PROJECT MANUAL

FOR

BSD Administration Office
Tenant Improvement

Beaverton School District
1260 NW Waterhouse Avenue
Beaverton, Oregon 97006

Bid Documents
April 21, 2023

ARCADIS

IBI GROUP

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FOR:

BSD Administration Office
Tenant Improvement

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Beaverton School District
1260 NW Waterhouse Avenue
Beaverton, Oregon 97006

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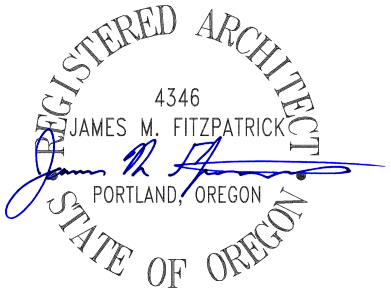

April 21, 2023

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SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. General Requirements.

B. Work Covered by Contract Documents.

C. Delegated Design Requirements.

D. Contractor Use of Premises.

1.02 GENERAL REQUIREMENTS

A. TIME OF COMPLETION
   1. The work of this Contract shall be commenced on the date of written notice to proceed and shall be completed by the dates established in the Owner/Contractor Agreement, and as stipulated in the General Conditions of the Contract for Construction.

B. LIQUIDATED DAMAGES
   1. The Contractor acknowledges and agrees to abide by all provisions of the General Conditions of the Contract regarding Liquidated Damages as it pertains to all work under this Contract.

C. ASBESTOS FREE CERTIFICATION
   1. Absolutely no materials containing asbestos are to be furnished or installed as part of this Project. Ensure that no subcontractor or any of the Contractor's own forces installs any materials containing asbestos. At final closeout of the Project, provide to the Owner certification that no materials containing asbestos have been installed in the Project, and that the Project is asbestos-free as required by the State in which the Project is located.

D. COORDINATION
   1. The Contractor is responsible for overall coordination of the Project.
   2. The Drawings and Specifications are arranged for convenience only and do not necessarily determine which trades perform the various portions of the Work.
   3. Coordinate sequence of work to accommodate agreed-upon Owner occupancy.
   4. Perform all necessary work to receive and/or join the work of all trades.
   5. Verify location of existing utilities and protect from damage.

E. PERMITS AND FEES
   1. The Owner will be responsible for filing and paying for building permits and all fees associated with the building permit, system development charges, impact fees, etc. The Contractor will be responsible for picking up all Project permits and will have full responsibility for requirements of and payments for all trade permits (i.e. electrical, plumbing, mechanical) as a direct expense.

F. REQUIREMENTS FOR CONTRACTOR, SUBCONTRACTORS, AND MATERIAL SUPPLIERS
   1. Ensure that all persons performing the Work comply with Owner's tobacco policy. Copies made available upon request.
   2. Contractor and Subcontractors shall refrain from contact with staff and students at all times.
   3. Neither the Contractor nor any of its Subcontractors of any tier shall utilize any employee at the site who has pled guilty to or been convicted of any felony crime involving the physical neglect of a child, physical injury to or death of a child, sexual offenses against or sexual exploitation of a child, child prostitution, or other similar offenses as defined by the most current State Statutes, or similar laws of another jurisdiction. Remove from the work and work site any employee who has engaged in such actions, or who the Owner reasonable considers objectionable.
      a. All personnel under the employment of the Contractor and its Subcontractors that travel to, or spend time at, the project site are to wear photo ID badges while on the

work site. Individuals not wearing badges will be removed from the project work site. ID badges are to contain:
1) Individual's full name (no nicknames).
2) Individual's company affiliation.
3) Recent photograph of the individual; taken within the last 4 years.

b. All personnel under the employment of the Contractor and its Subcontractors that spend time at the project site, must be run through formal background screening by the Contractor and pass that screening review, before being allowed on the work site. Background screening is to be done by a professional screening firm meeting the following qualifications:
1) Must have a minimum of five years of screening experience specifically for construction industry clients.
2) Must have a minimum of fifteen employees.
3) Must be able to provide access to an internet-based screening management software system which has a feature to allow access by the District to view the pass-no pass result for each screened Contractor/Subcontractor employee working on a District project.
4) Must be accredited by the National Association of Professional Background Screeners (NAPBS).

c. Each individual will be screened for having committed any crime as listed in ORS 342.142, most recent edition.

4. Without limiting the generality of the foregoing, ensure by appropriate provision in each subcontract agreement that the Contractor may remove from the work and work site any Subcontractor or Subcontractor's employee who has engaged in such action. At no change to the Contract Sum or Contract Time, remove from the work and work site any employee or other person pursuant to this Section. Failure to comply with these requirements is grounds for immediate termination of the Agreement for cause.

1.03 WORK COVERED BY CONTRACT DOCUMENTS

A. Work of this Contract comprises all required demolition and general renovation construction for the Beaverton School District Administration Office Tenant Improvement Project located at 1260 NW Waterhouse Avenue, Beaverton, OR 97006.

1.04 DELEGATED DESIGN REQUIREMENTS

A. Certain components of the Work under this project are Delegated Design. It is the Contractor's responsibility to coordinate and assume or assign to subcontractors the complete responsibilities for the design, calculation, submittals, fabrication, transportation and installation of the Delegated Design portions or components as required. Delegated Design components of the Work are defined as complete operational systems, provided for their intended use.

B. Owner shall not be responsible to pay for any delays, additional products, additional hours of work or overtime, restocking or rework required due to failure by the Contractor or the subcontractor to coordinate their work with the work of the other trades on the project or to provide the Delegated Design portion or component in a timely manner to meet the schedule of the project.

1.05 CONTRACTOR USE OF PREMISES

A. Work Sequence:
1. Perform Work in a manner required to accommodate School District use of premises during the Contract Period. Coordinate Work schedules and operations with Owner's use requirements.
2. Provide access to and from site as required by law and by Owner:
   a. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
3. Do not obstruct roadways, sidewalks, or other public ways without permit.

B. Limitations on Use:
   1. Owner intends to occupy and conduct business in the existing building during portions of the construction period. The existing building during times of Owner occupancy is a limited Contractor access area. Coordinate access to the existing building.
   2. Complete and exclusive use of the construction area except as outlined above will be permitted from Notice to Proceed until Substantial Completion of the Project. Coordinate areas available for early occupancy (if any) with Owner.
   3. During times of Owner's occupancy there may be down days during the Contract Period when occupied areas will be closed. Request from the District a list of down days that may occur during the Contract Period. Notify the District at least 48 hours in advance of down days during which time the Contractor intends to work. The District will pay for employee time during such down days when the building is required to be open for Contractor use.
   4. Smoking or open fires will not be permitted within the building enclosure or on the premises.
   5. Do not encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated or coordinated with Owner.
   6. Move any stored products under Contractor's control which interfere with operations of Owner or separate contractors.

C. Contractor's Site Conduct:
   1. Identifying name tags will be worn at all times.
   2. No loitering in the building or unsupervised/unauthorized entry.
   3. Site is tobacco-free. This means no smoking or chewing on any school district property.
   4. Beyond courtesy, there should be no interaction between contractor staff and building users.
   5. Keep project free of pop cans, lunch wrappers and similar debris.
   6. Review with the Owner the scheduling of any work that is excessively noisy or has the potential to disrupt activities of Owner or neighbors.
   7. Be considerate of the client and building users.
   8. Always consider, prior to an act, the safety of building users and other co-workers.
   9. Profanity is not acceptable.
   10. The wearing of clothing with logos displaying alcohol, tobacco, illegal substances or suggestive themes is not acceptable attire.

D. Non-Interference with Business Activities:
   1. Perform work operations upon areas adjacent to existing Owner-occupied areas and/or structures in such manner as to not interfere with continued free and comfortable use of such areas.
   2. During normal business hours, keep building exits safe, protected, and restricted from remainder of construction site and clear of obstructions at all times. If closure of an exit is required by the Work, notify the owner and allow ample time for an alternate exit plan to be executed.
   3. Work shall not be performed in Owner-occupied areas or rooms during normal business hours when such spaces are required for business use. Such Work shall be performed after normal business hours up to 10:00 PM or as agreed upon with Owner, and if no nighttime activities are planned (i.e. school board meetings, etc). Work may be performed during weekends and when the building is normally closed if coordinated in advance with school district administration.

E. Non-Interference with Serving Utilities:
   1. Do not interrupt electric, gas, water, or other services to existing Owner-occupied structures without prior notice to the District and then only at a definite time and for a definite duration approved by Owner.
      a. Disruption of utilities must be approved by the Owner. Requests must be made 72 hours prior to disruption and a plan detailing a definite start time and duration provided.

2. Schedule demolition, remodel, and new construction to accommodate Owner's continued use of existing and/or new mechanical, electrical, and plumbing services as required for Owner's continued occupancy and beneficial use of designated areas.
3. Consult with public and private utility companies for location and extent of all utilities before commencing work.
4. Provide services of a utilities locator to investigate and mark underground utilities in the vicinity of exterior work; and for interior below-slab utilities in areas which will be partially demolished prior to commencing work. Ensure that utilities are identified prior to saw cutting interior floor slabs.
5. Provide all services required. Protect and maintain existing utilities, active electrical conductors, sewers, pipes, and other active lines either on project site or in offsite street excavations.
6. Arrange for and pay cost of disconnecting, removing, relocating, capping, replacing, or abandoning of public and private utilities in the way of construction operations in accordance with serving utilities policies, local regulations and governing codes. Utilities, pipes, sewers, electrical conductors and the like to be abandoned shall be capped in accordance with instructions of governing authority or as directed.

F. Protections - Exterior Components:
1. Protect sidewalks, asphalt paving, concrete, plantings, and lawn areas at all times from spillage of materials used in carrying out the Work. Exercise care to preclude materials from clogging catch basins and yard drains. Leave all drainage items clean and in proper working condition.
2. Clean, repair, resurface, or restore existing surfaces to their original condition, or completely replace such surfaces to match existing where damaged by construction operations.
3. Whenever it is necessary to cut and remove fences and/or power lines (whether on private or public property), restore such demolished work to condition at minimum equal to that which existed prior to such demolition.
4. Damage to property adjacent to Owner's property shall be restored to the satisfaction of respective property owners.

G. Protections - Interior Components:
1. Contractor is responsible for protection of completed portions of the Work. Provide protection as required such that items are not soiled or damaged during the progression of the Work. Maintain all such protections for the entire duration of the construction until acceptance by Owner.
   a. Provide a weathertight condition throughout the Work. Clean, repair, resurface or restore building and site components required to be protected to their original condition, or completely replace items to match existing undamaged portions of Work, where damaged by construction operations.
2. Whenever it is required and/or necessary to demolish portions of work, take all precautions to protect adjacent portions of the work which remain from damage.
3. Keep public areas such as hallways, stairs, elevator lobbies and toilet rooms free from accumulation of waste material, rubbish or construction debris.
4. Gather and shroud all existing furnishings to the extent needed to provide protection from construction dust.
5. Clean, repair, resurface, or restore such items above required to be protected to their original condition, or completely replace items to match existing undamaged portions of work, where damaged by construction operations.

H. Security:
1. Provide security and facilities to protect the Work and Owner's operations from unauthorized entry, vandalism, and theft.
2. Provide temporary barriers, doors, and locks at all openings after building is enclosed.

3. Lock automotive vehicles and other mechanized or motorized construction equipment when parked and unattended. Do not leave vehicles or equipment unattended with the motor running or ignition key in place.
4. Coordinate with Owner's building security provider and program.

I. Removal of Equipment and Materials:
1. Clear site and surrounding street areas of all equipment, apparatus, appliances, tools, unused materials, and similar items immediately as they cease to be necessary to carry out the Work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 13 31
CERTIFICATE OF COMPLIANCE

No final payment shall be made until the Contractor provides to the Owner, prior to acceptance of the work, a notarized certification of compliance in following form:

The Contractor does hereby certify that all work has been performed and materials supplied in accordance with the drawings, specifications and Contract Documents for the above Work, and that:

No less than the prevailing rates of wages as ascertained by the governing body of the Contracting agency has been paid to laborers, workmen and mechanics employed on this Work;

There have been no unauthorized substitutes of Subcontractors; nor have any subcontracts been entered into without the names of the Subcontractors having been submitted to the Owner prior to the start of such subcontracted work;

No subcontract was assigned or transferred or performed by any Subcontractor other than the original Subcontractor, without prior notice having been submitted to the Owner together with the names of all Subcontractors;

All claims for material and labor and other service performed in connection with these specifications have been paid;

In WITNESS WHEREOF, the undersigned has signed and sealed this instrument this

_____ day of_____, _____

Firm Name: _____

Signature: _____

Title: _____

Attest _____
(Seal if Bidder is a Corporation)

As determined necessary, evidence of compliance may be required to be submitted with and made a part of this Certificate of Compliance.

END OF SECTION

SECTION 01 13 32
CERTIFICATE OF NO HAZARDOUS MATERIALS

No final payment shall be made until the Contractor shall file with the Owner, prior to acceptance of the work, a notarized certificate of no hazardous materials in the following form:

"To the best of my knowledge no hazardous material, including, but not limited to: asbestos, polychlorinated biphenyls (pcb's) and lead based products, is used in the construction of this project. Material safety data sheets will be provided as requested by the Owner for all materials which may be questioned in the future."

In WITNESS WHEREOF, the undersigned has signed and sealed this instrument this

_____day of_____, _____

Firm name: _____

Signature: _____

Title: _____

Attest: _____

(Seal if Bidder is a Corporation)

As determined necessary, evidence of compliance may be required to be submitted with and made a part of this certificate.

END OF SECTION

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Section 01 77 00 - Closeout Procedures: Substantial Completion and Final Payment.

1.03 SCHEDULE OF VALUES

A. Form to be used: AIA G703 Continuation Sheets.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Submit Schedule of Values at times indicated in Section 01 30 00 - Administrative Requirements.

E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization and bonds and insurance. Provide closeout and punchlist line items.

F. For items on which progress payments will be requested for stored materials, break down the cost into:
   1. The cost of materials (only), delivered and unloaded, with taxes and the like, paid.
   2. Remainder of installed value (labor, temporary facilities/equipment needed, etc.).
   3. Failure to provide this breakdown prior to materials being delivered voids Contractors right to be paid for affected materials until they are installed.

G. For each line item of installed value exceeding $20,000, show breakdown by major products or operations under each item.

