicated on drawings by symbol accompanying minor and major axis dimensions.
2. Provide spiral-seam, flat-oval duct manufactured from galvanized steel in the following U.S. Standard gauges:

FLAT OVAL DUCT CONSTRUCTION, SPIRAL SEAM	
MAXIMUM WIDTH (IN.)	**GAUGE**
0 - 24	24
25 - 48	22
49 - 70	20
70 and up	18

3. Provide reinforcement and bracing in accordance with SMACNA manual and published details of spiral flat-oval duct manufacturer for size and pressure conditions applicable.
4. Matching flat-oval fittings to be manufactured from galvanized steel with continuous weld seams in the following U.S. Standard gauges:

FLAT OVAL FITTING CONSTRUCTION	
MAXIMUM WIDTH (IN.)	**GAUGE**
0 - 36	20
37 - 60	18
61 and up	16

5. Construct flat-oval duct for sizes not available in spiral construction to the following minimum gauges:

FLAT OVAL DUCT CONSTRUCTION, LONGITUDINAL SEAM	
MAXIMUM WIDTH (IN.)	**GAUGE**
0 - 36	20
37 - 60	18
61 and up	16

6. Flat-oval duct not of spiral construction to be adequately braced on 4' centers by reinforced couplings or angle ring flanges to limit amplitude of wall vibration to plus or minus 0.008" and maximum wall deflection to 0.52" at 6" static pressure. Provide angle flanges when maximum width exceeds 41" or when maximum height exceeds 26".
7. Spun bellmouth connection shall be used at each flat oval duct connection to medium pressure plenum.

C. Rectangular Ductwork:

1. Reinforce rectangular duct with angles, i.e., no internal tie rods will be allowed for reinforcing. Joints to be double "S" slip up to 60" in width and companion angle flanged joint above 60" in width. Sheet metal gauges for medium pressure duct shall be as required by SMACNA manual.
2. Fabricate elbows using one of the following methods:

    a. Six inch throat radius with full radius, single thickness vanes and full heel radius. Maximum unsupported length of vanes shall be 36". Vanes shall be secure and stable in installed operating position. Construct vane edges to project tangents parallel to duct sides.
    b. Unvaned elbow with the throat radius equal to 3/4 of the width of the duct and a full heel radius.
    c. Square elbows with H-E-P: High Efficiency Profile turning vanes as manufactured by Aero/Dyne Company. Turning vanes shall be double thickness airfoil design with smoothly-rounded entry nose and extended trailing edge. Turning vane assemblies shall be fabricated with side rails and installed on design centers across the full diagonal dimension of the elbow. Vanes are to be installed in strict accordance with manufacturers' recommendations.
    d. Radius elbows are the preferred fitting. Square elbows are to be used only when available space prevents the use of radius elbows.

3. Contractor may request round or oval duct be substituted for any rectangular duct shown. Size substitutions to be based on equivalent airflow resistance.

D. Internally Insulated Double Wall Duct and Fittings:

1. Construction to be comprised of airtight outer pressure shell, 1" insulation layer, and perforated metal inner liner completely covering insulation.
2. Provide outer pressure shell manufactured from galvanized steel meeting ASTM A-525. Duct and fitting construction to be as specified for single wall round and flat oval duct.

3. Provide inner liner manufactured from galvanized steel meeting ASTM A-525 in the following minimum gauges:

	Diameter or Minor Axis, Inches		
	0”-34	35”-59	60+
Duct, Perforated Inner Liner	28	26	22
Fitting, Perforated Inner Liner	22	22	22

4. Perforations not to exceed 3/32" diameters. Percentage of open area to equal 13 percent.
5. Support inner liners of both duct and fittings with metal spacers welded in position to maintain spacing and concentricity.
6. Provide inner couplings to align inner lining to maintain airflow conditions equivalent to standard single wall medium-pressure duct joints. Butt joints are not acceptable for inner liner. Accomplish alignment by extending liner of fitting for slip joint into duct or by use of double, concentric coupling with two couplings held by spacers for rigidity and wall spacing. Provide insulation end fitting where internally insulated duct connects to uninsulated duct or fitting, fire damper, or flex to bring outer pressure shell down to nominal size.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Support round ducts from building structure with galvanized steel hangers as recommended in SMACNA manual. Secure hangers to masonry portion of building by means of inserts or other acceptable anchors. Secure hangers to steel structure members by means of C-clamps. Vertical risers and other duct runs where methods of support specified above are not applicable, to be supported by angle brackets as shown in SMACNA manual.

B. Support rectangular and flat oval ducts by 1" x 1/8" galvanized band iron or 3/8" galvanized rod hangers attached to reinforcing angles and spaced same as reinforcing angles. Secure hangers to concrete beam or slab by inserts, anchor shield and bolt, toggle bolt, or expansion bolt.

C. Attach hangers to ductwork using sheet metal screws.

D. Space hangers approximately 8' along the duct for ducts under 60". For ducts 60" and larger and heavier sections, such as welded duct, space hangers at approximately 4' intervals.

E. Hangers and bracing used with ductwork to be galvanized.

F. Obstructions shall not be located within ducts.

G. Provide smooth insulation finish around dampers, access doors, and similar operating devices. Provide metal collar equivalent in depth to insulation thickness.

H. Provide pitot ports for measuring airflows in each main supply duct downstream of straightest run of main and before first branch takeoff. Form pitot ports by drilling 7/16" holes in the duct, lined up perpendicular to airflow on maximum of 8" centers. Provide minimum of 3 per duct evenly spaced. Plug holes with plastic plugs. Provide access to pitot ports for future re-balancing.

I. Seal duct joints as follows:

1. Apply sealer to male end of couplings and fittings. After joint is slipped together, place sheet metal screws 3" on center, 1/2" from joint bead. Apply sealer to the outside of the joint extending 1" on each side of the joint bead and covering screw heads. Apply tape immediately over wet sealer.
2. Duct sealer to be specifically formulated for the sealing of high-pressure duct systems. Sealer to be compatible with tape to ensure cure and bond. Submit samples of sealer and tape along with specifications of each for approval. Flame spread rating of sealer to be less than 25, smoke development rating of sealer to be less than 50. Sealer to be mineral impregnated woven fiber tape and plastic type activator/adhesive as manufactured by Hardcast Inc., or approved equal. Apply joint material in strict accordance with manufacturers' published installation instructions.
3. Flanged joints to be sealed with neoprene rubber gaskets.

3.2 LEAKAGE TESTING OF INSTALLED SYSTEMS

A. Test medium pressure ductwork as follows:

1. Follow procedure published by United Sheet Metal Division of United McGill Corporation entitled "System Pressure Testing for Leaks" using prescribed test kit containing test blower, two U-tube manometer, and calibrated orifice tube.
2. Installed medium-pressure duct system to be pressurized to 6" w.g. maximum. Air leakage at test pressure to be measured by a calibrated orifice type flow meter. Total allowable leakage of system shall not exceed 1/2 of 1% of system air handling capacity. If system is tested in sections, leakage rates to be added to give performance of whole system.
3. Leakage concentrated at one point may result in objectionable noise even if system passes leakage rate criteria; correct to satisfaction of Designer.
4. Orifice flow measurement device to be individually calibrated against a primary standard and calibrated curve permanently attached to orifice tube assembly.

END OF SECTION

SECTION 233310 - SHEET METAL SPECIALTIES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Specialties to be submitted and approved before starting installation.

B. Items to be installed approximately as shown on drawings taking into account differences in mechanical equipment submitted and that shown on contract documents. Each item to be installed so that it is readily accessible for maintenance, repair, and/or setting and balancing.

C. Diffusers, registers, and grilles to have ratings certified by Air Diffusion Council and tested per ADC Equipment Test Code 1062R2 and ASHRAE Standard 36B-63.

D. Refer to drawings for diffuser, register, and grille sizes and number of airflow directions.

PART 2 - PRODUCTS

2.1 FIRE DAMPERS

A. Fire dampers to be U.L. listed in accordance with UL-555. Fire dampers to be held in an open position with a 165 degree F fusible link and arranged to lock in position on closure.

B. Fire dampers for rectangular duct to be type "B" (Blades out of air stream) and for round duct to be Type "C" (Blades and frame out of air stream). Fire dampers located behind sidewall registers and grilles and others specifically indicated on drawings to be Type "A" (Frame and Blades in air stream). Fire dampers to be multi-leaf type with spring closing for horizontal mounting and weighted-gravity closing for vertical mounting. Dampers to be steel construction with rust resistant finish and provided with a factory-installed mounting sleeve suitable for structure. Mount per manufacturer's published U.L. approved installation instructions. Manufacturer models which provide square to round or round oval transitions are acceptable.

C. See Architectural drawings for hour-rating of walls and/or floors. Dampers to be compatible with hour ratings.

D. Fire dampers to be Ruskin Model IBD2 Curtain Type Static Fire Dampers.

2.2 COMBINATION SMOKE/FIRE DAMPERS

A. Combination smoke/fire dampers to be U.L. listed both as 1-1/2 hour fire damper under UL-555 and as smoke damper under UL-555S as Minimum Leakage Category II and Elevated Temperature Category B (350 degrees F).

B. Dampers to be steel construction with rust resistant finish and provided with 165 degree F electronic resettable fuse link (EFL) and factory-installed mounting sleeve suitable for structure. Mount damper per manufacturer's published U.L. approved installation instructions.

C. Smoke detectors to be furnished by Division 26; coordinate wiring hook-ups. Damper operator to be electric type compatible with electrical characteristics used for smoke detection and/or fire alarm system.]

D. Dampers to be Ruskin Model FSD36 with crimped type blades for low-pressure duct systems and Ruskin Model FSD60 with airfoil blades for medium- and high-pressure duct systems.

2.3 SMOKE DAMPERS

A. Smoke dampers to be U.L. listed in accordance with UL-555S as Minimum Leakage Category II and Elevated Temperature Category B (350 degrees F).

B. Dampers to be steel construction with rust resistant finish and provided with factory installed mounting sleeve suitable for structure. Mount damper per manufacturer's published U.L. approved installation instructions.