H. Round-off figures to nearest dollar amount for the original breakdown only.

I. Make sum of total scheduled costs equal to Contract Sum.

J. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 SUBCONTRACTOR AND SUPPLIER LISTING

A. Subcontractor and Supplier Listing: Follow Project Manual Table of Contents as a format for listing name of Subcontractors, including lower-tier Subcontractors and suppliers.
   1. Identify by section number and title the company, address, telephone number and contact person.
   2. Adjacent to Subcontractor list its lower-tier Subcontractor(s) and/or supplier(s).

1.05 APPLICATIONS FOR PROGRESS PAYMENTS

A. Submit a preliminary copy of the Payment Application to Architect for comment prior to formal submittal.

B. Payment Period: Submit at intervals stipulated in the Agreement.
   1. Contractor is encouraged to review the payment application draft during the progress meeting that occurs during the last week of the month.

C. Form to be used: AIA G702 and G703.

D. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

E. Forms filled out by hand will not be accepted.

F. Execute certification by signature of authorized officer.

1. Notarized Affidavit: After the first request for payment, each subsequent request shall be accompanied by notarized affidavit stating that all subcontractors have been paid less earned retainage as their interests appeared in the last payment received. No application for payment by the Contractor shall be processed unless accompanied by such Contractor's affidavit.
2. In addition, the Owner may require that any requests for payment shall also be accompanied by a receipt with original signature from the Principal Subcontractors, and others as required by the Owner, of the dollar amount they received for the previous month's work (less earned retention), and an affidavit by such Subcontractors stating that all sub-subcontractors, suppliers, wages, fringes, and taxes arising out of such subcontract have been paid in full as their interest appeared in the last payment received.

G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
   1. For applications for stored materials include:
      a. Project.
      b. Application number and date.
         1) Item number and identification as shown on application and description of specific material or product.
         2) Material stored off-site: Record of quantities and bonding/insurance of storage facility.
         3) Must be within 75 driving miles of the site and open to Architect's and Owner's inspections and inventory during regular business hours.
      c. Verification of stored materials and partial payment for such materials do not constitute acceptance on the part of the District. In the event that materials stored are found to be unsuitable for installation or incorporation into the Work for any reason, Contractor shall bear full responsibility for any and all corrections needed.
      d. District shall not be responsible for any additional costs incurred for storage of materials unless such storage is the result of and a part of an approved Change Order where the District is found to be responsible for such costs.

H. List each authorized Change Order as a separate line item, listing Change Order number, description and dollar amount as for an original item of Work. Provide a breakdown by major products or operation for amounts in excess of $20,000.

I. Submit one electronic copy of each Application for Payment through e-Builder.

J. Include the following with the application:
   1. Construction progress schedule, revised and current as specified in Section 01 32 00 - Construction Progress Documentation.
   2. Partial release of liens from major Subcontractors and vendors.
   3. Affidavits attesting to off-site stored products.

K. Current Record Documents: Prior to acting on processing each monthly request for payment, Contractor is required to present for review to Architect and consultants, a current set of record documents indicating any revisions.

L. Certified Statements of Intent to Pay Prevailing Wage for each trade shall be on file with the Architect and Owner prior to applying for payment of work of that trade. Where such Certified Statements are not provided, that category of work will not be paid until appropriate documentation is filed.

M. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.06 SPECIAL CONDITIONS OF INITIAL PAYMENT

A. Prior to initial payment, the Contractor must have delivered all required insurance, bonds and contracts; acceptable Schedule of Values, Sub-Contractors/Suppliers List, Contractor Construction Schedule.

1.07 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
   1. Submit Application for Final Payment at time indicated in Section 01 30 00 - Administrative Requirements.

B. All Project Closeout activities must be complete; all liens and claims settled; all project record documents transmitted in final approved form; removal of temporary services, facilities and all debris/materials/ equipment. All permit drawings, sign-off sheets and Certificates of Occupancy transmitted.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittal procedures, coordination.

B. Section 01 60 00 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
      a. Substitution requests offering advantages solely to the Contractor will not be considered.

B. Substitutions: See General Conditions for definition.

1.04 SUBMITTALS

A. Substitution Requests: Electronically submit each request for consideration as a PDF. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Name of PDF shall reflect the specification Section number and the proposed product manufacturer or product name.
   2. Limit each request to one proposed substitution.
   3. Submit a separate form for each item upon which approval is requested, with the exception of groups of items (e.g., electrical fixtures, plumbing fixtures, etc.) for which an itemized listing may be attached.
   4. Acceptance of the particular product or method on a previous project does not confer or imply acceptance for this project.
   5. Submit samples to Architect upon request.
   6. It is the responsibility of the substitution applicant to notify the Architect whether there are additional primer requirements with the proposed product. At least the same level of laboratory testing and/or industry certification must be achieved with the proposed product.
   7. Organic-based urethane sealants are not a substitute for silicone technology.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.

5. Waives claims for additional costs or time extension that may subsequently become apparent.
6. Agrees to reimburse Owner and Architect for review or redesign services, detailing, construction costs, or re-approval by authorities caused by the requested substitution.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Substitution Request Form:
      a. Use Substitution Request Form following this Section for substitution requests during the bid phase.
      b. Use "Substitution Request (After the Bidding Phase)" form bound at the end of this Section for substitution requests after the Award of Contract.

D. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
   1. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
   2. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
   3. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
   4. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
   5. Samples, where applicable or requested.
   6. Certificates and qualification data, where applicable or requested.
   7. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
   8. List of availability of maintenance services and replacement materials.
   9. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
   10. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
   11. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
   12. Cost information, including a proposal of change, if any, in the Contract Sum.
   13. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
   14. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
   15. No specific form is required. Contractor's Substitution Request documentation must include the following:
      a. Project Information:
         1) Official project name and number, and any additional required identifiers established in Contract Documents.
         2) Owner's, Architect's, and Contractor's names.

b. Substitution Request Information:
   1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
   2) Indication of whether the substitution is for cause or convenience.
   3) Issue date.
   4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
   5) Description of Substitution.
   6) Reason why the specified item cannot be provided.
   7) Differences between proposed substitution and specified item.
   8) Description of how proposed substitution affects other parts of work.
c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
d. Impact of Substitution:
   1) Savings to Owner for accepting substitution.
   2) Change to Contract Time due to accepting substitution.

E. Limit each request to a single proposed substitution item.
   1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.

B. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.
   1. Submit all requests for substitutions electronically as PDFs.
   2. Submit Substitution Request Form via email to the individual indicated in Document 00 21 13 - Instructions to Bidders.

C. Accepted Substitutions prior to Bid Date will be listed in Addenda published in accordance with Advertisement for Bids and the Instructions to Bidders. Bidders will not rely upon approvals made in any other manner.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submit all requests for substitution electronically as PDFs.
   1. Submit all requests for substitutions after the Bid Phase in accordance with requirements for electronic submittals in Section 01 30 00 - Administrative Requirements.
   2. Submit all requests for substitutions after the Bid Phase through the Contractor. Substitution requests received directly from Subcontractors or Suppliers will be returned through the Contractor without review.

B. Substitutions will normally not be considered after date listed in Instructions to Bidders, except when required due to unforeseen circumstances. Within a period of 30 days after date of Contract, the Owner may, at its option, consider formal written requests for substitution of products in place of those specified when submitted in accord with the requirements stipulated herein. To receive consideration, one or more of the following conditions must be documented in any such request:
   1. The substitution is required for compliance with final interpretation of Code requirements or insurance regulations.
   2. The substitution is required due to unavailability of a specified product, through no fault of the Contractor.
   3. The substitution is required because subsequent information disclosed the inability of the specified product to perform properly or to fit in the designated space.
   4. Manufacturer's or fabricator's refusal to certify or warrant performance of specified product as required.

5. Subsequent information that a long delivery date will not be compatible with the Contract construction period.
6. 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.

C. Owner reserves the right to reject any and all substitution requests for any reason, without obligation or liability

D. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
3. Bear the costs engendered by proposed substitution of:
a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.

E. Substitutions will not be considered under one or more of the following circumstances:
1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
2. Submittal for substitution request has not been reviewed and recommended by Contractor. Substitution requests received directly from Subcontractors or Suppliers will be returned through the Contractor without review.
3. Without a separate written request.
4. When acceptance will require revisions to Contract Documents.
5. Submittal for substitution request does not include point-by-point comparison of proposed substitution with specified product.

3.04 RESOLUTION

A. Architect's Action for Substitutions After Award of Contract: If necessary, Architect will request additional information or documentation for evaluation within 7 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 7 days of receipt of additional information or documentation, whichever is later.
1. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
2. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

3.05 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

SUBSTITUTION REQUEST FORM

TO: IBI Group Architects (USA) Inc.
907 SW Harvey Milk Street
Portland, OR 97205
Attn: kristine.merkel@ibigroup.com

PROJECT: BSD Administration Tenant Improvement

We hereby submit for your consideration the Product described below as a substitute for the specified product indicated:

1. Specified Product:

Name: _____

Section:_____ Paragraph: _____

2. Proposed Substitution:

a. Brand Name:_____

b. Model/Catalog No.: _____

c. Manufacturer: _____
(Name)

_____
(Address) (Zip) (Telephone)

d. Nearest Distributor:_____
(Name)

_____
(Address) (Zip) (Telephone)

e. Substitute product effects adjacent Work in the following way:

_____
_____

3. Supporting Data:

a. Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

b. Attached data also includes description of changes to Contract Documents which proposed substitution will require for its proper installation.

4. Certification:

The undersigned certifies that the following paragraphs, unless modified on attachments, are correct:

a. The proposed substitution does not affect dimensions shown on Drawings.

b. The undersigned will pay for changes to the building design, including engineering design, detailing and construction costs caused by the requested substitution.

c. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.

d. Maintenance and service parts will be locally available for the proposed substitution.

e. The function, appearance and quality of the proposed substitution are equal or superior in all respects to the product specified.

5. Submitted By:

Firm:_____
(Name)

_____
(Address) (Zip) (Telephone)

By:_____ Title: _____
(Please type or print)

Signature:_____

6. Acceptance/Rejection:

Acceptable substitution items will be covered by an Addendum issued to all Bidders.

7. Architects Action:
The following is for use by the Architect:

___ Accepted ___ Accepted with exceptions as noted
___ Not Accepted ___ Received after deadline

Remarks: _____
_____
_____
_____

By:_____ Date: _____

For: IBI Group Architects (USA) Inc.

END OF FORM

SUBSTITUTION REQUEST
(After the Bidding Phase)

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ Architect Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No: _____

Installer: _____ Address: _____ Phone: _____

History: ☐ New Product ☐ 2-5 years old ☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

_____

_____

Point by Point comparative data attached - REQUIRED

Reason for not providing specified item: _____

_____

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes, explain _____

_____

Savings to Owner for accepting substitution: _____ ($_____).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days

Supporting Data Attached:
☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: _____

_____

_____

REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01 30 00.

☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 30 00.

☐ Substitution rejected - Use specified materials.

☐ Substitution Request received too late - Use specified materials.

Signed by: _____ Date: _____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐ _____

_____

_____

_____

_____

_____

_____

_____

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for processing contract modifications and Change Orders.

1.02 RELATED REQUIREMENTS

A. Section 01 20 00 - Price and Payment Procedures: Applications for payment and Schedule of Values.

B. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.03 SUBMITTALS

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

B. Submit name of individual authorized to accept changes, and to be responsible for informing others in Contractor's employ of changes in the Work.

1.04 GENERAL REQUIREMENTS

A. No additional work shall be undertaken without Owner's and Architect's written approval.

B. Written approval authorizing Contractor to undertake additional Work does not authorize automatic extension of Contract Completion time.

1.05 DEFINITIONS

A. Change Order (CO): This document signed by Owner, Contractor and Architect formally changes the Contract Sum or Contract Time and may incorporate Proposal Requests and/or Construction Change Directives.

B. Proposal Request (PR): This document initiated by the Architect is to be priced by the Contractor. Upon authorization by the Owner it becomes a directive to the Contractor to modify the scope of the Contract for inclusion in a future Change Order.

C. Architect's Supplemental Instructions (ASI): This form is a written order comprising instructions or interpretations, signed by Architect making minor changes in the Work not involving a change in Contract Sum or Contract Time. If the Contractor considers that the ASI constitutes a Change in the Work, it must notify the Owner in accordance with the Contract Documents.

D. Construction Change Directive (CCD): A written order to the Contractor, signed by the Owner and Architect, amending Contract Documents as described. This order directs Contractor to proceed with Work that may alter Contract Sum and/or Contract Time, and is intended to be included in a subsequent Change Order pending agreement on changes in the Contract Sum and/or Contract Time.

1.06 SIGNATURES

A. All signatures on Change Orders and Construction Change Directives shall be original; no photocopies, unless electronic signatures are acceptable to all parties. Facsimile signatures shall be followed immediately by mail and/or delivery of originals.

1.07 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
   1. Form for Minor Changes in the Work: Architect's "Architect's Supplemental Instructions" form.
   2. If Contractor determines that an Architect's Supplemental Instruction involves adjustments to the Contract Sum or Contract Time, Contractor shall prepare and issue a Proposal Request to the Architect for approval prior to proceeding with the Architect's Supplemental Instruction.

1.08 DOCUMENTATION OF CHANGE IN CONTRACT SUM AND CONTRACT TIME

A. Maintain detailed records of work performed on a time and materials basis. Provide complete information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

B. Document each quotation for a change in cost or time with sufficient data to allow evaluation of the quotation.

C. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

D. On request, provide additional data to support computations including:
   1. Quantities of products, labor, and equipment.
   2. Taxes, insurance, and bonds.
   3. Overhead and profit.
   4. Justification for any change in Contract Time.
   5. Credit for deletions from Contract, similarly documented.

E. Support each claim for additional costs, and for work performed on a time and materials basis with the following information:
   1. Origin and date of claim.
   2. Dates and times work was performed, and by whom.
   3. Time records and wage rates paid.
   4. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

1.09 PROPOSED CHANGE PROCEDURES

A. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 14 days.
   1. Form for Proposal Requests: Architect's "Proposal Request" form.
   2. Form for Fixed Price Quotation: Electronically submitted PDF.

B. If latent or unforeseen condition require modifications to the Contract, or if an RFI response or an Architect's Supplemental Instruction is determined to have cost or schedule impacts, Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01 60 00.
   1. Form for Proposal Requests: Architect's "Proposal Request" form.
   2. Form for Fixed Price Quotation: Electronically submitted PDF.

C. Proposal Request Log: Maintain a current log of all Proposal Requests and submit same at each project meeting and with each Application for Payment. Each Proposal Request shall have a unique number for tracking purposes.
   1. The log shall, at a minimum, show the Proposal Request number, date initiated, brief description, reference (e.g., RFI or supplemental instruction) estimated cost, estimated time, status and reason for the Proposal Request.

1.10 APPROVAL OR REJECTION OF PROPOSAL

A. When a proposed change is initiated through a Proposal Request:
   1. Submit the following in writing within seven (7) days of date on Proposal Request:
      a. All direct and indirect costs.
      b. Schedule of Values and Unit Prices including basis for costs.
      c. Impact on other Work not described. Describe and include all direct and indirect costs of changes to other Work not specified in the PR.

d. Quotation will be guaranteed for period specified in the PR beginning from signing of proposal, but, as a minimum, 30 days. If no period is specified, quotation shall be guaranteed for sixty (60) days from signing.
e. Proposal shall be signed by authorized person.
f. Failure of the Contractor to respond with pricing in a timely manner shall not be justification for claims by the Contractor of delay of the project associated with the Change.

2. Architect and Owner will review proposal and respond in writing by one of the following:
   a. Authorizing.
   b. Requesting additional information.
   c. Rejecting.
3. Authorization to proceed with Change through a recommendation by the Architect to the Owner and written authorization by the Owner directs Contractor to undertake Work.

B. When Change is initiated by Contractor:
1. Architect and Owner review and respond in writing by one of the following:
   a. Processing a Change Order or Proposal.
   b. Requesting additional information.
   c. Rejecting.
2. If Owner responds by processing a Proposal Request, follow procedure outlined above.
3. If additional information is requested by Owner, respond in writing within seven days of Owner's request.

1.11 DOCUMENTATION OF PROPOSALS AND CLAIMS

A. Support each lump sum proposal quotation and each unit price (not previously established) with detailed substantiating data. Clearly cross reference tracking numbers of CCDs, RFIs, PRs, etc. to allow easy identification of costs origins
1. Include as separate line items any changes related to credits to Contract Sum or Contract Time associated with not performing the originally specified Work.

B. On request, provide additional data to support time and cost computations:
1. Labor hours, number of workers, time cards and hourly rate cost justification
2. Equipment hours, make and model, number of pieces required, rental agreements and hourly rate justification.
3. Products required.
   a. Recommended source of purchase and unit cost.
   b. Quantities required.
4. Documented credit for Work deleted from Contract.
5. Justification citing specifics of critical path impacts per current CPM for any change in Contract Time.

C. Support each claim for additional costs, and time-and-material/force account work with documentation, as required for lump-sum proposal. Include additional information:
1. Name of Owner's authorized agent who ordered work, and date of order.
2. Dates and times work was performed and by whom.
3. Time record, summary of hours worked and wage rates paid.
4. Receipts and invoices for:
   a. Equipment used, listing dates and times of use.
   b. Products used, listing of quantities.
   c. Subcontracts.

1.12 CONSTRUCTION CHANGE DIRECTIVES

A. For changes that involve an adjustment to the Contract Sum or Contract Time, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.

2. Promptly execute the change.
3. Form for Construction Change Directives: Architect's "Construction Change Directive" form.

1.13 FIXED PRICE CHANGE ORDER

A. Base upon Architect's Proposal Request and Contractor's fixed price quotation; or Contractor's request for Change Order as approved by Architect and Owner.

B. Change Order describes Work changes, additions and deletions, with attachments of authorized Proposal Requests, agreed Construction Change Directives and/or previously agreed upon change pricing or Contract Time modifications.

C. Change Order provides accounting of any Contract Sum and Contract Time adjustment.

1.14 UNIT PRICE CHANGE ORDER

A. For pre-determined unit prices and quantities, Change Order will be executed on a fixed price basis.

B. For unit costs or quantities of units of work which are not predetermined, execute Work under a Construction Change Directive. Changes in Contract Sum or Contract Time will be computed as specified for a time and material Change Order.

1.15 TIME AND MATERIAL CHANGE ORDER

A. Submit itemized account and supporting data after completion of change, within time limits specified in General Conditions of the Contract.

B. Architect will determine the change allowable in Contract Sum and Contract Time as provided in the General Conditions of the Contract.

C. Maintain and provide detailed records of work done on a time and materials basis.

1.16 EXECUTION OF CHANGE ORDERS

A. Architect will issue Change Orders for signatures of parties as provided in General Conditions of the Contract.
   1. Form for Change Orders: Architect's "Change Order" form.

B. Proper signatures (original and dated) on CCD or Change Order authorize Contractor to proceed with Change.

C. Promptly sign and date Change Order or provide detailed written and signed statement detailing reasons if refusing to sign. If the Contractor does not sign and return the Change Order, all aspects will be considered disputed, and Contractor shall not be paid on any Work on it.

1.17 DISTRIBUTION

A. Architect will distribute one electronic copy to Owner and Contractor for review.

B. Change Orders: Upon authorization, all parties will sign originals with original signatures, unless electronic signatures are acceptable to all parties.
   1. Project procedures for distribution will be discussed and agreed upon at the preconstruction meeting.
   2. All parties will receive signed copies of the Change Order for record.

C. Construction Change Directives: Upon authorization, Architect will issue one electronic copy to Owner and Contractor.
   1. Directive describes Work Change additions or deletions, with attachments of revised Contract Documents.
   2. Owner will sign and date as directive to proceed with Change.
   3. Promptly sign, date and return to the Architect. If Contractor does not agree with terms, it will proceed with changed Work and follow procedures noted in the General Conditions while still returning one copy to the Architect.

1.18 CREDIT AMOUNT TO CONTRACT SUM - INSURANCE

A. If a Change Order or Construction Change Directive results in a reduction of the Contract Sum, the Owner shall be entitled to a credit that includes the amount of the value of bond premium, amounts charged for additives for insurance premium.

1.19 CORRELATION OF CONTRACTOR SUBMITTALS

A. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item. Adjust Contract Sum as shown on Change Order.

B. Promptly revise Progress Schedule to reflect any changes in Contract Time, revise subschedules to adjust times for other items of work affected by the change, and resubmit.

C. Promptly enter changes in Project Record Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Project coordination.

C. Electronic document submittal service.

D. Electronic document submittals.

E. Preconstruction meeting.

F. Progress meetings.

G. Preinstallation conferences.

H. Project closeout conference.

I. Contractor's daily reports.

J. Requests for information (RFI).

K. Submittals for review, information, and project closeout.

L. Number of copies of submittals.

M. Requests for Interpretation (RFI) procedures.

N. Deferred submittals.

O. Submittal procedures.

P. Product submittals - detailed requirements.

Q. Timing of submittals.

R. Construction progress schedule.

S. Schedule of values.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Delegated design requirements.

B. Section 01 31 23 - Project Management Database (PMD).

C. Section 01 60 00 - Product Requirements: General product requirements.

D. Section 01 32 00 - Construction Progress Documentation: Form, content and administration of schedules.

E. Section 01 40 00 - Quality Requirements: Testing Laboratory Reports and Manufacturer's Field Services.

F. Section 01 60 00 - Product Requirements: Contractor's list of Products.

G. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 70 00 - Execution for coordination of execution of administrative tasks with timing of construction activities.

1.04 PROJECT COORDINATION

A. Coordinate Work of all personnel, requirements and Work specified throughout the Contract Documents, including Work performed by subcontractors and suppliers.

B. Coordinate scheduling, submittals, and the work of the various Sections of the Specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Contractor's work and responsibilities include, but are not limited to, the following:
   1. Provide all labor, materials, equipment, delivery, tools, machines, facilities, and services necessary for the proper execution of the Work.
   2. Coordinate scheduling, submittals and Work of the various Sections of Specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
   3. Ensure that notification to and inspections by permitting agencies are completed in a timely fashion.
   4. Coordinate utility outages with a minimum of 48 hours advance notice to Owner.
   5. Store, protect, and secure materials, on and off site.
   6. Supervise and coordinate after hours work.

D. The separation of portions of the Work into particular divisions of the specifications or sections of the drawings may not in every case conform to the categories of work typically subcontracted to particular crafts or trades. Inform bidders, subcontractors, crafts and trades that work assigned to them may be contained in sections other than customary. In every case, provide and coordinate at no additional cost to Owner all work required in the Contract Documents.

E. Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, all such equipment.

F. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for piping, ductwork, and conduit as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

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

H. Coordinate completion and cleanup of Work of separate Sections in preparation for Substantial Completion and for portions of Work designated for Owner occupancy.

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
   1. Besides submittals for review, information, and closeout, this procedure applies to submittal schedule, requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, proposal requests, change orders, construction change directives), applications for payment, field reports and meeting minutes, substitution requests and any other document any participant wishes to make part of the project record.
   2. Contractor and Architect are required to use this service.
   3. It is Contractor's responsibility to submit documents in allowable format.
      a. Limit PDF size to 10MB, unless otherwise authorized by Architect.
      b. Name PDF's for product submittals as indicated under "Product Submittals - Detailed Requirements" Article.
   4. Subcontractors, suppliers, Architect, and Architect's consultants are to be permitted to use the service at no extra charge.

5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.

C. Submittal Service: The selected service is:
1. e-Builder.
   a. Refer to Section 01 31 23 - Project Management Database (PMD) for additional information.

D. Training: One, one-hour training session will be arranged for all participants, with representatives of Architect, Architect's Consultants and Contractor participating; further training is the responsibility of the user of the service.

E. Project Closeout: Coordinate with Architect and Owner to verify that archive documents have been saved and remain accessible to Architect and Owner prior to terminating the service for the project.

3.02 ELECTRONIC DOCUMENT SUBMITTALS

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via email directed to the personnel identified at the Preconstruction Meeting.
1. Besides submittals for review, information, and closeout, this procedure applies to submittal schedule, requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, proposal requests, change orders, construction change directives), applications for payment, field reports and meeting minutes, substitution requests and any other document any participant wishes to make part of the project record.
2. It is Contractor's responsibility to submit documents in PDF format.
   a. Limit PDF size to 10MB, unless otherwise authorized by Architect.
   b. Name PDF's for product submittals as indicated under "Product Submittals - Detailed Requirements" Article.
3. Paper document transmittals will not be reviewed, unless otherwise authorized by Architect.
4. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

3.03 PRECONSTRUCTION MEETING

A. The Owner will schedule a preconstruction conference before the start of construction, at a time convenient to the Owner, Contractor and the Architect, but no later than 10 days after execution of the Agreement. The conference will be held at the Project Site or another convenient location. The meeting shall be conducted to review general issues of responsibilities, communications, and contract administration procedures.

B. Owner will schedule a meeting after Notice of Award.

C. Attendance Required:
1. Owner.
2. Architect.
3. Contractor.
4. Contractor's Superintendent.
5. Major Subcontractors.
6. Major Suppliers when requested; others as appropriate.

D. Agenda:
   1. Status of the Contract, bonds, insurance or other contract requirements.
   2. Status/timing of Notice to Proceed.
   3. Submission of executed bonds and insurance certificates.
   4. Distribution of Contract Documents.
   5. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
   6. Submission of initial Submittal schedule.
   7. Designation of personnel representing the parties to Contract and Architect.
   8. Contract administration responsibilities, communications and procedures.
   9. Project management communications and electronic submittal service requirements.
   10. Tentative Contractor's construction schedule.
   11. Procedures and processing of field decisions, submittals, substitutions, applications for payments, BOLI requirements, proposal request, Change Orders, and Contract closeout procedures.
   12. Scheduling.
   13. Related work by Owner and coordination with Contractor.
   14. Use of premises and ongoing facility operations.
   15. Review of existing conditions.
   16. Hazardous materials.
   17. Owner's requirements.
   18. Working hours, site access and parking.
   19. Contractor's site mobilization and storage areas.
   20. Material and equipment deliveries.
   21. Maintaining good neighborhood relations and limiting noise, store water, erosion and dust control.
   22. Construction facilities and controls.
   23. Temporary storage.
   24. Security and housekeeping procedures.
   25. Special inspection, testing and quality control, including procedures for testing.
   26. Procedures for maintaining record documents.
   27. Requirements for start-up of equipment and Commissioning.
   28. Inspection and acceptance of equipment put into service during the construction period.
   29. Status of permits.
   30. Progress meeting schedule date and time.
   31. Review of Contract Documents and outstanding questions related thereto.

E. Architect will record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

A. Progress meetings will be conducted at the Project Site on a weekly basis, or at intervals otherwise agreed to. The schedule of the meetings shall be established by mutual consent of the Owner, Architect and Contractor. No changes to said schedule shall be made without mutual consent of the same parties. Coordinate preparation of the payment request with dates of meetings.
   1. Notify subcontractors and other representatives of scheduled meetings where their attendance is requested.

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

C. Attendees: In addition to representatives of the Contractor, Owner and the Architect, other individuals concerned with current progress or coordination may be represented at these meetings. Participation by Subcontractors shall be limited to attendance only when required by the Architect or when a prearranged topic relating to the specific trade or supplier requires their attendance at the meeting.

1. Persons designated by the Contractor to attend and participate shall have all required authority to commit the Contractor to solutions as agreed upon in the meeting.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Status of RFIs, ASIs, Proposal Requests, CCDs and Change Orders.
7. Review of off-site fabrication and delivery schedules.
8. Site access, utilization and parking.
9. Problems from or affecting occupants or neighbors.
10. Permitting and agency issues.
11. Quality/inspection issues.
12. Maintenance of progress schedule.
    a. Review progress since the last meeting;
    b. Distribute Contractor's two-week look ahead schedule.
    c. Evaluate current activity is in relation to the Contractor's Schedule.
    d. Identify in advance potential delays involving: submittals, material / equipment procurement; approvals; Owner-furnished materials; or separate contracts, if any.
    e. Determine how construction behind schedule will be expedited; securing commitments from parties involved to do so.
    f. Determine whether a recovery schedule is required for the Contractor's Construction Schedule to insure completion within the contract time.
13. Coordination of projected progress.
14. Maintenance of quality and work standards.
15. Effect of proposed changes on progress schedule and coordination.
16. Pay Application review at monthly interval.
17. Review of Project Record Documents.
18. Other business relating to work.

E. Architect will record minutes and distribute copies within two days after meeting to participants, with one copy to Architect, Owner, participants, and those affected by decisions made.
1. Minutes shall number topics in a manner that reflects when each topic was first raised.
2. Each topic shall reflect who is responsible for acting on the topic and date by which resolution is required.
3. No topic shall be dropped from the minutes until the method of resolution is recorded.