C. Smoke detectors to be furnished by Division 26; coordinate wiring hook-ups. Damper operator to be electric type compatible with electrical characteristics used for smoke detection and/or fire alarm system.]

D. Dampers to be Ruskin Model SD60 with crimped type blades for low-pressure duct systems and Ruskin Model SD60 with airfoil blades for medium- and high-pressure duct systems.

2.4 CEILING FIRE DAMPERS

A. Each ceiling fire damper to be UL 555c classified radiation damper and include 165 degree F fusible link.

B. Ceiling fire dampers for duct to be Ruskin Model CFD-2, 3, or 4 or approved equal.

C. Ceiling fire dampers for diffusers in lay-in ceilings to be Ruskin Model CFD or approved equal with thermal insulation blanket and extended frame for flex duct connection.

D. Ceiling fire dampers for diffusers in lay-in-ceilings to be Ruskin Model CFD-7 or approved equal.

E. Ceiling fire dampers for diffusers in "hard" ceilings to be Ruskin Model CFD-R5 or approved equal with thermal insulation blanket, extended frame for flex duct connection, and fusible volume adjustment.

F. Omit local dampers at diffusers and registers requiring ceiling fire dampers. Balance airflow using manual volume dampers at duct branch connections to main.

G. Coordinate requirement for square or round neck types.

H. Entire installation to be in strict accordance with manufacturers' published UL approved installation instructions.

I. All diffusers, registers, and grilles in rated ceilings must be all steel construction.

J. Contractors option to use factory assembled U.L. classified fire-rated diffusers, registers, and grilles in lieu of separate field assembled diffusers/registers/grilles and ceiling fire dampers. Factory assembled units to match all features specified herein.

K. Manual Volume Dampers (MVD): Manual volume dampers to be hand-operated type dampers constructed of galvanized steel, minimum 22-gauge for duct widths 18" and less, minimum 16-gauge for duct widths greater than 18". Dampers for ducts to 12" height and 12" diameter to be single blade carried on a 3/8" round steel rod mounted inside of duct without frame and fitted with locking type quadrant and brass end bearing plate accurately drilled and secured to duct. Dampers for ducts greater than 12" height to be multi-blade type, 12" maximum blade width up to 30" blade length and 10" maximum blade width over 30" blade length. Blades to be mounted on frame with brass sleeve bearings interconnected for operation from one locking type hand quadrant. Round pivot rods to have section faced flat to receive locking setscrew in locking quadrant. Refer to SMACNA manual Figures 2-14 and 2-15.

    1. For manual damper locations above a rigid or non-accessible ceiling or where damper access is limited, a remote damper operator shall be used. Damper operator to be self-locking worm gear designed for 3/8" damper shaft. Shaft extension to be 3/8" square rod with coupler. Remote operator to be provided with wrench operated shaft adjustment, position indication and lock nut. Where straight shaft extension cannot be used due to accessibility, a flexible cable operator with compatible damper operator and regulator may be utilized. Damper operator, shaft and regulator shall be designed for minimum 35 in-lb torque. THE FOLLOWING IS FOR TBR OR ICE COMMISSIONING PROJECTS ONLY.
    2. Ductwork manual volume damper (MVD) handles in externally wrapped ductwork shall be supplied with a stand-off bracket and locking quadrant to ensure that the handle can be adjusted without disturbing the insulation vapor barrier.

L. Backdraft Dampers (BDD): Backdraft dampers to be Ruskin Model CBD6 or approved equal low-leak counterbalanced backdraft dampers. Dampers to be heavy-duty type suitable for air velocities to 2500 fpm with all extruded aluminum construction, minimum 0.81" thick frame, and minimum .050" thick blades on maximum 4" centers. Provide blades with vinyl edge seals. Provide dampers with aluminum linkage and corrosion resistant type bearings. Provide dampers with adjustable counterbalances on blades to assist closing.

2.5 LINEAR SIDEWALL DIFFUSERS

A. Provide Titus CT-540 or approved equal linear bar diffuser for sidewall mounting at all locations designated by "LSD" on drawings. Linear bar diffuser to be extruded aluminum construction with 0 degree deflection, 1/4" wide fixed bars spaced 1/2" apart. Diffuser to be complete with maximum 3/4" flanged border, and concealed fastening. Finish to be baked-on, off-white enamel anodized with color selected by Designer.

2.6 LAMINAR FLOW DIFFUSERS

A. Provide Titus TLF-AA or approved equal laminar flow, aluminum, perforated face ceiling diffuser at all locations designated by schedule on drawings. Diffuser to have round neck, deflector ring, 3/32” diameter holes on 1/4” centers in a 60 degree staggered pattern, retainer cable and suitable for either surface-mounted or laid-in T-bar ceiling system. Finish to be baked-on, off-white enamel.

2.7 SIDEWALL SUPPLY REGISTERS

A. Provide Titus 1707 or approved equal at all locations designated by "SAR". Registers to be all aluminum construction complete with removable and rotating fixed horizontal blade core, and attached rear set of individually adjustable vertical blades. Finish to be baked-on, off-white enamel. Border to be curved, Titus Type C.

2.8 SIDEWALL RETURN REGISTERS

A. Provide Titus 1700 or approved equal at all locations designated by "RAR". Registers to be all aluminum construction complete with removable and rotating fixed horizontal blade core. Finish to be baked-on, off-white enamel. Border to be curved, Titus Type "C".

2.9 CEILING RETURN & EXHAUST REGISTERS

A. Provide Titus Model 50-F or approved equal at locations designated by schedule on drawings. Registers to be complete with 1/2" cube egg-crate aluminum grid. Finish to be baked-on, off-white enamel. Border to be flush mounted frame style.

2.10 CEILING FILTER GRILLE

A. Provide Titus 50-FF or approved equal filter grille at all locations indicated on drawings. Grilles to be complete with 1/2" cube eggcrate aluminum grid, hinged face and frame to hold 1" thick filter. Finish to be baked-on, off-white enamel. Border to be lay-in style for T-bar lay-in ceilings and surface style for rigid ceilings or exposed application. Filters to be 1" thick, 30 percent medium-efficiency Farr 30/30 or approved equal disposable type.

2.11 AIR LOUVERS

A. Air louvers shall be stationary horizontal, wind driven rain, extruded aluminum blades equal to Greenheck model EHH-601. The louvers shall be AMCA Certified. Louvers to be have minimum 0.081” thick aluminum frame and blades. Louver depth to be 6” with blades on approximate 2” spacing. Blade construction to be horizontal rain resistant style. Finish shall be color selected by Architect. Manufacturer will submit metal color chip to Architect as part of the submittal approval. Louver shall be rated at: the beginning point of water penetration (0.01 oz. of water (penetration) per sq. ft. of louver free area is above 1,250 fpm, minimum 46% free area, 0.21” S.P. resistance at 1,000 fpm. Provided 1/2” mesh expanded aluminum screen with removable frame mounted on inside face of louver. Provide minimum 10 year finish warranty.

2.12 DOOR GRILLES

A. Door grilles to be Titus T-700 steel construction with channel border for wood door construction and with flanged and auxiliary borders for metal door construction. Finish to be prime coated steel. Deliver door grilles to the Millwork Tradesman to install.

2.13 FLEXIBLE CONNECTORS

A. Install UL listed flexible duct connectors between duct and fan/equipment connections. Flexible duct connectors to be made of 28-ounce, heavy glass fabric double coated with neoprene.

2.14 FLEXIBLE DUCT

A. Flexmaster Type 1M Acoustical Attenuating or Approved equal. Submit acoustical performance of any alternate product for prior approval.

1. Characteristics of flexible duct:

    a. Approved as UL-181 Class 1 air duct.
    b. Flame spread rating less than 25 and smoke developed rating less than 50.
    c. Rated for 6" w.g. positive pressure, 4" w.g. negative pressure, and 5000 fpm air velocity.

d. Tear and puncture resistant reinforced CPE inner liner mechanically locked together with a corrosive resistant galvanized steel helix.
e. Insulated with minimum 1/2" thick fiberglass insulation with vapor barrier jacket.

B. Seal off the insulation jacket at its ends and at joints with mastic, Hardcast, or similar material. Replace flexible duct if jacket is punctured.

C. Flexible duct is NOT to be used for runouts where it must pass through walls or through smoke or fire partitions. Flexible duct is not to be used in exposed application. Flexible duct lengths shall not exceed 6 feet at each connection.

D. No bends shall be made in flexible duct with the center line radius less than one and one-half duct diameter and only one bend may occur per 6 foot length of duct material.

2.15 DUCT ACCESS DOORS

A. Duct access doors to be provided for access to all coils, fire, fire/smoke, and smoke dampers, automatic and backdraft dampers, duct smoke detectors, static pressure and air volume sensing devices, and other equipment installed in ducts and at other points indicated on drawings.

B. Access door construction and airtightness must be suitable for the duct pressure class used (low, medium, or high).

C. Access doors to be double-panel, galvanized steel construction with minimum 1" rigid insulation between panels. Access doors in exhaust duct and unlined return duct may be uninsulated single panel, galvanized steel construction. Doors to mount in rigid frame constructed of formed galvanized steel. Angle iron bracing to be used as required to provide rigid assembly. Doors to hinge on one side with door latch on opposite side.

D. Access doors in ductwork shall fully comply with Figure 7-2, 7-3 and 7-2M of SMACNA manual. Casing access doors shall fully comply with Figure 9-15 and 9-16 of SMACNA manual. Minimum size shall be 12” x 12” per NFPA 80.

E. Doors to close against gasket seal.

F. Ductwork and/or equipment access doors shall be required at all motorized dampers, fire/smoke dampers, smoke detectors, airflow monitoring stations, duct-mounted temperature/pressure sensors and/or transmitters, vaned elbows, duct-mounted heat transfer coils, sound attenuators and any other mechanical and/or control device requiring inspection, maintenance or test access. In addition, 24" x 24" access doors should be utilized wherever possible to facilitate adequate access for maintenance and/or testing.

G. Access doors for fire dampers, fire/smoke dampers, and smoke dampers shall be permanently identified on the exterior by a label having letters not less than 0.5 inches in height reading: “Fire Damper” “Fire/Smoke Damper” or “Smoke Damper” as required by 2012 International Mechanical Code.