3.05 PREINSTALLATION CONFERENCES

A. When required in individual Specification Sections, convene a preinstallation conference at work site prior to commencing work of the Section.
1. Additional conferences may be conducted as required for performance of the Work.

B. Attendees: The Installer and representatives of manufacturers and fabricators, sub-contractors, Contractor, Owner's representative and Owner's special inspector involved in or affected by the installation, and its coordination or integration with other materials and installations, shall attend the meeting. Advise the Architect of scheduled meeting dates.

C. Notify Architect and Owner minimum four days in advance of meeting date.

D. Agenda: Review the progress of related construction activities, including drawing and specification requirements for the following:
1. Shop Drawings, Product Data, and quality-control samples and other required submittals.
2. Time schedules,
3. Weather limitations.
4. Manufacturer's recommendations.
5. Warranty requirements.

6. Acceptability of substrates.
7. Quality, inspection, and testing requirements.

E. Review conditions of installation, preparation and installation procedures, and coordination with related work.

F. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

G. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

H. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

3.06 PROJECT CLOSEOUT CONFERENCE

A. Request a meeting to discuss the requirements for project closeout.

B. Attendees: In addition to representatives of the Contractor, Owner and the Architect, other individuals concerned with project closeout may be represented at these meetings.

C. Agenda:
1. Preparation of record documents.
2. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
3. Submittal of written warranties.
4. Requirements for preparing operations and maintenance data.
5. Requirements for demonstration and training.
6. Preparation of Contractor's punch list.
7. Completion time for correcting deficiencies.
8. Inspections by authorities having jurisdiction.
9. Certificate of occupancy and transfer of insurance responsibilities.
10. Partial release of retainage.
11. Preparation for final field observation.
12. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
13. Submittal procedures.
    a. Project Record Documents.
    b. Operating and maintenance documents.
    c. Final commissioning documentation.
    d. Warranties and bonds.
    e. Affidavits.
    f. Turnover of extra materials and spare parts.
14. Owner's partial occupancy requirements.
15. Installation of Owner's furniture, fixtures, and equipment.
16. Responsibility for removing temporary facilities and controls.
17. Final cleaning.
18. Contractor's demobilization of site.
19. Maintenance.

D. Architect will record meeting minutes.

3.07 REQUESTS FOR INFORMATION (RFIS)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, prepare and submit an RFI in the form specified.
1. RFIs shall originate with Contractor. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Limit topics on each RFI to a single topic to expedite response.

3. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
4. If Contractor disagrees with Architect's response to Contractor's RFI, Contractor shall notify Architect within seven days of receipt of response. Lack of such notification shall be understood to mean that Contractor agrees with response.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
2. Date.
3. Name of Contractor.
4. RFI number, numbered sequentially.
5. RFI subject.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested resolution. If proposed solution impacts the Contract Time or the Contract Sum, state impact in the RFI.
10. The following statement:
    a. "This reply is not an authorization to proceed with work involving additional cost, time or both. If any reply requires a change to the Contract Documents, a Change Order or Construction Change Directive must be executed in accordance with the Contract Documents prior to implementation of the reply. Proceeding with the Work in accordance with this RFI response indicates Contractor's acknowledgement that there will be no change in the Contract Sum or Contract Time."
11. Contractor's signature.
12. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings and other information necessary to fully describe items needing interpretation.

C. RFI Forms: Contractor's software-generated form with the content specified and as acceptable to the Architect.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
    a. Requests for approval of substitutions.
    b. Requests for adjustments in the Contract Time or the Contract Sum.
    c. Requests for interpretation of Architect's actions on submittals.
    d. 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 Proposal Request according to Section 01 26 00 - Contract Modification Procedures.
    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
    b. A response to an RFI is not direction or approval of a change to either Contract Time or Contract Sum.
    c. Proceeding with the Work in accordance with an RFI response, without such written notification and an approved Change Order or Construction Change Directive, indicates Contractor's acknowledgement that there is no change to the Contract Time or the Contract Sum.

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

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number using electronic document submittal service. Submit log at each Progress Meeting. Include the following:
   1. Project name.
   2. RFI number including RFIs that were dropped and not submitted.
   3. RFI description.
   4. Date the RFI was submitted.
   5. Date Architect's response was received.
   6. Identification of related Minor Change in the Work, Construction Change Directive, Change Order and Proposal Request, as appropriate.

3.08 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
   1. Submit at the same time as the preliminary schedule specified in Section - 01 32 16 - Construction Progress Schedule.
   2. Coordinate with Contractor's construction schedule and schedule of values.
   3. Format schedule to allow tracking of status of submittals throughout duration of construction.
   4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
   5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
      a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.09 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

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

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.10 DEFERRED SUBMITTALS

A. For delegated design elements defined in Section 01 10 00 - Summary, submit deferred submittals in accordance with the specified requirements and in accordance with Section 107.3.4.2 of the Oregon Structural Specialty Code.

B. Submission will include the following, as a minimum, in quantities as required by the governing agency:
   1. Drawings showing all members, sizes, fastener information, where applicable, dimensions, connections, materials used and how attached to the main structure.
   2. Calculations, including criteria, design assumptions, substantiating computations and such additional data sufficient to show compliance with Code.
   3. Product information.

4. Drawings and calculations must be stamped and signed by an Engineer registered in Oregon and must have Architect/Engineer of record's submittal review stamp.

C. Architect or Engineer, as applicable, will review delegated design submittals, and, if the submittal is acceptable and receives a "No Exceptions Taken" or "Make Corrections Noted" action, will forward to the Contractor for submission to the building official with annotation indicating that the deferred submittal documents have been reviewed and that they have been found to be in general conformance with the design of the building.

D. The Architect's and Engineer's approval is contingent upon approval of submittal by governing authorities.

E. Contractor shall be responsible for submission to the governing agency and for coordinating with the governing agency for timely review and approval of the submittals. Architect will not be responsible for delays due to failure of the Contractor to submit with adequate time allowance for agency review of the submittals.

F. The deferred submittal items shall not be installed until their design and submittal documents have been approved by the building official.

G. Contractor is responsible for obtaining written approval from governing authority for all Deferred Submittals.

H. Contractor is responsible for obtaining and costs associated with applicable permits for delegated design elements as required by governing authority.

3.11 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator for Owner. No action will be taken.

3.12 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.13 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.14 SUBMITTAL PROCEDURES

A. General Requirements:

1. Submit submittals to Architect as indicated in Electronic Document Submittals Article above.
2. Transmit using approved form.
   a. Use form generated by Electronic Document Submittal Service software.
3. Submit Schedule of all shop drawings, product data, and samples as specified in each individual Section of the Project Manual. Include submittal and installation dates of each product and assembly. Coordinate with construction schedule and allow ample time, but in no case fewer than 14 days, for Architect's review. Allow time for possible disapproval, correction, and resubmittal.
4. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   a. Provide a separate PDF for each submittal element (Product Data, Shop Drawings, etc.) for each specification Section.
      1) Submit all elements for any Section as a single submittal at the same time.
      2) Do not combine submittals for multiple specification Sections, unless previously approved by the Architect.
   b. Number submittals as indicated in Product Submittals - Detailed Requirements Article.
   c. No secure PDFs allowed.
   d. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
   a. Architect will not accept or process submittals which do not have Contractor's signed stamp that reflects Contractor's review and approval.
   b. Submission of submittal by Contractor represents that Contractor has fully reviewed and certified acceptance.
7. Schedule submittals to expedite the Project, and coordinate submission of related items.
   a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
   b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   a. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Architect's review of submittals, unless Contractor notates specific deviations and the deviations are specifically approved by the Architect.
9. Provide space for Contractor and Architect review stamps.
10. When revised for resubmission, identify all changes made since previous submission.
11. Submittals not requested will be recognized, but will be returned without comment,

B. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
   2. Do not reproduce Contract Documents to create shop drawings.
   3. Use of reproductions of Contract Documents in digital data form to create shop drawings is only permitted following execution of digital media files agreement.
   4. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

C. Do not fabricate products or begin work which requires submittals prior to return of submittal with Architect acceptance.

D. Contractor is responsible for timely and efficient submittals and the correctness of the documentation submitted. Costs associated with multiple reviews of submittal information beyond one re-submittal (if any) shall be the responsibility of the Contractor.

E. The Contractor is responsible for timely submittals of any required deferred submittals to the governing agencies.

3.15 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

D. Architect's and consultants' actions on items submitted for review:
   1. Authorizing purchasing, fabrication, delivery, and installation:
      a. "Approved", or language with same legal meaning.
      b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
         1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
      c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
   2. Not Authorizing fabrication, delivery, and installation:

E. Architect's and consultants' actions on items submitted for information:
   1. Items for which no action was taken:
      a. "Received" - to notify the Contractor that the submittal has been received for record only.
   2. Items for which action was taken:
      a. "Reviewed" - no further action is required from Contractor.

3.16 PRODUCT SUBMITTALS - DETAILED REQUIREMENTS

A. Present in a clear and thorough manner. Title each drawing with Project Name.

B. Identify field-verified dimensions; show relation to adjacent or critical features of Work or products.

C. Number submittals by submittal section number, followed by a two letter designation for the type of submittal and a number which sequentially numbers submittals in order submitted to Architect. For example, the initial submittal of Joint Sealers 07 92 00 Product Data would be designated 079200-PD-1. If the submittal must be resubmitted it shall be identified as 079200-PD-1R1 and subsequent resubmittal shall be sequentially numbered in order as resubmitted.

D. Shop Drawings (SD):
   1. Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproduction of the Contract Documents or standard printed data.
   2. Fully illustrate requirements in the Contract Documents including, but not limited to:
      a. Identification of products.
      b. Compliance with specified standards.
      c. Notation of coordination requirements.
      d. Notation of dimensions established by field measurement.
      e. Relationship and attachment to adjoining materials or assemblies, relevant field conditions and all necessary dimensions.

E. Product Data (PD):

1. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number.
2. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the Work. Delete information not applicable.
3. Product data that has not been marked to indicate the applicable information will be returned without review.
4. Contractor shall assemble Product Data required for maintenance manuals and submit to Architect in accordance with Section 01 78 00 - Closeout Submittals.

F. Samples (SA):
1. Samples for Initial Selection: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected. Architect will retain selected sample for confirmation of subsequent submittals.
2. Submit samples to illustrate functional characteristics of products, including parts and attachments.
3. Approved samples which may be used in the Work are indicated in the individual Specification Sections.
4. Label each sample with identification required for transmittal letter.
5. Verification Samples: Submit the number of samples specified in individual Specification Sections. One of which will be retained by the Architect.
   a. Submit three copies if no number is indicated.
   b. Submit additional samples when copies will be required for distribution to other subcontractors or fabricators for matching or preparation of finish samples.
6. Provide field samples of finishes at project site, at location acceptable to Architect, as required by individual Specifications Section. Install each sample complete and finished. Acceptable finishes in place may be retained in completed work if approved by Architect.

G. Manufacturer's Instructions (MI):
1. Provide at Minimum: Manufacturer's instructions for storage, preparation, assembly, installation, start-up, adjusting, balancing, and finishing in accordance with Section 01 40 00 - Quality Requirements.

H. Manufacturer's Certificates (MC):
1. When specified in individual Specification Sections, submit manufacturers' certificate to Architect/Engineer for review, in quantities specified herein.
2. Indicate material or product in conformance with or exceeding specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
3. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect.

3.17 TIMING OF SUBMITTALS

A. General:
1. The listing of submittals hereinafter is set forth as a checklist for Contractor's convenience and is general in nature.
2. Architect reserves the right to add to this list in case of omission of any submittals specified in other Sections but not listed hereinafter.

B. Submittals - Required Within Seven Days Post bid:
1. Contractor's Qualification Statement.
2. Letter from Insurance Company - insurance required effective upon Contract.
3. Letter from Surety - bonds required effective upon Contract.
4. Breakdown of bid (if requested).
5. Names of proposed suppliers for each of the principal portions of the Work.
6. Contractor's Construction Management Personnel: Project Manager - minimum 3 years experience; Field Superintendent - minimum 5 years experience.
7. Responsibility of Subcontractors.

8. A designation of the Work to be performed by the Contractor by his own forces.

C. Submittals - Required Within Seven Days After Notice of Intent to Award Contract (Prior to Execution of Contract):
1. Final List of Subcontractors and major material suppliers for principal portions of the Work.
2. Evidence of bondability (Performance Bond and Payment Bond).
3. Certificates of Insurance (on AIA Document G705 or equivalent).
4. Actual costs (%) of the Contractor's liability insurance.
5. Endorsements for additional insured.
6. Statements of State Worker's Compensation coverage.
7. Copy of Builder's Risk Policy.
8. Project Organizational Chart.
9. Key Staff Resumes with telephone and contact information.
10. Summary of Warranties included in Bid, including duration and start time of each. Itemize any deviations from Bid Document requirements.
11. Other documents required by Contract Documents.

D. Submittals - Prior to Notice to Proceed:
1. Executed Agreement.
2. Certified copies of Contractor's Liability Insurance Policies (AIA Document G705).

E. Submittals - Within Seven Days Following Contract Execution and Prior to Commencing Work:
1. Deliver Bonds to Owner with copy to Architect.
2. Performance and Labor & Material Payment Bonds per Oregon Law with certified copy of Power of Attorney from Attorney-in-Fact executing bonds.
3. Certified Schedule of Prevailing Wage Rates (attach to executed contract).

F. Submittals - Within Thirty Days Following Notice to Proceed and Prior to First Payment Application:
1. Schedule of values - submit at least 14-days in advance of application.
2. Schedule of submittals.
3. Copies of acquired and unacquired building permit licenses etc. to complete the Work of the Contract. Submit copies of any remaining permits as they are acquired.
4. Construction schedule.

G. Submittals - Prior to Each Month's Progress Payment:
1. Submit 10 days in advance of date established for progress payment.
2. Application and Certificate for Payment (AIA Document G702 and G703).
3. Notarized affidavit of payments to all subcontractors and major material suppliers (see application for payment).
4. Updated Construction Schedule.
5. Public Works Contractor Wage Certification per Oregon Law.

H. Submittals - Prior to request for Substantial Completion:
1. Notification to Architect that Work of the Project is substantially complete.
2. Itemized listing of items of work to be completed or corrected.
3. Submit Certificate of Occupancy or Occupancy Permit issued by the Local Building Department for the entire Project.
4. Draft Operations and Maintenance Manuals and draft warranties.