2.16 PERFORATED PLATE

A. Construct plate of 1/16" thick galvanized steel with 1/2" diameter holes staggered 5/8" center to center, with minimum free area of 70 percent. Anchor plate to the sheet metal with angle iron as required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation to be in accordance with manufacturers’ published installation instructions as well as applicable sections of SMACNA manual.

B. Provide all screws, bolts, nuts, and inserts required for attaching sheet metal specialty items to ducts, walls, floors and ceilings.

END OF SECTION

SECTION 233620 - VARIABLE VOLUME SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall furnish all labor, materials, tools, equipment, and services for installation of variable volume/variable temperature system as indicated, in accordance with the provisions of the contract documents.

B. Completely coordinate with work of other trades.

1.2 RELATED WORK

A. Section 230710: Insulation.

B. Section 233110: Sheet Metal Ductwork - Low Pressure.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Parker Electronics or approved equal.

2.2 MATERIALS

A. Sheet Metal:

1. 14 gauge galvanized steel for control cabinets.
2. 24 gauge galvanized steel for damper assembly.
3. 20 gauge galvanized steel for damper blade.
4. Damper housing constructed of spiral duct.

B. Wiring:

1. All control and power supply wiring to equipment to be 24 volt.
2. All wiring to be minimum 18 gauge.
3. All wiring to be run in conduit.
4. Furnish and install rigid galvanized steel conduit, associated couplings, connectors and fitting as manufactured by Thomas and Betts Corp. or approved equal. Conduit to be minimum 1/2" size.

2.3 EQUIPMENT

A. System Monitor:

1. Capability to communicate with up to 8 zone thermostats.
2. Able to control heating and cooling cycles of HVAC unit.
3. Furnish with key-locked control panel.
4. Equip with system monitoring lights for the following functions:

    a. Cooling stages,
    b. Heating stages,
    c. Supply fan,
    d. Reversing valve,
    e. Governor thermostats,
    f. High-Low temperature,
    g. Power,
    h. Night set back.

5. Automatic changeover from heating to cooling mode.
6. Provisions for time clock interface.
7. Equipped with adjustable high-low temperature limits.
8. External communications capabilities.
9. Capable of governor thermostat setpoint lock.

B. Governor Damper Assembly:

1. Ability to operate in master/slave arrangement.
2. Equipped with duct temperature sensor.

C. Governor Thermostat:

1. Two-digit display of thermostat setpoint.
2. Ability to control minimum and maximum damper positions.
3. Equipped with automatic heating/cooling changeover.
4. Digital readout of damper position and duct temperature.

D. Bypass Controller:

1. Compatible with single-speed or 2-speed HVAC fans.
2. External communications capabilities.
3. Equipped with system monitoring lights for following functions:

    a. Damper open position,
    b. Damper closed position,
    c. Damper operating,
    d. Power.

E. MAID Control Panel:

1. External communications capabilities.
2. Equipped with system monitoring lights for following functions:

    a. Power,
    b. Monitor communication,
    c. External computer communication,
    d. Economizer,
    e. Cooling stages,
    f. Heating stages.

3. Furnish with key-locked control panel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all equipment as indicated and in accordance with manufacturers' recommendations and instructions.

B. Mechanical contractor to be responsible for all control and low voltage wiring and conduit installation.

3.2 DEMONSTRATION

A. Demonstrate operation of the system to Owner's representatives and instruct them in the operation, adjustment and repair.

END OF SECTION

SECTION 260100 - GENERAL PROVISIONS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Secondary power wiring and distribution system.

B. Fire alarm and smoke detection system.

C. Telephone system rough-in.

D. Lighting control equipment.

1.2 RELATED WORK

A. Foundations and pads required for equipment furnished under this division of the specifications.

B. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting.

C. Electrical control systems and interlock wiring as required by mechanical drawings, specifications or manufacturer's schematics.

D. Flashing of conduits into roofing and outside walls.

E. Heating, ventilating, and air conditioning equipment.

F. Plumbing equipment.

1.3 QUALITY ASSURANCE

A. Comply with applicable local, state and federal codes.

B. Comply with applicable requirements of recognized industry associations which promulgate standards for the various trades.

C. Employ only qualified journeymen for this work. Employ a competent qualified electrician to supervise the work.

1.4 STANDARDS

A. Perform work specified in Division 26 in accordance with standards listed below including amendments or revisions. When these specifications are more stringent, they take precedence. In case of conflict, obtain a decision from the Designer.

B. National Fire Codes (NFPA) including, but not limited to following:

1. NFPA-70 - National Electrical Code. 2017 Edition.
2. NFPA-72 - National Fire Alarm Code. Latest Edition.
3. NFPA-101 - Life Safety Code. Latest Edition.

C. Applicable Codes:

1. ANSI-A17.1: Elevators, Dumbwaiters, Escalators and moving walks.
2. IBC 2018
3. IECC 2018

D. Should any work be construed as being contrary to or not conforming to aforementioned codes, such alleged confliction to be brought to attention of Architect in writing ten (10) days prior to bid date for review so that such point in question may be resolved. All work to be installed in strict conformity with applicable codes without additional cost to Owner.

E. Contractor to submit and/or file with proper authorities all necessary specifications and drawings as required by governing authorities.

1.5 SUBMITTALS

A. Submit individual submittals for each item or piece of equipment. Assign a separate submittal number and transmittal to each item. Do **NOT** group items or equipment together in one submittal, they will be rejected and returned without review.

B. Within fifteen (15) days after contract has been awarded, Contractor to submit to Designer for review a complete list of materials, equipment, and accessories proposed for use, listing the item and manufacturer's name only.

C. Based upon aforementioned approved listing, Contractor to submit One (1) electronic PDF copy of COMPLETE BROCHURES AND SHOP DRAWINGS OF ALL MATERIALS, FIXTURES, AND EQUIPMENT that he proposes to use giving the names of manufacturers, trade name and specific catalog numbers.

D. Brochures to be submitted in time to allow fifteen (15) days from date of receipt in Engineer's office before final approval or disapproval is required to meet construction schedule. Submittals to bear Contractor's stamp of approval evidencing he has examined and checked same and information contained therein is in accordance with contract requirements, and any deviations to be clearly marked. Approval of shop drawings not to be construed as permitting departure from the contractual documents.

E. Above-mentioned brochures to be submitted and approved before any materials are ordered.

F. In the event that within time stated above contractor fails to submit complete list of materials, equipment and accessories in proper form, the Designer reserves the right to select a full line of materials, fixtures, and equipment, which shall be binding upon Contractor for these materials, fixtures, and equipment as the case may be and which shall be used in his work.

G. Brochures: Submit complete descriptions, illustrations, specification data, etc. of all materials, fittings, devices, fixtures, special systems, etc., including the following:

1. Wiring devices and plates.
2. Disconnect switches.
3. Lighting, including lamps.

H. Proposed items to be clearly indicated when other items are shown on same sheet. When proposing items other than those specified, brochures to contain both specified item sheets and proposed item sheets for ease of comparison. On request from Designer, samples shall be submitted and/or set up, as directed, for inspection and approval. Samples will be returned to Contractor.

I. Shop Drawings: Submit specific shop drawings for major materials including the following:

1. Fire alarms and smoke detection systems, including point-to-point wiring diagrams.
2. Dimensional layout of all electrical rooms, drawn to scale, with equipment location shown therein. Clearances to be in accordance with NEC and local codes.

1.6 OPERATING AND MAINTENANCE MANUALS

A. Prior to final acceptance of the project, furnish to Owner complete bound sets of operation and maintenance manuals of instructions for operation and maintenance of all pieces of equipment and systems provided under this division of specifications.

B. Manuals to also include all submittal data on all materials and equipment. Clearly indicate items provided on this project. A list giving name and address of nearest supply house carrying spare parts and name of Installation Contractor to be given to Owner.

C. Verbally instruct Owner's representatives. Contractor to obtain letter signed by the owner's representative indicating that the in-service training has been completed.

D. Three sets of the following data are required:

1. Operating and maintenance instructions.
2. Spare parts lists.
3. Copies of approved submittal data.

E. Arrange each set of data in an orderly way, and bind each set in a separate 3-ring, hard-cover binder.

F. As soon as data accumulates, prepare one of the sets and deliver to the Owner's Representative, continuously updating this set as additional data is obtained.

G. At completion of work, submit two complete sets of data to the Owner's Representative for distribution to the proper parties.

1.7 DELIVERY AND STORAGE

A. Insofar as possible, deliver items in manufacturers' original unopened packaging. Where this is not practical, cover items with protective materials, to keep them from being damaged. Use care in loading, transporting, unloading, and storage to keep items from being damaged.

B. Store items in a clean dry place and protect from damage.

C. All damaged painted surfaces of equipment to be touched up to match original paint.

1.8 RECORD DRAWINGS

A. Keep a set of blueline prints at the job site exclusively for recording deviations from the drawings.

B. Record locations and depths of buried and concealed conduits from fixed easily identifiable objects, such as building walls. Where conduits are concealed in walls, indicate distances off of building corners or other building features not likely to be disturbed by future alterations.

C. Mark deviations in colored pencils so that work of various systems can be easily identified.

D. When work is completed, record all deviations on clean sepia copies of drawings.

E. Submit three sepia copies of completed "record drawings" to Owner's Representative for distribution.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. All materials and equipment used in carrying out these specifications to be American made unless approved otherwise by the Owner and to be new and have UL listing, or listing by other recognized testing laboratory when such listings are available. Specifications and drawings indicate name, type, and catalog numbers of materials and equipment to be used as "standards" shall not be construed as limiting competition. Contractor may at his option, use materials and equipment when, in the judgment of the Designer, they are equivalent to that specified.