I. Submittals - Prior to request for Final Completion:
1. Certified copy of punchlist items completed.
2. Submit final Application for Payment.
3. Summary of Commissioning indicating all required items are completed.
4. Demonstration and Training reports.
5. Final complete and correct Operations and Maintenance Manuals.
6. Record Drawings of Contract Documents with all changes indicated.
7. Final dated and signed Warranties.

3.18 CONSTRUCTION PROGRESS SCHEDULE

A. Submit initial progress schedule as required in Section 01 32 00 - Construction Progress Documentation.

B. Revise and resubmit as required.

C. Review revised schedules with each Application for Payment, identifying changes since previous version.

D. See Section 01 32 00 for specific requirements.

3.19 SCHEDULE OF VALUES

A. Submit typed schedule on AIA Form G703. Contractor's standard form or media-driven printout will be considered on request.

B. Format: Table of Contents of this Project Manual. Identify each line item with number and title of the major Specification Sections.

C. Revise schedule to list change orders, for each application for payment.

D. Comply with requirements in Section 01 20 00 - Price and Payment Procedures.

END OF SECTION

SECTION 01 31 23
PROJECT MANAGEMENT DATABASE (PMD)

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Summary.

B. General Requirements.

C. System Requirements.

D. System Access.

E. System Use.

1.02 SUMMARY

A. Project Management Communications: The Owner, Contractor and Architect shall use the Internet web-based project management communications tool, e-Builder® software, and protocols included in that software during this project. The use of project management communications as herein described does not replace or change any contractual responsibilities of the participants.

B. Purpose: The intent of using e-Builder® is to improve project work efforts by promoting timely initial communications and responses and to reduce the number of paper documents while providing improved record keeping by creation of electronic document files

1.03 GENERAL REQUIREMENTS

A. Project management communications is available through e-Builder® as provided by "e-Builder®" in the form and manner required by the Owner.

B. The project communications database is on-line and fully functional. User registration, electronic and computer equipment, and Internet connections are the responsibility of each project participant. The sharing of user accounts is prohibited.

C. Support: e-Builder® will provide on-going support through on-line help files.

D. Authorized Users: Access to the web site will be by individuals who are licensed users as required by the Owner.

E. Licenses Granted by Owner: Owner shall pay for and provide licenses for the following members of the project team:
   1. Lead member of Architect's design team responsible.
   2. Two Contractors representatives.
   3. Owner's project manager or representative.
   4. Others as deemed appropriate by Owner.

1.04 SYSTEM REQUIREMENTS

A. System configuration:
   1. PC system 500 MHz Intel Pentium III or equivalent AMD processor
   2. 128 MB Ram
   3. Display capable of SVGA (1024 x 768 pixels) 256 colors display
   4. 101 key Keyboard
   5. Mouse or other pointing device.

B. Operating system and software configuration
   1. All software shall be properly licensed with vendors or developers. Use of “e-Builder” does not convey any rights or licensure for use of any software, hardware or internet service provider.
   2. Software configuration:
      a. Most current version of Microsoft Internet Explorer (current version is a free distribution for download). This specification is not intended to restrict the host server

or client computers provided that industry standard HTTP clients may access the published content.

b. Most current version of Adobe Acrobat Reader (current version is a free distribution for download).

c. Other plug-ins specified by e-Builder® as applicable to the system (current versions are a free distribution for download from www.e-builder.net)

d. Users are recommended to have properly licensed versions of the standard Microsoft Office Suite (current version must be purchased) or the equivalent.

1.05 SYSTEM ACCESS

A. Minimum Equipment and Internet Connection: In addition to other requirements specified in this Section, the Contractor shall be responsible for providing suitable computer systems for each licensed user at the user's normal work location with high-speed Internet access, i.e. DSL, local cable company's Internet connection, or T1 connection.

B. Authorized users will be contacted directly by the web site provider, e-Builder®, who will assign the temporary user password.

C. Individuals shall be responsible for the proper use of their passwords and access to data as agents of the company in which they are employed.

1.06 SYSTEM USE

A. Owner's Administrative Users: Owner administrative users have access and control of user licenses and all posted items. DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!

B. Improper or abusive language toward any party or repeated posting of items intended to deceive or disrupt the work of the project will not be tolerated and will result in deletion of the offensive items and revocation of user license at the sole discretion of the Administrative User(s). Costs incurred or associated with such issues shall be the financial responsibility of the party responsible for the transgression.

C. Communications: Communication for this project for the items listed below shall be solely through e-Builder®:

1. Applications for Payment.
2. Meeting minutes.
3. RFI, Requests for Information.
4. Contract Modifications.
5. Architect's Supplemental Instructions.
6. Submittals.
7. Substitution requests.
8. Record document submission.
9. Test results.
10. O&M Manuals (electronic format).
11. Formal letters and notices between the District and the Contractor.
12. Calendar of Events (meetings, events, open houses, public site tours, etc.).
13. All other communication shall be conducted in an industry standard manner.

D. Document Integrity and Revisions:

1. Documents, comments, drawings, and other records posted to the system shall remain for the project record. The authorship time and date shall be recorded for each document submitted to the system. Submitting a new document or record with a unique ID, authorship, and time stamp shall be the method used to make modifications or corrections.
2. The system shall identify revised or superseded documents and their predecessors.
3. Server or Client-side software enhancements during the life of the project shall not alter or restrict the content of data published by the system. System upgrades shall not affect access to older documents or software.

E. Document Security:
   1. The system shall provide a method for communication of documents. Documents shall allow security group assignment to respect the contractual parties' communication except for Administrative Users.

F. Document Integration:
   1. Documents of various types shall be logically related to one another and discoverable.

G. Notifications and Distribution:
   1. Document distribution to project members shall be accomplished both within the extranet system and via email as appropriate. Project document distribution to parties outside of the project communication system shall be accomplished by secure email of outgoing documents and attachments, readable by a standard email client.

H. Ownership of Documents and Information:
   1. All documents, files or other information posted on the system shall become the property of the Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, with network analysis diagrams and reports.

C. Material location reports.

D. Field condition reports.

E. Special reports.

1.02 REFERENCES

A. AGC (CPSM) - Construction Planning and Scheduling Manual.

B. M-H (CPM) - CPM in Construction Management - Project Management with CPM; O'Brien.

1.03 SUBMITTALS

A. Preliminary Schedule: Within 10 days after date of Owner's Notice of Intent to Award the Contract, submit preliminary schedule defining planned operations for the first 30 days of Work, with a general outline for remainder of Work.
   1. Submit minimum two hard copies to Architect for review.
   2. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

B. Construction Schedule: Within 14 days after date established in Notice to Proceed, submit draft of proposed complete schedule for review.
   1. Include written certification that major Subcontractors have reviewed and accepted proposed schedule.
   2. Not less than 10 percent of the initial Application for Payment may be withheld until a complete Construction Progress Schedule has been submitted in a form acceptable to Architect and Owner.
   3. Neither Owner nor Architect shall be responsible for review of the entire substance of the Progress Schedule.
   4. Within 30 days after dated established in Notice to Proceed, submit complete schedule.
   5. Submit updated schedule with each Application for Payment.
   6. At each progress meeting, submit the following:
      a. Updated schedule incorporating revisions to the construction schedule.
      b. A three-week look-ahead schedule listing current and upcoming activities by trade, including anticipated start and complete dates as applicable.

C. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.

D. Material Location Reports: Submit at monthly intervals.

E. Field Condition Reports: Submit at time of discovery of differing conditions.

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

1.04 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one year minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

1.05 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

B. Diagram Sheet Size: Maximum 30 x 42 inches or width required.

C. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS

2.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a preliminary network diagram.

B. Content
   1. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
   2. Identify each item by specification section number.
   3. Identify work of separate stages and other logically grouped activities.
   4. Include conferences and meetings in schedule.
   5. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
   6. Show product and installation dates for major products.
   7. Provide separate schedule of submittal dates for shop drawings, product data, and samples, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.
   8. Include a line item for Project Closeout.
   9. Coordinate content with schedule of values specified in Section 01 20 00 - Price and Payment Procedures.
   10. Include not more than 30 days for punch list and final completion, unless otherwise indicated.
   11. Provide legend for symbols and abbreviations used.

2.02 NETWORK ANALYSIS

A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.

B. Schedule shall include date of Notice to Proceed, date of Substantial Completion, and date of Final Completion in accordance with Contract Documents.
   1. Critical Path shall be clearly indicated on Schedule.
   2. Not more than 20 percent of the progress activities shall be on the Critical Path at any one time.
   3. Not more than 5 percent of the total individual activities may exceed $50,000 or 20 calendar days (per activity) without prior approval.

C. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.

D. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
   1. Preceding and following event numbers.
   2. Activity description.
   3. Estimated duration of activity, in maximum 20 day intervals.
   4. Earliest start date.
   5. Earliest finish date.
   6. Actual start date.
   7. Actual finish date.
   8. Latest start date.
   9. Latest finish date.
   10. Total and free float; float time shall accrue to Owner and to Owner's benefit.
   11. Monetary value of activity, keyed to Schedule of Values.
   12. Percentage of activity completed.
   13. Responsibility.

E. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and recomputation of all dates and float.

F. Milestone completion dates shall be clearly shown on the Schedule.

G. If abbreviations are used on the Schedule, a legend shall be provided to define all abbreviations.

H. Required Reports: List activities in sorts or groups:
   1. By preceding work item or event number from lowest to highest.
   2. By amount of float, then in order of early start.

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

2.03 THREE-WEEK WORK SCHEDULE

A. Each week, prepare and present an updated schedule showing the planned activities for the next three weeks and one week prior. The schedule shall be coordinated with the master schedule and accurately portray activities completed and activities planned for the upcoming weeks. Present this schedule at the weekly progress meeting.

2.04 SCHEDULE - DRIVEN REQUIREMENTS

A. A schedule for the purchase, delivery, and receipt of critical items required for performance of the Work, showing lead times between purchase order placement and delivery dates, shall be integrated with the Construction Progress Schedule. Neither the Architect nor the Owner shall be deemed to have approved or accepted any such material, or its schedule, nor deemed to have waived this requirement if some or all of the material is not received.

B. Should the Contractor fail to meet any scheduled date as shown on the current Construction Progress Schedule, the Contractor shall, if requested, be required at its own expense to submit within ten days of the request an updated Construction Progress Schedule. If the Contractor's progress indicates to the Owner that the Work will not be Substantially Completed within the Contract Time, the Contractor shall, at its own expense, increase its work force and/or working hours to bring the actual completion dates of the activities into conformance with the Construction Progress Schedule and Substantial Completion within the Contract Time. The Contractor shall reschedule and also submit a revised Construction Progress Schedule at its own expense within ten days of notice from the Architect that the sequence of work varies significantly from that shown on the current Schedule showing work to complete on original Contract Time with approved extensions. Neither the Owner nor the Architect will, however, be obligated to review the substance or sequence of the Construction Progress Schedule or otherwise determine whether it is correct, appropriate or attainable.

C. Schedule Float Utilization:
   1. Any float time to activities not on the critical path shall belong to the Project, and may be used by the Project to optimize its construction process. Any float time between the end of the final construction activity and the final completion date shall belong to the Owner, and may be used by the Owner in determining if additional contract days are to be awarded for changes in the contract or for delays to the contract caused by the Owner. The Contractor will not be entitled to any adjustment in the Contract Time, the Construction Schedule, or the Contract Sum, or to any additional payment of any sort by reason of the Owner's use of float time between the end of the final construction activity and the final completion date or by reason of the loss or use of any float time, including time between the Contractor's anticipated completion date and end of the Contract Time, whether or not the float time is described as such on the Construction Progress Schedule.

D. Closeout: In the Contractor's Construction Schedule provide key activities required under Sections 01 77 00 - Closeout Procedures and 01 78 00 - Closeout Submittals. These activities will be cost-loaded to a cumulative total of not less than 2 percent of the contract value.

2.05 REPORTS

A. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.06 SPECIAL REPORTS

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

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

PART 3 EXECUTION

3.01 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

3.02 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Update diagram to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

3.03 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Architect, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. References and standards.

C. Inspection agencies and services.

D. Control of installation.

E. Tolerances.

F. Manufacturers' field services.

G. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittal procedures.

B. Section 01 42 16 - Definitions.

C. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 SUBMITTALS

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

B. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

C. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

D. Manufacturer's Field Reports: Submit reports in quantities specified for Product Data.
   1. Submit report within 15 days of observation to Architect for information.
   2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

E. 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.

1.04 DEFINITIONS

A. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

B. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.05 CONFLICTING REQUIREMENTS

A. Metal Thickness: Where thickness of metals is designated in both gage and thickness in inches, the thickness in inches shall govern. Gages are provided for convenience only. Specified submittals for metals shall indicate thicknesses in inches.

1.06 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

1.07 INSPECTION AGENCIES AND SERVICES

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified inspection agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of inspecting agencies engaged and a description of types of inspecting they are engaged to perform.
   2. Costs for reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
   2. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   3. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   4. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

1.08 MANUFACTURER'S FIELD SERVICES

A. Manufacturer's Field 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.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

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

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

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

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

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

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

3.02 TOLERANCES

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

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

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

3.03 INSPECTION

A. See individual specification sections for inspection required.

B. Inspection Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
   3. Perform additional inspections required by Architect.
   4. Submit reports of all inspections specified.
      a. One copy of all inspection reports shall be promptly sent directly to the Contractor, Architect, Owner, Structural Engineer, Building Department, unless otherwise directed.
      b. In addition to written reports, immediately notify by telephone Architect, Owner and Contractor of any portions of the work found to be in non-compliance with the Contract Documents.

C. Limits on Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
   1. Provide access to the Work.
   2. Provide incidental labor and facilities:
      a. To provide access to Work to be inspected.
      b. To facilitate inspections.
   3. Notify Architect and inspection agency 24 hours prior to expected time for operations requiring inspection services.
      a. When inspections cannot be performed, through the fault of the Contractor, reimburse the Owner for the additional costs incurred.
      b. Schedule inspection so that the services of inspection personnel will be as continuous and brief as possible.
   4. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
      a. When tests or inspections cannot be performed, through the fault of the Contractor, reimburse the Owner for the additional costs incurred.
   5. Arrange with Owner's agency and pay for additional inspections required by Contractor beyond specified requirements.
      a. Schedule inspection so that the services of inspection personnel will be as continuous and brief as possible.

E. Contractor shall be responsible for coordinating inspecting services so as to insure that inspections are performed and reports delivered in a manner not to cause delays to the Work. Allow adequate time for inspection and any needed corrections before proceeding to the next construction stage.

F. Furnish records, drawings, certificates, and similar data as may be required by the inspecting personnel to assure compliance with the Contract Documents.

G. Re-inspection required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

H. Re-inspection required because of non-conformance to specified requirements shall be paid for by Contractor.

3.04 INSPECTION REPORTS

A. The inspecting agency will perform and furnish the following:
   1. Field Inspection Reports: Furnish field inspection reports for each site visit documenting activities, observations, and inspections of work being inspected include:
      a. Date issued.
      b. Project title and number.
      c. Inspecting agency or engineering firm name, address, and telephone number.
      d. Name and signature of representative.
      e. Observations on weather and climatic conditions.
      f. Time and date
      g. Conditions and/or status of the work being inspected.
      h. Actions taken.
      i. Recommendations or evaluation of the work.
   2. Reports will be submitted to Owner and Architect in duplicate giving observations and results of inspections, indicating compliance or non-compliance with specified standards and with Contract Documents.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

C. 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.

3.06 DEFECT ASSESSMENT

A. When inspections indicate non-compliance with the Contract Documents, subsequent re-inspection occasioned by such noncompliance shall be performed by the same personnel as performed the initial inspections, and the additional cost shall be paid by the contractor as stipulated under the Conditions of the Contract.

B. Contractor shall remove and replace any work found defective or not in compliance with the Contract Documents at no additional cost to Owner, and furnish notice for re-inspecting as specified herein above.

C. Replace Work or portions of the Work not conforming to specified requirements.

3.07 REPAIR AND PROTECTION

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

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

END OF SECTION

SECTION 01 40 05
CUTTING AND PATCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements and limitations for cutting and patching of the Work.

1.02 RELATED REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

B. Section 01 70 00 - Execution: Examination, preparation, and general installation procedures.

C. Section 02 41 19 - Selective Structure Demolition.

1.03 REPAIR AND PROTECTION

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

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

1.04 SUBMITTALS

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

B. Submit written request in advance of cutting or alteration which affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather-exposed or moisture-resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight-exposed elements.

C. Include in request:
   1. Identification of Project.
   2. Location and description of affected work.
   3. Necessity for cutting or alteration.
   4. Description of proposed work, and products to be used.
   5. Alternatives to cutting and patching.
   6. Date and time work will be executed.

PART 2 PRODUCTS

2.01 MATERIALS

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

B. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00.

PART 3 EXECUTION

3.01 GENERAL

A. Execute cutting, fitting, patching and finishing including excavation and fill, to complete Work, and to:
   1. Fit the several parts together, to integrate with other work.
   2. Uncover work to install ill-timed work.
   3. Match work that has been cut to adjacent work.
   4. Repair areas adjacent to cuts to required condition.
   5. Repair new work damaged by subsequent work.
   6. Remove and replace defective and non-conforming work.
   7. Provide finished appearance of surfaces and to match adjacent surfaces (unless otherwise noted) affected by the Work.

3.02 INSPECTION

A. Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

B. After uncovering, inspect conditions affecting performance of work.

C. Beginning of cutting or patching means acceptance of existing conditions.

3.03 PREPARATION

A. Provide supports to assure structural integrity of surroundings; devices and methods to protect other portions of Project from damage.

B. 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. Maintain excavations free of water.

C. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.04 PERFORMANCE

A. Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.

B. Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

C. 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. Roofing: At locations where existing roofing must be removed to accommodate new construction, remove roofing, including insulation as necessary. Provide a temporary cutoff in strict accordance with roofing manufacturer's recommendations, to provide a 100 percent watertight seal.
      a. If any water is allowed to enter under the existing roofing, the affected area shall be removed and replaced at Contractor's expense.

D. 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. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. At locations where interior finishes are damaged to accommodate modifications to or relocation of roof ladders, patch and repair gypsum board finishes and touch up paint so that no evidence of patch remains in the finished work.
      a. Coordinate with Owner to match paint materials, color and sheen.
   4. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.
   5. Replacement of defective work will not create new seams or joint lines.
   6. Restore work with new products in accordance with requirements of Contract Documents.

7. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

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

3.05 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements. Materials subject to testing and inspection in the specifications shall be retested after cutting and patching operations are completed.

END OF SECTION

SECTION 01 42 16
DEFINITIONS

PART 1 GENERAL

1.01 SUMMARY

A. This section supplements the definitions contained in the General Conditions.

B. Other definitions are included in individual specification sections.

1.02 SPECIFICATION EXPLANATION

A. The specifications are divided into Divisions and Sections for the convenience of writing and using. The titles of these are not intended to imply a particular meaning nor to fully describe the work of each division or section, and are not an integral part of the text which specifies the requirements. The Architect is not bound to define the limits of any subcontract, and will not enter into disputes between the Contractor and its employees, including subcontractors.

B. These specifications are of the abbreviated, or "streamlined" type, and include incomplete sentences. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.

C. Omissions of words or phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the drawings.

D. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

1.03 DEFINITIONS

A. The definitions in this Section are not necessarily complete or exclusive but, generally, apply to all portions of the Work. Some contractual definitions appear in the General Conditions. Definitions of words of a special nature which relate to Work covered in one or two Sections of the Specifications are included in such Sections. Terms used throughout the Contract Documents are defined in this Section.

B. Approve: Where used in conjunction with the Architect's or Engineer's response to submittals, requests, applications, inquiries, reports, and claims by the Contractor, the meaning of the term "approved" will be held to the limitations of the Architect's responsibilities and duties as specified in the General and Supplementary Conditions. In no case will "approval" by the Architect be interpreted as an assurance to the Contractor that the requirements of the Contract Documents have been fulfilled. The term “or approved” used in conjunction with specified materials means “properly submitted and approved substitution request.”

C. Coordinate: The term "coordinate" means satisfactorily combine the work of all trades for a complete and operating installation.

D. Directed, Requested, etc.: Unless otherwise explained, terms such as "directed", "requested", "authorized", "selected", "approved", "required", "accepted", and "permitted" mean "directed by the Architect", "requested by the Architect", etc. However, no such implied meaning will be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.

E. Furnish: Except as otherwise defined in greater detail, the term "furnish" is used to mean supply and deliver to the project site, ready for unloading, unpacking, assembly, installation and similar operations.

F. General Requirements: The provisions or requirements of Divisions 01 Sections apply to entire work of Contract and, where so indicated, to the other elements of work which are included in the Project.

G. Guarantee and Warranty: "Warranty" is generally used in conjunction with products manufactured or fabricated away from the project site, and "guarantee" is generally used in

conjunction with units of work which require both products and substantial amounts of labor at the project site. The resulting difference is that warranties are frequently issued by manufacturers and frequently supported (partially) by product guarantees from contractors and/or installers.

H. Indicated: A cross reference to details, notes or schedules on the Drawings, to other paragraphs or schedules in the Specifications, and to similar means of recording requirements in the Contract Documents. Where terms such as “shown”, “noted”, “scheduled”, and “specified” are used in lieu of “indicated”, it is for purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.

I. Install: Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

J. Installer: The person or entity engaged by the Contractor or his Subcontractor or Sub-subcontractor for the performance of a particular unit of work at the project site, including installation, erection, application and similar required operations. It is a general requirement that Installers be recognized experts in the work they are engaged to perform.

K. Product: The term "product" as used in the Project Manual includes materials, systems, and equipment provided by the Contractor for use in the Work.

L. Project Manual: The term "Project Manual" is the volume which includes the Bidding Requirements, Conditions of the Contract, and the Specifications, Divisions 01 through 33 inclusive, as applicable, and as listed in the Table of Contents bound therein.

M. Provide: Except to the extent further defined, the term "provide" means to furnish and install, complete and ready for the intended use.

N. Selected: The term "selected" means "selected by the Architect and Owner"; the Architect shall be the sole judge of the acceptability of a product or an installation.

O. Site: Space available to the Contractor for performing the Work under this Contract, either exclusively or in conjunction with other contractors as part of the overall Project. The Site may be unimproved vacant land, an existing building or space within an existing building. The extent of the Site is shown on the Drawings.

P. Specification Language: Imperative language is used, generally, throughout the Specifications. Requirements expressed imperatively are to be performed by the Contractor. For clarity at certain locations, contrasting subjective language is used to describe responsibilities which must be performed by the Contractor or, when so noted, will be performed by others.

Q. Trades: Using terms such as carpentry is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufacturer's standard warranties and special warranties.

B. General product requirements.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations and procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittal requirements and electronic submission requirements.

B. Section 01 40 00 - Quality Requirements: Product quality monitoring.

C. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting packaging and substitutions.

1.03 SUBMITTALS

A. Proposed Products List: Electronically submit list of major products and list of finish materials proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Agreement.
   2. For products specified only by reference standards, list applicable reference standards.
   3. Indicate product lead times.

B. Substitution Requests: Electronically submit each request for consideration as a PDF. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Name of PDF shall reflect the specification Section number and the proposed product manufacturer or product name.
   2. Limit each request to one proposed substitution.
   3. Submit a separate form for each item upon which approval is requested, with the exception of groups of items (e.g., electrical fixtures, plumbing fixtures, etc.) for which an itemized listing may be attached.
   4. Acceptance of the particular product or method on a previous project does not confer or imply acceptance for this project.
   5. Submit samples to Architect upon request.

C. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. Shop Drawing Submittals: Prepared specifically for this Project.

E. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.04 QUALITY ASSURANCE

A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

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

D. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.

E. Neither the contractual relationships, duties, nor responsibilities of the parties in Contract nor those of the Architect shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

F. Contractor warrants to the Owner that the materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of material and equipment.

1.05 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. Refer to Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 - Closeout Procedures.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.
   1. Means new material, machinery, components, equipment, fixtures, and systems comprising the Work. Does not include machinery and equipment used for preparation, fabrication, conveying, and erection of the Work.
   2. Products may also include existing materials or components when specifically designated for reuse.

B. DO NOT USE products having any of the following characteristics:
   1. Made using or containing CFC's or HCFC's.
   2. Made of wood from newly cut old growth timber.

C. Where all other criteria are met, Contractor shall give preference to products that:
   1. Have longer documented life span under normal use.
   2. Result in less construction waste.

2.02 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. Two or more items of the same kind shall be considered identical and by the same manufacturer.
   4. Provide products suitable for service conditions.
   5. Adhere to equipment capacities, sizes and dimensions shown or specified unless variations are specifically approved in writing.
   6. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
   7. Where products are accompanied by the term "as selected," Architect will make selection.
   8. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming Products of More than One Manufacturer: Use one of the products named and meeting specifications, no options or substitutions allowed.

D. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

E. 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. Submit a request for substitution for other named manufacturers. Use of manufacturers not named not allowed.

F. 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 for substitutions

G. 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.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section. Requests received after that time will not be considered except as specified below under "Substitutions Requested After Award of Contract."

B. Submit all requests for substitutions electronically as PDFs.
   1. Submit all requests for substitutions during the Bid Phase via email to bill.conboy@ibigroup.com.
   2. Submit all requests for substitutions after the Bid Phase in accordance with requirements for electronic submittals in Section 01 30 00 - Administrative Requirements.

3. Submit all requests for substitutions after the Bid Phase through the Contractor. Substitution requests received directly from Subcontractors or Suppliers will be returned through the Contractor without review.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

D. A request for substitution constitutes a representation that the Contractor/Bidder:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.
   5. Will pay for changes to building design, including architectural or engineering design, detailing, construction costs, or re-approval by authorities caused by the requested substitution.

E. Substitutions after Award of Contract will not be considered when:
   1. Indicated or implied on shop drawings or product data submittals without formal request submitted in accordance with this Section.
   2. Submittal for substitution request has not been reviewed and recommended by Contractor. Substitution requests received directly from Subcontractors or Suppliers will be returned through the Contractor without review.
   3. Acceptance will require substantial revision of Contract Documents or other items of the Work.
   4. Submittal for substitution request does not include point-by-point comparison of proposed substitution with specified product.

F. Substitution Request Form:
   1. Use Substitution Request Form bound at the end of this Section for substitution requests during the bid phase.
   2. Use "Substitution Request (After the Bidding Phase)" form bound at the end of this Section for substitution requests after the Award of Contract.

G. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
   1. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
   2. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
   3. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
   4. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
   5. Samples, where applicable or requested.
   6. Certificates and qualification data, where applicable or requested.
   7. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
   8. List of availability of maintenance services and replacement materials.
   9. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

10. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
11. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
12. Cost information, including a proposal of change, if any, in the Contract Sum.
13. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
14. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

H. Accepted Substitutions prior to Bid Date will be listed in Addenda published in accordance with Advertisement for Bids and the Instructions to Bidders. Bidders will not rely upon approvals made in any other manner.

I. Architect's Action for Substitutions After Award of Contract: If necessary, Architect will request additional information or documentation for evaluation within 7 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 7 days of receipt of additional information or documentation, whichever is later.
   1. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
   2. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

3.02 SUBSTITUTIONS REQUESTED AFTER AWARD OF CONTRACT

A. Substitutions will normally not be considered after two days prior to last addendum date, except when required due to unforeseen circumstances. Within a period of 30 days after date of Contract, the Owner may, at its option, consider formal written requests for substitution of products in place of those specified when submitted in accord with the requirements stipulated herein. To receive consideration, one or more of the following conditions must be documented in any such request:
   1. The substitution is required for compliance with final interpretation of Code requirements or insurance regulations.
   2. The substitution is required due to unavailability of a specified product, through no fault of the Contractor.
   3. The substitution is required because subsequent information disclosed the inability of the specified product to perform properly or to fit in the designated space.
   4. Manufacturer's or fabricator's refusal to certify or warrant performance of specified product as required.
   5. Subsequent information that a long delivery date will not be compatible with the Contract construction period.
   6. 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. Owner reserves the right to reject any and all substitution requests for any reason, without obligation or liability

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. 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.

E. Transport and handle products in accordance with manufacturer's instructions.

F. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

G. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

H. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

I. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store materials in a manner that will not endanger Project structure.