PART 3 - EXECUTION

3.1 COORDINATION

A. Intent:

1. These sections of specifications and drawings form a complete set of documents for the electrical work of this project. Neither is complete without the other. Any item mentioned in one shall be as binding as though mentioned in both.
2. The intent of these specifications and drawings is to form a guide for a complete electrical installation. Where an item is reasonably necessary for a complete system but not specifically mentioned, such as pull boxes, fittings, expansion fittings, support hangers, etc., provide same without additional cost to Owner.
3. Electrical layouts indicated on drawings are diagrammatical only. Exact location of outlets to be governed by project conditions. The Designer reserves the right to make any reasonable changes (approximately 6 feet) in location of junction boxes, or equipment prior to roughing-in of such without additional cost to Owner.

B. Deviations:

1. No deviations from specifications and drawings to be made without full knowledge and consent of Designer.
2. Should Contractor find during progress of work that existing conditions make desirable a modification of the requirements of any particular item, report such item promptly to Designer for his decision and instructions.

C. Insofar as it is possible to determine in advance, leave proper chases and openings. Place all outlets, anchors, sleeves, and supports prior to pouring concrete or installation of masonry work. Should contractor neglect doing this, any cutting and/or patching required to be done is at this contractor's expense.

D. Visit site and be informed of conditions under which work must be performed. No subsequent allowance will be made because of error or failure to obtain necessary information to completely estimate and perform work involved.

E. Designer to be mediating authority in all design related deviations and disputes arising on the project.

F. Coordinate to assure that proper points of service transformer locations, voltage characteristics and capacity of service are in accordance with contract drawings.

3.2 CUTTING AND PATCHING

A. Repair or replace routine damage caused by cutting in performance of this contract.

B. Correct unnecessary damage caused due to installation of electrical work, brought about through carelessness or lack of coordination.

C. Holes cut through existing floor slabs to be core drilled with drill designed for this purpose. All openings, sleeves and holes in slabs between floors to be properly sealed, fire proofed and water proofed.

D. Repairs to be performed with materials which match existing materials and to be installed in accordance with appropriate sections of these specifications.

3.3 TRENCHING, EXCAVATION, BACKFILLING, AND REPAIRS

A. Provide trenching, excavation, and backfilling necessary for performance of electrical work.

B. Trenching and excavation to be unclassified. No extra will be paid in event that rock is encountered.

C. Backfilling to be carefully done using only clean earth thoroughly tamped and compacted below and above embedded items.

3.4 FOUNDATIONS AND PADS

A. Provide foundations and pads required for equipment provided under this division of specifications. Coordinate proper size and location of foundations, pads, anchor bolts, and other items to be built into structure.

B. Concrete to be in accordance with concrete division of these specifications.

3.5 TESTS

A. On completion of work, installation to be entirely free from grounds, short circuits, and open circuits. Perform a thorough operational test in presence of Owner or his representative. Balance all circuits so that feeders to panels be not more than 10% out of balance between phases with all available load energized and operating. Furnish all labor, materials and instruments for above tests.

B. Furnish Owner, as a part of closing file, a copy of such tests including identification of each circuit and readings recorded. Test information to be furnished to Owner includes ampere readings of all panels and major circuit breakers, insulation resistance reading of motors and transformers.

C. Prior to final observation and acceptance, test, leave in satisfactory operating condition all electrical systems and equipment including but not limited to the following:

1. Electrical distribution system.
2. Ground fault protection system.
3. Fire alarm and smoke detection system.
4. Electric motors for all equipment.
5. Electric safety devices.

3.6 INSPECTION FEES AND PERMITS

A. Obtain and pay for all necessary permits and inspection fees required for electrical installation.

3.7 IDENTIFICATION OF EQUIPMENT

A. Properly identify all starters, contactors, relays, safety switches and panels with permanently attached black (normal power) or red (essential systems) phenolic plates with 1/4" white engraved lettering on the face of each attached, with two sheet metal screws. Starters and relays connected by the electrical tradesman to be identified by him whether furnished by him or others.

3.8 TEMPORARY LIGHTS AND POWER

A. Provide a temporary electrical lighting and power distribution system of adequate size to properly serve the following requirements, including adequate feeder sizes to prevent excessive voltage drop. Temporary work to be installed in a neat and safe manner in accordance with the National Electrical Code, Article 590, and as required by OSHA or applicable local safety codes.

B. Provide one pigtail socket with 150 watt lamp for every 1000 square feet of floor area, evenly distributed throughout building and with minimum of one pigtail socket per room.

C. Provide one duplex power outlet for every 1,500 square feet of floor area, evenly distributed throughout the building. Power outlets to be 20 amp, single phase located as directed by the contractor.

D. Check with contractor prior to installation to determine if any lighting or power outlets over the maximum quantity noted above are required.

E. Provide service and panelboards required for above lighting and power outlets.

F. Power consumption will be paid for by the Contractor.

G. Check with the Contractor prior to installation to determine whether single phase or three phase service is desired.

H. Contractor to maintain the existing lights and power during normal regular hours as directed by Owner. Any interruption of power must be approved by and coordinated with Owner's representative.

3.9 DEMOLITION

A. Contractor shall visit the site before submitting a bid to acquaint himself with existing conditions.

B. Work in existing buildings shall be scheduled well in advance with the Owner. Work shall be performed at such times and under such conditions as suit the convenience of the Owner. Plan the work to minimize disruption of formal operations.

C. In renovated areas, remove wiring devices, fixtures, components, electrical equipment, conductors, boxes, and conduits not required to remain in service when this project is complete.

D. Remove existing conduit and wire from areas to be remodeled, back to panelboard, cabinet or junction box.

E. Where a circuit is interrupted by removal of a device or fixture from that circuit, the contractor shall install wire, conduit, etc., as required to restore service to the remaining devices and fixtures on that circuit.

F. Lighting fixtures, wiring devices, panelboards, and conductors removed shall be offered to the Owner. If he chooses to retain these items or a part of these items, turn those chosen over to him. Items rejected by the Owner shall be removed from the project site by the contractor.

3.10 OBSERVATIONS

A. When field observation services are a part of the project scope, Engineer's office will provide periodic observation of the progress of work specified herein. Purpose of the observation is to ensure compliance of Contractor's work with specifications and drawings. Engineer's office will also observe tests required of Contractor as called for in other sections of specifications.

B. Specifications and drawings represent work to be done in view of total project requirements. Final location of conduits, fixtures, panels, switchboards, etc., to eliminate possible conflict with other trades is responsibility of Contractor. Contractor to provide all supervision required for his personnel to ensure that installation is made in accordance with specifications and drawings and all safety rules and regulations are observed. In event of conflicts of work on project with other trades, Contractor to make every reasonable effort to resolve conflict through meetings and discussions with other parties involved, by preparation of drawings or other appropriate action. Only after this has been done shall the Engineer's assistance be requested.

C. When Engineer is requested to visit project to aid in resolution of conflicts or for witnessing tests, he shall be given a minimum of 48 hours notice prior to time his presence is required at job site.

D. Cost of Engineer's time for general observation or test observance as described herein is to be borne by Engineer except in those cases where Engineer has been requested to visit project and upon visiting finds Contractor has caused Engineer an unnecessary visit. It shall be deemed an unnecessary visit in the following circumstances.

1. Due to lack of supervision on Contractor's part.
2. Test is not ready for observation.
3. Engineer is placed in role of determining reason system or equipment is not operating properly, only to find that Contractor has not fulfilled his responsibility in troubleshooting, etc.
4. Contractor requests a trip to check off final punch list items and it is found that no attempt has been made by Contractor to correct previous punch list items.
5. Contractor will be billed for Engineer's time for making unnecessary visit at the rate of $400 per day plus mileage and living expenses.

3.11 WARRANTY-GUARANTEE

A. Designer reserves right to accept or reject any part of installation which does not successfully meet requirements as set out in these specifications.

B. Contractor shall and hereby does guarantee all work installed under this division shall be free from defects in workmanship and materials for a period of one year from date of final acceptance, whichever is earliest. The above parties further agree that they will repair and replace any defective material or workmanship which becomes defective within the terms of this warranty-guarantee.

END OF SECTION

SECTION 260519 - CONDUCTORS 600 VOLT AND BELOW

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide a complete system of conductors for lighting, power, and controls throughout building.

B. Refer to drawings for sizes of conductors.

PART 2 - PRODUCTS

2.1 CONDUCTORS - POWER AND LIGHTING

A. Provide 98% conductivity copper conductors with 600-volt insulation.

B. Interior conductors shall be Type THHN-2/THWN-2 insulation.

C. 600-volt insulation for conductors installed in underground raceways shall have XLP (cross-linked polyethylene) insulation, Type XHHW-2.

D. For feeder and branch circuit conductors No. 12 AWG and No. 10 AWG, provide solid type.

E. For all control and motor circuits, and all conductors No. 8 AWG and larger, provide stranded type.

F. Conductors shall be manufactured by Triangle, Phelps Dodge, Southwire, or approved substitute.

G. Provide white or gray colored neutral conductors; provide black or color coded phase conductors.

H. Provide No. 14 AWG stranded type THHN fixture conductors, for conductors entering fixtures and in stems of pendant fixtures.

I. Provide type THHN stranded conductors, 90 degrees C for conductors running through continuous rows of fluorescent fixtures.

J. Where permitted by local codes, Type MC cable may be used for branch circuits routed concealed above ceilings or in walls.

2.2 CONDUCTORS - CONTROLS

A. Single Conductor

1. Class B stranded soft-drawn copper with 600 volt thermoplastic insulation.
2. Size 14 AWG.
3. Type THHN/THWN.

B. Multiconductor

1. 600 Volt insulated Type TC
2. 16 AWG stranded (7x24) copper
3. PVC insulation – unshielded
4. 90 º C rating

2.3 CONDUCTORS - INSTRUMENTATION

A. Type TC, Class B concentrically stranded copper with 300 volt PVC insulation.

B. Single twisted pair of triad shielded cables as required.

C. Overall foil shield with stranded, tinned copper drain wire.

D. Separate communication wire for calibration.

E. Size 16 or 18 AWG.

F. Temperature Rating: 105 degrees C.

2.4 CONDUCTORS - THERMOCOUPLE

A. Solid thermocouple extension wire with 300 volt PVC insulation (nominal 16 mils).

B. Color coded per ANSI - MC96.1 - 1982.

C. Single twisted pair, one conductor identified, with overall aluminum/mylar shield with a tinned copper drain wire.

D. PVC insulated copper communications wire.

E. Size 16 AWG for runs over 100 feet - otherwise 20 AWG.

F. Temperature Rating: 105 degrees C.

2.5 DATA CONNECTIONS

A. Ethernet shall be CAT-5e manufacturer's rated cable.

1. Industrial Ethernet cable with 300 volt PVC jacket
2. RJ-45 Compatible
3. Gigabit Ethernet, Ethernet I/P compliant
4. Temperature Rating: 75 degrees C.

B. Ethernet Fiber Optic cable shall be multimode with the following features.

1. Fiber Type: 62.5/125/250 Micron
2. 12 Fiber unless specifically detailed on plans
3. Gigabit Ethernet compatible.TIA/EIA 455 certified for crush and impact resistance.
4. 300 volt PVC insulated.
5. Temperature Rating: 70 degrees C.

C. Serial RS-485 cable shall be 22 gauge twisted, shielded pairs (2-pair).

1. 100% foil covered.
2. 65% braid.
3. 120 ohm characteristic impedance.
4. 11 pF/ft conductor to conductor and 20.9 pF/ft conductor & shield.
5. 300 volt, 60°C PVC jacket.

D. Allen-Bradley DH+ cable.

1. Twinax shielded cable.
2. Nominal characteristic impedance: 78 ohms
3. Nominal inductance: 0.13 µH/Ft
4. Nominal capacitance: 19.7 pF/Ft conductor to conductor.
5. Outer jacket: 300 volt PVC for dry installation and Polyethylene for wet applications.
6. Temperature Rating: 80 degrees C.

E. ControlNet cable

1. RG-6/U Coax with 18 AWG solid copper conductor
2. Quad shielded with 100 % coverage
3. Nominal characteristic impedance: 75 ohms
4. Nominal inductance: 0.093 µH/Ft
5. Nominal capacitance: 16.3 pF/Ft conductor to shield.
6. Outer jacket: PVC for dry installation and PVDF for wet applications.
7. Temperature Rating: 75 degrees C

F. ODVA DeviceNet (Thicknet) Cable

1. Multiconductor cable with stranded conductors.
2. 15 & 18 AWG tinned conductors for bus power and data.

3. 65% coverage braided shield
4. Impedance per pair: 120 ohms
5. Nominal capacitance: 12 pF/Ft (18 AWG pair)
6. 600 volt PVC outer jacket
7. Temperature Rating: 75 degrees C.

G. ODVA DeviceNet (Thinnet) Cable

1. Multiconductor cable with stranded conductors.
2. 22& 24 AWG tinned conductors for bus power and data.
3. 65% coverage braided shield
4. Impedance per pair: 120 ohms
5. Nominal capacitance: 12 pF/Ft (18 AWG pair)
6. 600 volt PVC outer jacket
7. Temperature Rating: 75 degrees C.
8. Rated for NEC Class II application.

H. Foundation Fieldbus or PROFIBUS Cable

1. 18 AWG stranded tinned copper twisted conductors
2. 100 % overall aluminum foil-polyester shield with drain wire
3. Inductance: 0.19 µH/Ft
4. Impendence: 100 ohms at 0.03125 MHz
5. Nominal Capacitance: 24 pF/Ft conductor to conductor
6. 300 volt PVC outer jacket
7. Temperature RATING: 105 degrees C

2.6 ACCEPTABLE MANUFACTURERS AND TYPES - CONTROLS, INSTRUMENTATION, DATA CONNECTIONS AND THERMOCOUPLE

A. Use Belden or approved substitute.

B. Control Wiring: Belden 27618A multiconductor cable

C. Instrumentation: Twisted Pair – Belden 1032A or Belden 3076F cable.

D. Instrumentation: Twisted Triad – Belden 1031A cable.

E. Thermocouple Extension: Belden 311xA series cable where x = thermocouple type.

F. Ethernet Cable: Belden DataTuff 7923A cable

G. Ethernet Fiber: Belden I60xx55 Fiber cable where x = number of fibers

H. RS – 485 Cable: Belden 3107A cable

I. ControlNet Cable: Belden 3092A or 3093A for underground and wet locations

J. DH+ Cable: Belden 9463 or Belden 9463DB for underground locations

K. DeviceNet: Belden 7897A (Thicknet) or 3084A (Thinnet)

L. Foundation Fieldbus and PROFIBUS Cable: Belden 1327A (2 – Pair) for connection from control cabinet to segment protector and Belden 3076F (1 – Pair) for instrument drop connection.

2.7 TRAY CABLE

A. Description: Control or power cable for use in cable trays and raceways. THWN-2 insulated copper conductors for use in areas with ambient temperatures above 30 degrees Fahrenheit. XHHW-2 insulated copper conductors for use in areas with ambient temperatures at or below 30 degrees Fahrenheit.

B. Type TC Cable.

C. Meets UL 1581 for CT use.

D. Meets UL 1277 for direct burial and sunlight resistance.

E. Color coded per ICEA-S-58-679 Method 1 for control cable.

F. Color coded per ICEA-S-58-679 Method 4 for power cables.

G. Insulated voltage rating: 600V.

2.8 TYPE MC CABLE

A. Type MC Cable shall not be used without prior written approval from the Owner. If approval is given, MC Cable shall only be permitted as allowed by local code and as described below.

B. Maximum length of MC Cable per branch circuit shall be limited to 35 feet after transition from EMT. MC Cable shall not be permitted directly inside a panelboard. EMT conduit shall be used from the panel.

C. MC Cable shall not be permitted for use in branch circuits serving HVAC, elevator/escalator, medical and kitchen equipment loads.

D. MC Cable shall not be permitted for use within mechanical, electrical, or telecommunications rooms.

E. MC Cable shall not be used for exposed branch circuits or wet locations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install pull boxes in circuits or feeders over 100' long.

B. All conductors shall be continuous from origin to panel or equipment termination without splices where possible. Where splices and taps are necessary or are required, they shall be made in splice boxes with suitable connectors.

C. Make all splices or connections only at outlet, pull or junction boxes.

D. Use pulling compound to pull conductors.

E. Install instrument and data connection conductor in separate raceways from all other conductors. Separate control wiring from power wiring in separate raceways. Separation distances shall be as specified by control system manufacturer or as listed in IEEE Standard 518, whichever is greater.

F. Bend radius on conductors shall be less than the limitations listed by the cable manufacturer.

G. Deliver all conductors to job site new and in original wrapping, package or reel.

H. All conductors and connections shall test free of grounds, shorts, and opens.

I. For 20-amp, 120-volt branch circuits, provide No. 10 wire in lieu of No. 12 wire for any branch circuit in excess of 90 linear feet to prevent excessive voltage drop. Where branch circuit exceeds 175 linear feet, use No. 8 wire.

J. Use Ideal wing nuts, Scotchlok Type Y, R, G, or B, or approved equivalent connectors for fixture connections at outlet boxes.

K. Make feeder taps and joints with OZ type T, PT, PM or PTS, or approved equivalent clamp connectors as manufactured by Kupler, or with approved compression sleeves. Wrap connectors with No. 10 electro-seal or approved equivalent plastic filler and vinyl tape.

L. Use only compression lugs equal to T & B series 60,000 for termination of aluminum conductors.

M. Leave a minimum of 8" slack wire in every outlet box whether it be in use or left for future use.

N. Color code conductors as follows:

CONDUCTOR COLOR CODE	
	120/208 Volt
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Ground	Green

O. If the above conflicts with existing color coding, match existing.

P. Use factory color coded conductors where commercially available. If not, use black wire and band with color tape.

END OF SECTION

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The entire system of raceways and equipment to be grounded in accordance with Article No. 250 of latest edition of National Electrical Code and any local regulation or governmental governing authority.

PART 2 - PRODUCTS

2.1 GROUND CLAMPS

A. OZ Electrical Manufacturing Company, Steel City, Appleton, or approved substitute.

B. Feeder circuits to panels, motor control centers, etc., shall have a separate green grounding conductor in conduit sized in accordance with Table 250.122 of N.E.C.

C. All branch circuits shall have a separate green grounding conductor installed in same conduit as phase and neutral conductor from panel ground bus to device. The grounding conductor shall be sized in accordance with Table 250.122 of N.E.C.

D. Flexible conduit will not be approved as achieving continuity of ground. All flexible conduit shall have a jumper wire sized to ampacity of branch breaker and shall be connected to conduit system on both ends; this applies to fixtures, motors, controls, etc.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Effectively bond all grounding conductors to grounding electrodes, equipment enclosures and ground busses.

B. Provide a shunt path around main water meter by bonding around both sides of meter to assure continuity.

C. Locate all grounding attachments away from areas subject to physical damage. Provide protective covering as required.

D. Clean all non-conductive surfaces on equipment to be grounded, to assure good electrical continuity.

END OF SECTION

SECTION 260529 - SUPPORTING DEVICES AND HANGERS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide a system of supporting devices and hangers to ensure secure support or bracing for conduit, electrical equipment, including safety switches, fixtures, panelboards, outlet boxes, junction boxes, cabinets, etc.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide appropriate supporting devices and hangers as manufactured by Erico Products, Inc., Steel City, Rayco, or approved substitute:

1. Vertical flange clamps (beam clamps).
2. "Z" purlin clips.
3. Conduit clips.
4. Universal clamps (Beam clamps).
5. Beam clamps (set screw type).
6. Combination push-in conduit clips.
7. Combination conduit hanger clamps.
8. Flexible conduit clips.
9. Special combination conduit clips.
10. One hole steel straps.
11. Minerallac conduit hangers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Secure conduits to within 3' of each outlet box, junction box, cabinet, fitting, etc., and at intervals not to exceed ten feet (10') for EMT and IMC conduit and in accordance with Table 344.30 (B) (2) for Rigid Steel conduit. In seismic zones, support conduits 1" and under at 6' intervals.

B. Install clamps secured to structure for feeder and other conduits routed against the structure. Use drop rods and hangers or racks to support conduits run apart from the structure.