C. Store and protect products in accordance with manufacturers' instructions.

D. Store with seals and labels intact and legible.

E. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

F. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

G. For exterior storage of fabricated products, place on sloped supports above ground.

H. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

I. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

J. Comply with manufacturer's warranty conditions, if any.

K. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

L. Prevent contact with material that may cause corrosion, discoloration, or staining.

M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 70 00
EXECUTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Protection of installed construction.

C. Correction of the Work.

D. Progress cleaning.

1.02 RELATED REQUIREMENTS

A. Section 01 74 19 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.04 QUALITY ASSURANCE

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

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

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   a. Description of the Work.
   b. List of detrimental conditions, including substrates.
   c. List of unacceptable installation tolerances.
   d. Recommended corrections.
2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine walls and roofs for suitable conditions where products and systems are to be installed.
   a. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings in substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

D. 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.

E. Verify space requirements and dimensions of items shown diagrammatically on Drawings.

F. Review 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 the Contractor, submit a request for information to Architect according to requirements in Section 01 30 00 - Administrative Requirements.

3.03 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
   2. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
   3. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
   4. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
   5. Make neat transitions between different surfaces, maintaining texture and appearance.

B. Installer Inspections: Require installer of each major unit of work to inspect substrate and conditions for installation and to report unsatisfactory conditions in writing.
   1. Correct unsatisfactory conditions before proceeding with installation.
   2. Inspect each product immediately before installation.
   3. Do not install damaged or defective products, materials or equipment.
   4. Start of installation shall be understood as acceptance of substrate conditions by the installer.

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

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

E. 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.

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, attachment plates, 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.

3.04 PROTECTION OF INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual specification Sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to minimize damage.

C. Provide and maintain temporary shoring and lateral bracing of structure during erection to resist all loads including:
   1. Wind
   2. Seismic
   3. Construction
   4. Materials
   5. Moving equipment

D. Do not remove temporary bracing and shoring until adequate, permanent connections or structural elements are in final position and positively anchored.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

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

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

3.05 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
   1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

3.06 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 degrees F.
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
      a. Utilize containers intended for holding waste materials of type to be stored.
   4. Daily cleaning shall include magnetic sweep of jobsite to pick up all nails and metallic debris.

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 01 74 19 - Construction Waste Management and Disposal.

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

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period.

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.

END OF SECTION

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
   1. Aluminum and plastic beverage containers.
   2. Corrugated cardboard.
   3. Wood pallets.
   4. Clean dimensional wood: May be used as blocking or furring.
   5. Metals, including packaging banding, metal studs, sheet metal, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
   6. Plastic buckets.
   7. Plastic sheeting.
   8. Rigid foam insulation.

E. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.

F. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.
   5. Incineration, either on- or off-site.

G. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state, and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

1.03 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating, and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

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

B. Submit Waste Management Plan within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner; submit projection of all trash and waste that will require disposal and alternatives to landfilling.
   1. Prior to commencing construction on site, develop and have reviewed and approved a construction site waste management plan.

C. Waste Management Plan: The plan will cover all Contractor work on site. Source reduction on the job site should be an integral part of the plan. Include the following information:
   1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
   2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
   3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
   4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
   5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
   6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
      a. Identify licensed haulers and processors of recyclables; identify markets for salvaged materials; identify deconstruction, salvage and recycling strategies and processes; include waste auditing; and document the cost for recycling, salvaging and reusing materials.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings, particularly at:
   1. Pre-bid meeting.
   2. Pre-construction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide construction dumpsters. Do not intermingle trash with school dumpsters.
   3. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   4. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Substantial Completion.

B. Final Completion.

C. Punch List.

D. Warranties.

E. Cleaning prior to Substantial Completion review.

F. Final Cleaning.

1.02 RELATED REQUIREMENTS

A. Section 01 13 31 - Certificate of Compliance.

B. Section 01 13 32 - Certificate of No Hazardous Materials.

C. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.03 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting review for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.
   1. In progress payment request coincident with or first following date claimed, show either 100 percent completion for portion of work claimed as "substantially complete", or list incomplete items, value of incompletion, and reasons for being incomplete. Include supporting documentation for completion as indicated in these contract documents.
      a. Submit statement showing accounting of changes to the Contract Sum.
      b. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Advise Owner of pending insurance changeover requirements.
   3. Submit workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits and similar releases.
   5. Submit completed Certificate of Compliance. Refer to Section 01 13 31.
   6. Submit completed Certificate of No Hazardous Materials. Refer to Section 01 13 32.
   7. Prepare and submit drafts for Operation and Maintenance Manuals.
   8. Prepare and submit drafts for Project Record Documents.
   9. Terminate and remove temporary facilities from Project site, along with construction tools, and similar elements.
   10. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
   11. Complete final cleaning requirements.
   12. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
   13. Make submittals that are required by governing or other authorities.
      a. Provide copies to Architect and Owner.
      b. Provide copy of Occupancy Permit to Architect and Owner.

B. Review: Submit a written request for review for Substantial Completion. On receipt of request, Architect will either proceed with review or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after review 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. Results of completed review will form the basis of requirements for Final Completion.
2. Should the Architect have to perform any additional reviews due to failure of Work to comply with claims of completion made by Contractor, the cost for each additional review will be charged to the Owner at the Architect/Engineer's hourly rate. The Owner shall have the right to deduct such charges from the contract amount as provided in the Conditions of the Contract.

1.04 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final review for determining final completion, complete the following:
   1. Submit a final Application for Payment with final waivers according to Section 01 20 00 - Price and Payment Procedures.
      a. Submit updated final statement, accounting for additional (final) changes to Contract Sum.
   2. Submit consent of surety.
   3. Prepare and submit final Project Record Documents within 30 days after date of Substantial Completion or before final completion, whichever occurs first.
   4. Submit final warranties.
   5. Submit final operation and maintenance manuals.
   6. Submit certified copy of Architect's Substantial Completion review list of items to be completed or corrected (punch list). The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
   8. Submit permanent Certificate of Occupancy.
   9. Submit payment and release of liens to requirements of General Conditions. Before final payment, the Contractor shall furnish the following to the Architect:
      a. An affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner of property might in any way be responsible, have been paid or otherwise satisfied (use AIA Form G706 or approved).
      b. An affidavit from each Subcontractor on AIA Form G706 or approved.
      c. Letter from Bonding Company addressed to Owner but submitted to the Architect, approving release of final payment and waiving submission of final receipts as well as a statement confirming the extension of the Bond for the warranty period as specified. Final receipts from all Subcontractors and material and equipment suppliers may be required to furnish to the Owner by the Contractor if the Surety does not waive this requirement. Letters to be in substantially the following form:

         (Name of Owner)Re: (Bond No.)
         (Address)(Name of Contractor)
         (Name of Project)
         Gentlemen:
         The (Name of Bonding Company), surety on the above named Bond, consents to payment of retained percentages and agrees to waive submission of final receipts.
         It is also agreed that the final payment to the Contractor shall not relieve the Surety Company of any of its obligations and that the Bond is extended to include guarantees and warranties of workmanship and materials.
         (NAME OF BONDING COMPANY)
         Attorney-in-Fact
      d. Submit Contractor's Affidavit of Release of Liens (AIA Form G706A).
      e. Return all copies of the Drawings and Specifications in accordance with the General Conditions.
   10. Submit Affidavit of Wages Paid for Contractor and all sub-contractors.
   11. Submit Department of Revenue Release (for projects over $35,000 only).
   12. Instruct Owner's personnel in maintenance of products and systems.

13. Submit attendance record for training of Owner's personnel.
14. Complete requirements of Section 01 78 00 - Closeout Submittals.

B. Review: Submit a written request for final review for acceptance. On receipt of request, Architect will either proceed with review or notify Contractor of unfulfilled requirements. Architect will either prepare a letter to Owner recommending final acceptance or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
   1. Additional Reviews: Request an additional review when the Work identified in previous reviews as incomplete is completed or corrected.
   2. Should the Architect have to perform any such additional reviews due to failure of Work to comply with claims of completion made by Contractor, the cost for each additional review will be charged to the Owner at the Architect/Engineer's hourly rate. The Owner shall have the right to deduct such charges from the contract amount as provided in the Conditions of the Contract.
   3. Provide additional cleaning services as required for Work which was not complete at the time of initial review. Reclean as required until all Work is fully complete and recommended for final acceptance by Architect.
   4. If the Work does not achieve Final Completion within two weeks of the date originally scheduled to do so, plus any time adjustments by Change Order, the Architect's time and efforts beyond that period shall constitute extra services, the cost of which at the Architect's standard hourly rates will be deducted from the Contractor's Final Payment or retainage by the Owner.
   5. Punch list items in the Schedule of Values will be released on any given line item only when all punchlist items relating to that line item are satisfactorily completed.

1.05 CONTRACTOR'S LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Prior to requesting review for Substantial Completion, perform a thorough punch list of the project identifying incomplete items, damaged items and substandard items requiring correction.
   1. Distribute the Punch List to applicable subcontractors and indicate corrections made to each item.
   2. Reinspect and sign off on all complete items.
   3. This Punch List will form the basis of the list to be submitted with the request for Substantial Completion.
   4. Supplement Punch List with valuation of incomplete items and reasons for being incomplete.
   5. Prepare Punch List in digital format acceptable to Architect.

B. 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 by roof area.
   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.

1.06 WARRANTIES

A. Submittal Time:
   1. Submit summary of warranties included in the bid within seven days after Notice of Intent to Award Contract (Prior to Execution of the Contract). Indicate duration of each warranty and start date.
   2. Submit sample warranties as part of the project submittal process.

3. Submit final warranties before requesting review for final acceptance.

B. Comply with requirements of Section 01 78 00 - Closeout Submittals.

PART 2 PRODUCTS

2.01 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

3.01 CLEANING PRIOR TO SUBSTANTIAL COMPLETION REVIEW

A. At time of project close-out, clean or reclean the Work to the condition expected from a normal, commercial building cleaning and maintenance program.

B. Complete the following cleaning operations before requesting the Architect's review for certification of Substantial Completion.
   1. Remove grease, dust, dirt, stains, manufacturer's labels, fingerprints, etc., from sight exposed surfaces.
   2. Remove non-permanent protection and labels.
   3. Repair, patch and touch-up marred surfaces.
   4. Remove construction debris.
   5. Police yards and grounds.

3.02 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 anti-pollution 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 review for certification of Substantial Completion for entire Project or for a 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 labels that are not permanent.
      f. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
         1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.
      g. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove other foreign substances.
      h. Leave Project clean and ready for occupancy.
   2. Maintain in cleaned condition until Final Completion or Owner occupancy.

END OF SECTION

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Manuals.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 31 23 - Project Management Database (PMD): Electronic submittal of record documents.

B. Section 01 77 00 - Closeout Procedures: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Record Drawings:
   1. Draft: Submit one copy of marked-up record prints in electronic color PDF format prior to request for review for Substantial Completion.
   2. Final: Submit one paper copy set and an electronically scanned copy of marked up prints within 30 days of dated established for Substantial Completion or prior to request for review for final completion, whichever occurs first.
   3. Approved permit set of plans.

B. Record Specifications:
   1. Draft: Submit one copy of marked-up copy of Project Manual in electronic color PDF format prior to request for review for Substantial Completion.
   2. Final: Submit one copy of marked-up copy of Project Manual and one electronically scanned copy within 30 days of date established for Substantial Completion or prior to request for review for final completion, whichever occurs first.

C. Operation and Maintenance Manuals:
   1. Draft: Submit one copy of draft manuals in electronic color PDF format prior to request for review for Substantial Completion. Architect will review draft and return one copy with comments. Revise content of all document sets as required prior to final submission.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Final: Submit three sets of revised Manuals and an electronically scanned copy in final form prior to request for review for final completion.

D. Warranties and Bonds:
   1. Submit a summary of warranties included in the bid within seven days after Notice of Intent to Award Contract (Prior to Execution of the Contract). Indicate duration of each warranty and start date.
   2. Draft: Submit as part of normal submittal process.
   3. Final: Submit final forms of warranties prior to request for review for final completion.

E. PDF Format: Submit searchable PDF electronic files. File names shall clearly identify the Owner, project name, drawing or specification number and name and date. File name shall be established to list in the same order as identified in the Contract Documents.
   1. Submit electronic documents for record documents and Operations and Maintenance Manuals by e-Builder as specified in Section 01 31 23 - Project Management Database (PMD).

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and Construction Change Directives.
   5. ASIs and responses to RFIs.
   6. Reviewed shop drawings, product data, and samples.
   7. Manufacturer's instruction for assembly, installation, and adjusting.
   8. Architect will provide one hard copy and one PDF electronic file of a conformed set of Contract Documents, incorporating addenda for use by Contractor in developing As-Built Drawings.

B. The As-Built documents shall include all disciplines of work whether changes occur or not. These documents, as well as the approved permit set of plans, shall be available to the Architect and Owner at the site and reviewed with them on a monthly basis. Satisfactory maintenance of up-to-date record drawings on a monthly basis will be a requirement for approval of progress payments.

C. Store As-Built documents in the field office apart from the Contract Documents used for construction. Do not use project As-Built documents for construction purposes. Maintain As-Built documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project As-Built documents for Architect's reference during normal working hours.

D. As-Built Drawings:
   1. 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. Actual existing equipment locations.
      d. Changes made by Addenda.
      e. Changes made by Change Order or Construction Change Directive.
      f. Changes made following Architect's written orders, including ASIs and responses to RFIs.
      g. Details not on the original Contract Drawings.
      h. Field records for variable and concealed conditions.
      i. Record information on the Work that is shown only schematically.
   2. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
   3. Mark As-Built sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
   4. Mark important additional information that was either shown schematically or omitted from original Drawings.
   5. Mark revisions and/or clarifications issued by Addenda, ASI, Construction Change Directive, Change Orders or responses to RFIs to reflect the change. Each such revision shall be graphically depicted to represent physical construction and clearly noted with the applicable Addenda, ASI, Change Order or RFI number. Notation of the Addenda, RFI, ASI, Construction Change Directive or Change Order number alone will not be acceptable.
   6. Ensure entries are complete and accurate, enabling future reference by Owner.
   7. Scanned Drawings: After review of draft drawings by Architect, incorporate necessary changes and prepare a full set of scanned Contract Drawings and Shop Drawings on CD-ROM.