C. Furnish and install suitable angle iron, channel iron or steel metal framing with accessories to support or brace electrical equipment including safety switches, fixtures, panelboards, outlet boxes, etc.

D. Paint all supporting metal not otherwise protected, with rust inhibiting primer and then with a finish coat if appropriate to match the surrounding metal surfaces. (Prepainted or galvanized support material is not required to be painted or repainted.)

E. Secure type "NM" (Romex) non-metallic sheathed cable, with appropriate staples or straps, to within 12" of outlet boxes; and, at intervals not to exceed 4-1/2 feet, in accordance with N.E.C.

F. Secure Type "AC" armored cables with appropriate straps or staples to within 12" of outlet boxes and at intervals not to exceed 4-1/2 feet in accordance with N.E.C.

G. Support all fixtures including lay-in troffers from the structure as detailed on the drawings to comply with seismic requirements for the specific area.

H. Use of chains, perforated iron, bailing wire, or tie wire for supporting conduit runs will not be permitted.

I. For support of low voltage wiring not required to be in conduit, Contractor shall bundle cables together in a neat manner using approved nylon tie wraps. Bundled cables shall be supported with "J" hooks on telephone type bridle rings, a minimum of 6 feet on centers. Contractor shall clearly identify all differing types of cables being run and tag them with tape tags reading "telephone", “data”, etc., for the appropriate system cables. Identification tape shall be provided at minimum intervals of 25 feet on center and within each building space.

END OF SECTION

SECTION 260534 - RACEWAYS AND CONDUIT SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide a complete conduit system with associated couplings, connectors, and fittings.

B. Conduits shall be mechanically and electrically continuous from outlet to outlet and from outlets to cabinets, pull or junction boxes.

1.2 SUBMITTALS

A. Submittal for products furnished under this section is not required.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. IMC, RGS and EMT conduit shall be hot-dip galvanized, or electrogalvanized steel by Allied, Wheatland Tube, Republic Conduit, Western Tube, or approved substitute.

B. Erickson couplings for IMC and RGS, shall be used where neither length of conduit can be rotated.

C. IMC/RGS conduit connectors from 1/2” to 4” trade sizes shall use compression type.

D. EMT conduit connectors from 1/2” to 2” trade sizes shall use set screw type. EMT conduit connectors from 2-1/2” to 4” trade sizes shall use two set screw type.

E. EMT conduit connectors from 1/2” to 4” trade sizes shall use compression type.

F. Weatherproof hub shall be complete with sealing "O" ring or sealing locknuts.

G. Provide polyvinyl chloride (PVC) conduit, Type 40, and associated couplings, connectors, and fittings. PVC conduit shall be UL listed and 90 degrees C UL rated.

H. Provide aluminum conduit in areas requiring non-ferrous materials.

2.2 ELECTRICAL METALLIC TUBING (EMT)

A. Use Electric Metallic Tubing (EMT) for:

1. Branch circuits installed overhead, both exposed and concealed, installed more than 6 feet above finished floor.
2. Branch circuits originating from isolated panels (O.R., Cystoscopy, or Delivery).

2.3 INTERMEDIATE METAL CONDUIT (IMC)

A. Use Intermediate Metal Conduit (IMC) for:

1. Panelboard feeders.
2. Branch circuits installed in hazardous areas.
3. Branch circuits and feeders installed in concrete slabs at ground floor.
4. Branch circuits installed exposed below 6 feet above finished floor.
5. Branch circuits installed in wet locations.
6. Pendant drops.

2.4 RIGID GALVANIZED STEEL (RGS)

A. Conduit Use:

1. Interior and exterior exposed primary service conduit.
2. Interior and exterior exposed secondary service conduit.
3. Exterior exposed branch circuits.

2.5 POLYVINYL CHLORIDE (PVC)

A. Use PVC for:

1. Service entrance conduits for power encased in concrete.
2. Service entrance conduits for telephone.
3. Exterior feeders encased in concrete.
4. Exterior underground branch circuits.
5. Primary power conduits encased in concrete.

B. PVC conduit shall not be used for feeders or branch circuits inside the building.

2.6 FLEXIBLE METAL CONDUIT

A. Provide a flexible metal conduit system for the termination points at equipment that may possibly vibrate such as motors, welders, etc. The length shall not exceed 6 feet.

B. Conduit shall be electrically continuous from outlet or conduit end to the utilization equipment.

C. The total length of flexible conduit in any circuit shall not exceed 6 feet.

D. Where exposed to continuous or intermittent moisture, conduit shall be liquid tight flexible type, U.L. Type EF.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Minimum size of conduits shall be 1/2 inch.

B. Conduit joints shall be cut square, threaded, reamed smooth, and drawn up tight so conduit ends will butt in couplings, connectors, and fittings.

C. Make bends or offsets with standard ells or field bends with an approved bender.

D. Run conduits concealed in floor slabs, below slabs, or in walls in direct line with long sweep bends or offsets. Run exposed conduits and conduits run above lay-in ceilings parallel to and at right angles to building lines. Group multiple conduit runs in banks.

E. Secure conduits to all boxes and cabinets with two locknuts and bushings so system will be electrically continuous from service to all outlets.

F. Cap ends of conduits to prevent entrance of water and other foreign material during construction.

G. Complete conduit systems before pulling conductors.

H. Provide cable supports in conduits rising vertically in accordance with the National Electrical Code, Article 300-19.

I. Provide nylon pull cord in all empty conduits. Steel wire not acceptable as pull wire.

J. Conduits which pass through floor slabs (except ground floor) shall be sealed with concrete grout. Seal around conduits or other wiring materials passing through partitions, which extend to the underside of the slab above, and those passing through smoke partitions and fire-rated walls. Refer to appropriate details on architectural and mechanical drawings.

K. Conduits which enter crawl space, tunnels, and basements from outside the building shall be grouted-in to prevent entry of gases, vapors, insects, or rodents to these spaces from street mains.

L. Conduit not serving elevator equipment shall not be permitted to pass through elevator shafts or elevator equipment rooms.

M. Where IMC or RGS conduit is installed in a cabinet, junction box, pull box, or auxiliary gutter, conductors shall be protected by an insulated bushing. Locknuts shall be installed on conduit outside and inside enclosure.

N. In areas where enclosed and gasketed fixtures and weatherproof devices are specified, where rigid conduit enters a sheet metal enclosure, junction box and outlet box, and not terminated in a threaded hub, a steel, or malleable iron nylon insulated hub, complete with recessed sealing "O" ring or sealing locknut shall be used.

O. Where conduits stub up in conduit space beneath switchgear and do not connect directly to equipment enclosures, use malleable iron nylon insulated ground bushing with a lay-in lug design complete with bonding screw, Raco 1212-1296.

P. Provide seal-off fitting in all conduits entering hazardous areas and any conduits entering a cold temperature area such as freezers and dry refrigerators.

Q. In concrete slabs, block up conduit from forms and securely fasten in place. All conduits in slabs shall have a minimum of 1-1/2 inches concrete coverage above and below.

R. Encase in 4 inches of 1:2:4 mix concrete on all sides all feeder conduits laid below ground outside building foundation line.

S. Where conduits running overhead pass through building expansion joints they shall be connected by flexible metal conduit of same size with sufficient slack to allow conduits on either side of expansion joint to move a minimum of 3 inches in any direction. Provide supports as required on each side of expansion joint, all in accordance with seismic requirements of specific area.

T. Conduits for feeders and branch circuits shall be terminated directly into panelboard enclosure without the use of pull boxes, junction boxes, wireways, or auxiliary gutters, unless the panelboard enclosure does not provide sufficient surface area for all conduits. Where such cases exist, the contractor shall notify the Designer. In no case will splices in such boxes, wireways, etc., be permitted.

U. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit, and fixtures shall fit into available spaces in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring servicing shall be readily accessible.

V. If the above conflicts with existing color code, use existing.

W. No conduit shall be installed in elevated slabs.

3.2 EMT

A. Do not use electric metallic tubing in cinder concrete or cinder fill where subject to permanent moisture unless protected on all sides by a layer of noncinder concrete at least 2 inches thick or unless the EMT is at least 18 inches under the fill. Use of set-screw fitting is not acceptable in concrete or in fill under slab.

3.3 PVC

A. Use threaded fittings for all connectors and adapters.

B. Provide code sized ground conductors in all power conduit runs.

C. Provide 1/4-inch nylon pull rope in all primary power and incoming telephone service entrance conduits.

D. Encase all PVC conduit in reinforced concrete with a minimum of 4-inch encasement on all sides except exterior branch circuits.

E. No PVC shall emerge from the ground or the concrete slab or encasement. PVC shall convert to galvanized rigid metal prior to its emergence.

F. Make bends with standard ells or with an approved heat bender.

3.4 FLEXIBLE METAL CONDUIT

A. Flexible metal conduits shall be 1/2 inch minimum size.

B. Where fittings for liquidtight flexible conduit are brought into an enclosure with a knock-out, a gasket assembly, consisting of one piece "O" ring, with Buna-N sealing material, Raco Series 3500, shall be installed on outside of box. Fittings shall be made of either steel or malleable iron only, and shall have insulated throats or insulated bushings.

C. In dry locations, where final connections to motors and other equipment may be made with flexible metal conduit, fittings shall be of steel or malleable iron only with insulated throats or insulated bushings, and shall be of wedge and screw type having an angular wedge fitting between convolutions of conduit.

D. An additional copper ground wire shall be installed inside of flexible conduit and bonded at each end to assure continuity of ground to lighting fixtures, controls, and other utilization equipment.

E. All recessed lighting fixtures shall be connected with flexible metallic conduit from outlet box to fixture. Rigid conduit connections to lighting fixtures are not acceptable.

F. Install liquidtight flexible conduit in such a manner as to prevent liquids from running on the surface toward fittings.

G. Allow sufficient slack conduit to reduce the effect of vibration.

END OF SECTION

SECTION 260537 - OUTLET BOXES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide each fixture, switch, receptacle, communication devices, and other wiring devices with a galvanized outlet box of appropriate size and depth for its particular location and use unless indicated otherwise.

1.2 SUBMITTALS

A. Submittals are not required for items furnished under this section.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Outlets and junction boxes shall be Steel City or approved substitute.

B. Provide 4" square x 1-1/2" deep boxes for switches and receptacles in drywall partitions. Use square cut plaster rings of proper gauge and depth.

C. Provide 4" x 1-1/2" octagonal boxes for ceiling outlets. For increased cubic capacity provide 4" x 2-1/8" octagonal, 4" x 1-1/2" square or 4" x 2-1/8" square boxes for ceiling outlets.

D. Provide 4" x 3-1/2" octagonal concrete rings with removable back plates and fixture studs for ceiling outlets in prestressed or reinforced concrete slabs.

E. Provide 2-1/2" x 3-3/4" one gang masonry boxes for switches and receptacles installed in concrete block walls not plastered. For increased cubic capacity provide 3-1/2" x 3-3/4" one gang masonry boxes. Where more than two conduits enter the box from one direction, provide 4" square boxes with square cut device covers not less than 1" deep specifically designed for this purpose. Use round edge plaster rings only if the block walls are to be plastered. Use sectional or gangable type outlet boxes only in dry wall construction.

F. For all systems boxes, provide 4-11/16" square outlet boxes with square cut device corners for block walls or round edge plaster rings for plastered walls. Single gang device boxes are not acceptable.

G. Permanent barriers shall be furnished in multi-gang boxes if the voltage between adjacent wiring devices exceeds 300 volts.

H. Provide galvanized malleable iron fittings with threaded hubs for screw connections and with the proper type covers for switches and receptacles served by exposed conduit. Use pressed steel outlet only for ceiling fixture outlets.

I. Provide galvanized malleable iron condulets with threaded hubs and covers and with proper configurations for all changes of direction of exposed conduits. Standard conduit ells may be used if they do not interfere or damage or mar the appearance of the installation.

J. Provide rectangular boxes for floor outlets. Boxes to be 2-gang or 3-gang, fully adjustable before and after concrete pour, Steel City No. 642-643. Cover to be Steel City No. P64-D4/P6DS, aluminum, with duplex screw cover for duplex receptacle. Carpet flange to be lexan type. Fittings to be Steel City No. SFH50, satin aluminum for high tension and Steel City No. SFH50-TEL, satin aluminum for low tension. For boxes in elevated slabs less than four inches thick, use Steel City 642 and 643-SC.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate boxes to prevent moisture from entering or accumulating within them.

B. Use boxes of sufficient cubic capacity to accommodate the number of conductors to be installed. See Article #370 of the latest edition of the National Electrical Code.

C. Effectively close unused openings in boxes with metal plugs or plates.

D. Set recessed boxes so that front edges are flush with finished surfaces.

E. Secure boxes to surfaces upon which they are mounted or embed boxes in concrete or masonry. Support boxes from structural members with approved braces.

F. Install blank device plates on outlet boxes left for future use.

G. Provide bushings in holes through which cords or conductors pass.

H. Install boxes so that the covers will be accessible at all times.

I. Outlet boxes in walls shall not be mounted back to back. Where drawings show outlets on both sides of the same wall, the boxes shall be staggered sideways and connected with short nipples to prevent passage of sound. Where outlets are mounted on both sides of same fire wall they are to be staggered a minimum of 24 inches to maintain the ratings of the wall.

J. Where required to hang a specified fixture, provide a fixture stud of the no-bolt, self-locking type on ceiling outlets.

END OF SECTION

SECTION 260538 - PULL AND JUNCTION BOXES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide pull and junction boxes of appropriate size and depth or as indicated on the drawings and as specified hereinafter.

1.2 SUBMITTALS

A. Submittals of products furnished under this section are not required.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/MATERIALS

A. Pull and junction boxes shall be by Hoffman or approved substitute.

B. For interior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, 3/4 inch flanges, screw covers, etc.

C. For exterior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, 3/4 inch flanges, bolted covers with full gaskets forming a completely water-tight assembly, equal to Hoffman, Concept Series.

D. For exterior work in graded areas outside the building, provide heavy duty sidewalk junction boxes externally flanged for flush mounting. Covers to be fully gasketed, watertight and secured with plated screws or bolts.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide junction boxes as shown on drawings and otherwise where required, sized according to number of conductors in box or type of service to be provided. Minimum junction box size 4 inches square and 2-1/8 inches deep. Provide screw covers for junction boxes.

B. Use minimum 16 gauge steel for pull boxes and provide with screw cover.

C. Install boxes in conduit runs wherever necessary to avoid long runs or excessive bends. Do not exceed 100 foot runs, or three 90 degree bends, without pull boxes.

D. Rigidly secure boxes to walls or ceilings. Use of conduit as a support is not acceptable.

E. Install boxes in accessible locations. Size boxes in accordance with Articles No. 312 and No. 314 of the latest edition of the National Electrical Code.

F. Install boxes so that the covers will be accessible at all times.

G. Do not install pull or junction boxes for joint use of line voltage and signal or low voltage controls unless all conductors are insulated for the highest voltage being used in the same box. Emergency system and normal system circuits shall not be routed through a common pull or junction box.

END OF SECTION

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide switches, receptacles, device plates, and other wiring devices as indicated on drawings.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers include Leviton, Hubbell, Eagle, Arrowhart, Pass and Seymour, and Bryant. Leviton numbers are used for clarity.

2.2 SWITCHES

A. 20-Amp, 120/277 VAC:

1. Single pole: Leviton No. 1221-2W.
2. Three-way: Leviton No. 1223-2W
3. Single pole, weatherproof: Leviton No. 1221-2W with Steel City No. SW1-C weatherproof plate.
4. Single pole with pilot light (120 VAC): Leviton No. 1221-PLC.
5. Momentary contact switch: Leviton No. 1257.

B. Dimmers shall be universal (LED/CFL/MLV/Incandescent) slide dimmers equal to Leviton DSM10-1LZ.

2.3 RECEPTACLES

A. 20-Amp, 125-VAC, NEMA 5-20R:

1. Duplex type: Leviton No. 5362-W (white).
2. Ground fault circuit interrupter: Leviton No. MGFN2-W (white).
3. GFCI Duplex type, heavy-duty industrial grade, Weather and Tamper-Resistant: Leviton G5362-WTW (White).
4. Weatherproof “In Use”, extra-duty type cover: Leviton 5980-UCL.
5. Duplex type, heavy-duty industrial grade, Weather and Tamper-Resistant: Leviton TWR20-W (White).

6. Tamper resistant type: Leviton 5362-SGW (white).
7. Duplex isolated ground type: Leviton 5362-IGW (white).

B. 20-Amp, 125-VAC, NEMA 5-20R:

1. Duplex type, hospital grade, for patient care areas: 8300-W (white) for normal power devices and 8300-R (red) for emergency devices.
2. Duplex type (in area other than patient care): Leviton No. 5362-W (white).
3. Ground fault circuit interrupter, 20-amp hospital grade: Leviton No. GFNT2-HGW (white) for normal power and GFNT2-HGR (red) for emergency power.
4. Tamper resistant type: Leviton 8300-SGW (white) for normal power and 8300-SGR (red) for emergency power.
5. Duplex isolated ground type: Leviton 5362-IGW (white) for normal power and Leviton 5362-IGR (red) for emergency power.
6. Weatherproof “In Use”, extra-duty type cover: Leviton 5980-UCL.

2.4 MISCELLANEOUS DEVICES

A. Twist lock receptacle: Hubbell No. 23000-HG series or approved substitute.

B. Flush dryer receptacle, 30-amp, 125/250 VAC: Leviton No. 5207 with No. 84028 plate.

C. Flush range receptacle, 50-amp, 125/250 VAC: Leviton No. 5206 with No. 84028 plate.

D. Clock outlet: Leviton No. 5261CH.

2.5 DEVICE PLATES

A. Provide Leviton Series 84 stainless steel Leviton Series 80 nylon plates (white), or approved substitute. Provide cast alloy or stamped metal plates on all exposed switches and receptacles.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mounting:

1. Mount all switches 46" above the finished floor to centerline of switch unless noted otherwise.
2. Mount all receptacles 18" above the finished floor to centerline of receptacle unless noted otherwise.
3. Mount weatherproof receptacles vertically.

4. Work devices to nearest block course using proper type outlet boxes as specified under Section 260537. Check architectural and furniture drawings for counter (desk, special booth etc.) locations. Mount devices above work counters. Verify other special mounting conditions and locate devices as required.

B. Polarity: Properly wire all convenience outlets so that the hot wire, the neutral wire and the ground wire connect to the proper terminal on all receptacles.

C. Grounding: Install all receptacles in boxes specified under Section 260537, and install a No. 12 green ground wire from device grounding terminal back to the grounding bus in the panelboard and bond to outlet box.

D. Receptacles shown on the drawings as "special mounting height" shall be installed at mounting height as indicated on drawings. Where no mounting height is given and receptacles are above counters (or casework), they shall be mounted with centers 4" above top of counter. If the counter has a backsplash, receptacles shall be mounted with centers 4" above top of backsplash. Where special mounting height receptacles are not above counters and no mounting height is indicated, receptacle mounting heights shall match adjacent light switches or above counter receptacles. The Contractor shall coordinate the installation of all special mounting height receptacles with architectural design.

E. Install device plates in full contact with wall surface. Plates shall not project out from the wall.

F. Install device plates in full contact with surface-mounted box. Plates shall not project out from the edge of the box.

G. Receptacle plates for all receptacles in critical patient care areas shall be labeled to indicate the appropriate panel designations and circuit number. Plates shall be labeled by engraving on the plate or with other approved method. Use of laminated tape such as Dymotape is not acceptable.

END OF SECTION

SECTION 262818 - SAFETY SWITCHES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide horsepower-rated, quick-make, quick-break, safety switches provided with the number of poles and fuses as required.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/EQUIPMENT

A. Safety switches shall be as manufactured by General Electric, Square D Company, Cutler-Hammer, or approved substitute.

B. For 208- and 240-volt circuits, use general-duty type switches with Class R fuse clips. For 480-volt circuits, use heavy-duty type switches with Class R fuse clips.

C. Switches shall have arc shields, shall be of enclosed construction and fusible or non-fusible as indicated. Switches shall be rated for either 250-volt AC or 600-volt AC service as required.

D. Safety switches for all part-winding or two-speed motors requiring remote disconnect to be similar to Square D Series HLL-660, six-pole.

E. Switches shall have Electrical Interlock Kit with one normally open and one normally closed contact.

F. All switches shall be capable of interrupting locked rotor current of motor which it serves.

G. Enclosures to be NEMA-1 for interior use and NEMA-3R for exterior use unless noted otherwise.

H. Provide dual-element Bussman type FRN (250 volt) or type FRS (600 volt) fuses for any fusible safety switch serving a motor circuit.

I. For non-motor loads, provide dual element Bussman type LPN (250 volt) or type LPS (600 volt).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide non-fusible switches at remote motor locations (raintight where required) as indicated on drawings.

B. Provide fusible disconnects at package A/C units, fused as specified on unit nameplate.

C. Mount switches to walls or adjacent to equipment enclosures using unistruts with a minimum of four bolts using toggle anchors for masonry construction, Phillips "Red Head" anchors for poured concrete construction and bolts, jumbo washers, lock washers and nuts for equipment enclosure mounting.

D. All safety switches to be identified with Bakelite nameplates.

END OF SECTION

SECTION 265100 - INTERIOR LIGHTING AND LAMPS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, material, equipment and services necessary to provide all interior lighting fixtures, necessary hangers and lamps. Fixtures include all interior fixtures plus all exterior fixtures mounted to exterior wall or to structures connected directly to building.

1.2 SUBMITTALS

A. Submit for approval prior to purchasing fixtures complete fixture lists of fixtures proposed to be used. Include cuts of both specified fixture and proposed equivalent fixtures if fixtures other than those specified are submitted.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide lighting fixtures indicated by type on lighting fixture schedule on drawings.

2.2 EQUIPMENT 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.

B. Standards:

1. ENERGY STAR certified.
2. California Title 24 compliant.
3. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
4. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
5. UL Listing: Listed for damp location.
6. Recessed luminaires shall comply with NEMA LE 4.
7. User Replaceable Lamps:

    a. Bulb shape complying with ANSI C78.79.
    b. Lamp base complying with ANSI C81.61.

C. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

D. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

E. Provide luminaires from a single manufacturer for each luminaire type.

F. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

G. Rated lamp life of 50,000 hours to L70.

H. Lamps dimmable from 100 percent to 0 percent of maximum light output.

I. Internal driver.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. Comply with NECA1.

B. Fixtures shall be securely mounted as required by Section 410, NEC and as specified herein.

C. Fixtures mounted in a suspended ceiling shall be secured to the grid with approved clips as required by the NEC.

D. Fixtures shall be mounted in locations as shown on architectural reflected ceiling drawings.

E. Mount fixtures as called for in schedule on electrical drawings. Determine type of ceiling to be installed in each space from architectural drawings and schedules and furnish fixtures suitable for the exact type.

F. Receive, store, uncrate, and install lighting fixtures shown in schedule on drawings to be furnished by others.

G. Recessed fixtures in dropped ceiling areas shall be connected using Greenfield and No. 14 THHN wire. Greenfield shall be connected to fixture and outlet box. Each piece of Greenfield shall include in it a separate insulated green grounding conductor not smaller than No. 14 AWG for grounding continuity between fixture and conduit system. Grounding conductor shall be mechanically connected in a permanent and effective manner to fixture and conduit system and shall be electrical continuous. No conduit shall enter a recessed fixture directly as this would prevent removal of fixture without disturbing balance of circuit.

H. Joints in fixture wiring shall be made using wire nuts, preinsulated Scotch locks, Ideal No. 30-410 crimps and No. 30-415 wrap caps, or other approved mechanical means of connection.

I. Adjustable type fixtures shall be adjusted by the Contractor to illuminate intended area to satisfaction of Owner.

J. Any adjustable outside area lights or lights mounted on building shall be adjusted at night by the contractor to satisfaction of Owner.

K. Recessed fixtures installed in exposed or concealed tee bar ceilings may not use ceiling grid to support fixtures. Fixtures shall be securely fastened to ceiling framework per NEC Article 410, and shall be supported as described in seismic detail.

L. Surface or recessed fixtures in or on plastered or drywall ceilings shall be supported in accordance with seismic fixture mounting details and shall not depend on ceilings for support.

M. Support fixtures in seismic zones per detail on drawings.

N. All light fixtures shall be grounded in accordance with the NEC. Any fixtures suspended from ceiling which do not include a separate ground wire shall be grounded in a method approved by section 250 of the NEC. Where the conduit is utilized as the ground with a hook pendant style mounting system, a separate ground conductor shall be bonded to the conduit where the conduit ceases to be continuous and routed to the fixture.

END OF SECTION

SECTION 273700 - LOW VOLTAGE ROUGH-IN SPECIFICATIONS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. All work specified in this section shall comply with the provisions of Division 26.

B. All conduit rough-in and outlet boxes for all low voltage systems/communications shall be provided and installed by Electrical Contractor.

C. All device locations will be as shown on communications systems drawings. Refer to system details for height requirements.

1.2 RELATED WORK

A. Raceways: Sections 260534.

B. Supporting Devices and Hangers: Section 260529.

C. Pull and Junction Boxes: Section 260538.

D. Outlet Boxes: Section 260537.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. All low voltage conduits shall be 1” EMT stubbed to nearest accessible ceiling unless otherwise noted in these specifications or drawings. Conduit shall be terminated with nylon bushing.

B. Contractor to provide standard outlet boxes to conform to "OUTLET BOX" section of these specifications and sized as shown on drawings.

C. The Electrical Contractor is responsible for all hangers, straps, and support structure necessary to properly hang/support conduit.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The General contractor will schedule the installation of the conduit systems.

B. The Electrical Contractor will receive, store and protect all rough-in equipment.

C. The Electrical Contractor shall use building lines or 90° angles when installing conduit.

D. The Electrical Contractor shall work with others trades to coordinate location and installation of bracing for TV brackets.

E. For structured voice and data cabling infrastructure, the Electrical Contractor is to provide all rough-in, sleeves, fire stopping and standard outlet boxes. The Communications Contractor is to provide and install all cable, low voltage relays, and special backboxes. All equipment, devices, terminations and miscellaneous hardware required for a complete system is to be provided and installed.

F. For television cable system, background music/paging system, intercom system and nurse call/code blue system, the Electrical Contractor is to provide all rough-in, sleeves, fire stopping and standard outlet boxes. The Communications Contractor is to provide and install all cable, low voltage relays, and special backboxes. All equipment, devices, and miscellaneous hardware required for a complete system is to be provided and installed by the respective Owner/Vendor.

G. Where open cable is run above dropped ceilings and penetrates a smoke or fire rated wall, this contractor shall furnish and install a minimum 1" (unless otherwise noted) empty sleeve, 5' long, extending at least 2' on both sides of the partitions with bushings on both ends. In areas in which penetrations larger than 1” are required, the communications contactor shall install Specified Technologies EZ Path product or approved equivalent.

H. All cable concealed in walls or inaccessible (drywall) ceilings shall be installed in conduit.

END OF SECTION

SECTION 283102 - FIRE ALARM SYSTEM (MODIFICATIONS TO EXISTING)

PART 1 - GENERAL

1.1 SYSTEM

A. Fire alarm system is existing and is a Honeywell system.

1.2 WORK INCLUDED

A. Contractor to modify and add to system as shown on drawings including necessary conduit, wire, devices and control panel modifications.

B. Work under this contract to match existing unless devices required are not used, in which case, new items are to be provided to be compatible with existing system.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. New components are to match existing or as shown and be equivalent to Edwards components.

1. Pull stations: 270-SPO
2. Smoke detectors (duct mounted) with 6387 remote indicator light mounted on wall: 6380-A
3. Heat detectors (fixed temperature): 288-00
4. Heat detectors (rate of rise) with 2 N.O. contacts: 285-00
5. Evacuation signals, flashing light: 7641-2
6. Evacuation signals, horn-light combination: 891 lamp, 893 back box, 880-D horn

B. New components to be Simplex to match existing or as shown.

1. Pull station 2099-9209 2 Contact
2. Pull station 2099-9754 1 Contact
3. Smoke detector (ceiling mounted) 2098-9202
4. Smoke detector (duct mounted) 2098-9649

    a. housing, 2098-9201 head, and 2098-9806
    b. remote indicator light mounted on wall
    c. near detector. (Match system voltage)

5. Heat detector (rate of rise) 2098-9400

6. Heat detector (fixed temperature) 2098-9403
7. Evacuation signal, flashing Xenon light and chime

    a. combination ADA 100cd
    b. Wheelock: CH-DF1-WM-24-VF-R

8. Evacuation signal, bell and flashing Xenon light

    a. combination 4903-9501
    b. base assembly and 4904-9105 vertical lens with 2901-9332 6-inch bell

9. Evacuation signal, horn and flashing Xenon light

    a. combination 4903-9501
    b. base assembly and 4904-9105 vertical lens with 2901-9840 horn.

10. Evacuation signal, flashing Xenon light ADA 100cd 4904-9105

    a. For ceiling mount provide 4904-9104

PART 3 - EXECUTION

3.1 MODIFICATIONS

A. Modify system as shown on drawings and in accordance with manufacturers' recommendations including conduit, boxes, wiring and accessories. Install wiring in conduits. Tag wires at junction points.

3.2 MAINTENANCE

A. Provide on-premises maintenance during normal working hours at no cost for a period of twelve months from date of completion.

3.3 ANNUNCIATOR SHOP DRAWINGS

A. Submit a separate shop drawing of fire alarm annunciator layout, zone identification engraving, and signal light type and style for new devices being added to existing zones (under Base Bid for this Contract).

3.4 INSTALLATION DRAWINGS

A. Subcontractor providing system for Electrical Contractor will prepare drawings utilizing architectural floor plans indicating component locations and all conduit and cable requirements.

3.5 TESTS

A. Contractor to leave system in satisfactory working conditions.

END OF SECTION