E. Specifications: Legibly mark and record at each product section a description of actual products installed, including the following:
   1. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   2. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
   3. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals.
   4. Mark revisions and/or clarifications issued by Addenda, ASI, Construction Change Directive, Change Orders or responses to RFIs to reflect the change. Each such revision shall be graphically depicted to represent physical construction and clearly noted with the applicable Addenda, ASI, Change Order or RFI number. Notation of the Addenda, RFI, ASI, Construction Change Directive or Change Order number alone will not be acceptable.
   5. Format: Submit record Specifications as scanned PDF electronic file(s) of marked up paper copy of Specifications.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. 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.
   2. Product data, with catalog number, size, composition, and color and texture designations.
   3. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

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

D. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

E. Additional information as specified in individual product specification sections.

F. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.

3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

D. Include manufacturer's printed operation and maintenance instructions.

E. Include sequence of operation by controls manufacturer.

F. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

G. Provide control diagrams by controls manufacturer as installed.

H. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

I. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

J. Include test and balancing reports.

K. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed Volume Title (e.g., Equipment Operation and Maintenance Manual), name of Project, BSD, Architect, and date of Substantial Completion. Include Contractor's name and date. On bound edge, imprint name of project, BSD and year of Substantial Completion.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

J. Arrangement of Contents: Organize each volume in parts as follows:
1. Project Directory.
2. Table of Contents, of all volumes, and of this volume.

3. Operation and Maintenance Data: Arranged by system, then by product category.
   a. Source data.
   b. Product data, shop drawings, and other submittals.
   c. Operation and maintenance data.
   d. Field quality control data.
   e. Photocopies of warranties and bonds.
4. Design Data: To allow for addition of design data furnished by Architect or others, provide a tab labeled "Design Data" and provide a binder large enough to allow for insertion of at least 20 pages of typed text.

K. PDF Electronic File: After review of draft manuals, assemble each manual into a composite electronically-indexed file. Submit on digital media acceptable to Architect.
1. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically-linked operation and maintenance directory.
2. Enable inserted reviewer comments on draft submittals.
3. File Names and Bookmarks: Enable bookmarking of individual documents based upon 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 upon opening file.

3.06 WARRANTIES AND BONDS

A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
2. The Owner reserves the right to refuse to accept or pay for Work for the Project where a Special Warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

E. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Completion is determined.

F. Verify that documents are in proper form and contain full information.

G. Co-execute submittals when required.

H. Retain warranties and bonds until time specified for submittal.

I. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

J. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project, BSD, Architect, and date of Substantial Completion. Include name of Contractor and date. On bound edge, imprint name of project, BSD and year of Substantial Completion.

K. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
   1. Product or work item.
   2. Installer of product or item, with name of principal, address, and telephone number.
   3. Describe the work provided by this installer/Subcontractor, under this Contract.
   4. Date of beginning of warranty or service and maintenance contract. (See General Condition's Warranty paragraph.)
   5. Duration of warranty or service maintenance contract.
   6. Information for Owner's personnel, including:
      a. Proper procedure in case of failure.
      b. Contact phone numbers of manufacturer.
   7. Instances that might affect validity of warranty or bond.
   8. Contractor, name of responsible principal, address, and telephone number.

L. Schedule of Warranties: Provide a summary schedule of start and end date of each warranty.

M. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 02 41 19
SELECTIVE STRUCTURE DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of building elements for alterations purposes.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises and requirements related to abatement of hazardous materials.

B. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SCOPE

A. Remove portions of existing buildings as indicated on Drawings.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Do not begin removal until receipt of notification to proceed from Owner.

B. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

C. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

D. If hazardous materials are discovered during removal operations, stop work, restrict/isolate work area, and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

E. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.

3.03 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions.

B. Separate areas in which demolition is being conducted from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.

1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
3. Verify that abandoned services serve only abandoned facilities before removal.
4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

F. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch as specified for patching new work.

3.04 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove from site all materials not to be reused on site; comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Floors and slabs on grade.
B. Concrete reinforcement.
C. Joint devices associated with concrete work.
D. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

1.03 REFERENCE STANDARDS

A. ACI 211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide 2022.
B. ACI 301 - Specifications for Concrete Construction 2020.
C. ACI 302.1R - Guide to Concrete Floor and Slab Construction 2015.
D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete 2000 (Reapproved 2009).
E. ACI 305R - Guide to Hot Weather Concreting 2020.
F. ACI 306R - Guide to Cold Weather Concreting 2016.
G. ACI 308R - Guide to External Curing of Concrete 2016.
H. ACI 318 - Building Code Requirements for Structural Concrete 2019 (Reapproved 2022).
I. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2022.
J. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement 2019.
K. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete 2011.
L. ASTM C157/C157M - Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete 08(2014)e1.
M. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2018.
N. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens 2021.
O. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2022a.
P. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete 2020.
Q. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete 2010a (Reapproved 2016).
R. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete 2019.
S. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete 2022.
T. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing 2017.
U. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete 2020a.

V. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete 2021.
W. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures 2020.
X. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete 2019.
Y. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete 2018.
Z. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers 2020.
AA. ASTM E1155M - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers (Metric) 2014.
BB. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs 2017.
CC. OSSC - Oregon Structural Specialty Code, Section 1811, Radon Control Methods Public Buildings.
DD. SCAQMD 1113 - Architectural Coatings 1977, with Amendment (2016).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
B. Product Data: Submit manufacturers' data on manufactured products including underslab vapor retarder and accessories, showing compliance with specified requirements and installation instructions.
   1. Provide design mixtures for each concrete mixture containing fly ash as a replacement for Portland cement or other Portland cement replacements and for equivalent concrete mixtures that do not contain Portland cement replacements.
C. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
   3. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   4. Indicate amounts of mixing water to be withheld for later addition at Project site.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.
B. Follow recommendations of ACI 305R when concreting during hot weather.
C. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished, unless otherwise indicated.
   3. Finish: Galvanized in accordance with ASTM A767/A767M, Class I, unless otherwise indicated.

2.02 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
   1. Acquire cement for entire project from same source.
B. Fine and Coarse Aggregates: ASTM C33/C33M.

1. Acquire aggregates for entire project from same source.
2. Maximum Size: 1-1/2 inches and not more than 1/5 of narrowest dimension between sides of forms, 1/3 depth of flatwork, or 3/4 of narrowest space between reinforcing bars.

C. Fly Ash: ASTM C618, Class C or F.

D. Calcined Pozzolan: ASTM C618, Class N.

E. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.

F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.03 ADMIXTURES

A. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

B. Air Entrainment Admixture: ASTM C260/C260M.

2.04 ACCESSORY MATERIALS

A. Under Slab Vapor Retarder: Sheet material complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.

1. Perm Rating: 0.1 maximum.
2. Products:
   a. ISI Building Products; Viper VaporCheck II 15-mil (Class A): www.isibp.com/#sle.
   b. Poly-America; Husky Yellow Guard 15-mil Vapor Barrier: www.yellowguard.com/#sle.
   c. Raven Industries; VaporBlock 15: www.vaporblock.com.
   d. Stego Industries, LLC; Stego Wrap Vapor Barrier 15-mil (Class A) : www.stegoindustries.com.
   e. W. R. Meadows, Inc; PERMINATOR Class A - 15 mils (0.38 mm): www.wrmeadows.com/#sle.
   f. Substitutions: See Section 01 60 00 - Product Requirements.

B. Coatings, General: Provide products with VOC limits as established in SCAQMD 1113, Architectural Coatings.

1. Floor Coatings: 50 g/L maximum.
2. Sealers: 100 g/L maximum.
3. Concrete Curing Compounds: 100 g/L maximum.
4. Waterproofing Sealers: 100 g/L maximum.

C. Sealer Type **SC-1**: ASTM C1315, Type 1, Class A, ASTM C309, Type 1 Class A, penetrating product with no less than 34 percent solids content, leaving no sheen, VOC content rating as required to suit regulatory requirements with a 5 year documented history in controlling moisture vapor emission from damaging floor coverings.

1. Products:
   a. Creteseal; SC2000: www.creteseal.com.
   b. Curranseal PMC3300: www.curranseal.com.

2.05 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.

B. Epoxy Bonding System:

1. Complying with ASTM C881/C881M and of Type required for specific application.

2.06 CURING MATERIALS

A. Moisture-Retaining Sheet: ASTM C171. Provide one of the following:

1. Curing paper, regular or white.
2. Polyethylene film, clear or white, minimum nominal thickness of 0.0040 in.
3. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.

B. Water: Potable, not detrimental to concrete.

2.07 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
   1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

D. Normal Weight Concrete: Refer to Structural Drawings.
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
   2. Water-Cement Ratio: Maximum 40 percent by weight.

2.08 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

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

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

B. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent (parging)in according to bonding agent manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
   2. Use latex bonding agent only for non-load-bearing applications.

C. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

D. Install vapor retarder under interior slabs on grade according to ASTM E1643 and manufacturer's written instructions, and as indicated on Drawings. Lap joints minimum 12 inches and seal watertight by taping edges and ends with manufacturer's recommended tape. Terminate and seal vapor retarder to exterior face of concrete footings or thickened slab edges with self-adhered flexible flashing or concrete parge coat as specified in this section. Use vapor retarder sheet to boot around all penetrations and seal with tape to create a continuous vapor retarder. Do not penetrate vapor retarder with screed pins, wood stakes or other items.
   1. Comply with requirements of Section 1811 of the OSSC for Radon Control Methods.
   2. Place vapor retarder under the entire soil-contact area of the floor in a manner that minimizes the required number of joints and seams. Take care to prevent damage to the membrane during the construction process.

3. Where the slab edge is cast against a foundation wall or grade beam, install the membrane to seal to the foundation element.
4. Fit membrane to all penetrations to within 1/2 inch of the penetration and seal with tape or mastic.
5. Repair all damaged portions of the membrane with tape or with a patch made from the same or compatible material as the membrane, cut so as to provide a minimum 12-inch lap from any opening and taped continuously about its perimeter.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

D. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer. Where approved, record the amount of water added on site and provide with the special inspection reports.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
   1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
   2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
   3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   2. Maintain reinforcement in position on chairs during concrete placement.
   3. Screed slab surfaces with a straightedge and strike off to correct elevations.
   4. Slope surfaces uniformly to drains where required.
   5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

G. Cold-Weather Placement: Comply with ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When average high and low temperature is expected to fall below 40 degrees F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

H. Hot-Weather Placement: Comply with ACI 305R and as follows:

1. Maintain concrete temperature below 90 degrees F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

I. Protect all uncovered interior concrete flatwork where polished concrete finishes are scheduled from wind by providing curtains adjacent to areas being placed.

J. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

A. Anchor joint fillers and devices to prevent movement during concrete placement.

B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:

1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15, on-grade only.
2. Under Carpeting: F(F) of 25; F(L) of 20, on-grade only.
3. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25, on-grade only.
4. Polished Concrete Finish: F(F) of 40; F(L) of 25.

B. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.

C. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.

D. Correct defects by grinding if affected area is concealed from view. If not concealed, removal and replacement of the defective work is required. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

A. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:

1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include thin set ceramic tile, thin set quarry tile, resilient flooring, resilient athletic flooring, fluid applied flooring, carpeting, entry mat, and wood athletic flooring.

B. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1/4 inch per foot or as indicated on drawings.

3.08 CURING AND PROTECTION

A. Evaporation Reducer Application: Follow manufacturer's instructions.

B. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

1. Normal concrete: Not less than seven days.
2. High early strength concrete: Not less than four days.

D. Sealer Application:

1. Sealer SC-1: Apply sealer the day of the concrete pour just after final finishing and soff cutting. Apply with a low-pressure industrial sprayer at 200 square feet per gallon. After

the concrete sealer is applied, broom evenly across the concrete slab until completely absorbed into the concrete surface.

a. Locations of Use: All areas scheduled or indicated to receive carpeting and at floors exposed to view.

3.09 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.10 PROTECTION

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

B. Develop a concrete protection procedure which addresses the following:

1. Communication of protection plan to subcontractors and vendors.
2. Procedures for cleaning spills, including use of and availability of cleaning chemicals and absorptive materials at site.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items including, but not limited to, the following:
   1. **WD-1** - Wood veneer wall panels .

B. Wood casings and moldings.

1.02 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition.

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards.

C. AWPA U1 - Use Category System: User Specification for Treated Wood.

D. PS 1 - Structural Plywood.

E. SCAQMD 1168 - Adhesive and Sealant Applications.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with electrical rough-in and installation of associated and adjacent components.

1.04 SUBMITTALS

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

B. Product Data:
   1. For installation adhesives, include printed statement of VOC content.
   2. For each composite-wood product used, provide documentation indicating that the bonding agent contains no urea formaldehyde.
   3. For each adhesive used, provide documentation indicating that the adhesive contains no urea formaldehyde.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
   2. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
   3. Coordinate with Section 08 12 13 - Hollow Metal Frames for wood casings to match size of door frame.

D. Samples:
   1. Submit 2 samples of wood trim 12 inches long with specified finish.
   2. Submit 2 samples of each type of wood panel 12 inches square with specified finish.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

B. Formaldehyde Free Panel Products: Provide fiberboard, particleboard and plywood products made with NAF or ULEF resins.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store materials in interior, ventilated location under constant minimum temperature of 60 degrees F and minimum relative humidity of 55 percent.

B. Protect from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

C. Interior Woodwork Items:

1. Wood casings for Hollow Metal Frames: Clear maple to match existing.

2.02 LUMBER MATERIALS

A. Hardwood Lumber: White maple species, plain sawn, maximum moisture content of 6 percent; with vertical grain of quality suitable for transparent finish.

2.03 SHEET MATERIALS

A. Softwood Plywood, Not Exposed to View: Any face species, veneer core; PS 1 Grade A-B, glue type as recommended for application.

B. **WD-1** - Wood Veneer Wall Panel: Hardwood veneer AWI/AWMAC/WI (AWS) Veneer Face Grade A, white maple face species, plain sliced cut; 3/4 inch thick particleboard or MDF substrate, finished stained with conversion varnish finish.

1. **Basis of Design** - Appleply by States Industries.

2.04 ADHESIVE

A. Adhesive: Type recommended by laminate manufacturer to suit application.

1. Do not use adhesives that contain urea formaldehyde.
2. VOC Limits for Installation Adhesives and Glues: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.
   a. Wood Glues: 30 g/L.
   b. Contact Adhesive: 80 g/L.

2.05 FASTENERS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Adhesive for factory-fabricated units: Manufacturer's recommended adhesive for application.

C. Fasteners: Of size and type to suit application; plain finish in concealed locations and stainless steel finish in exposed locations, unless otherwise indicated.

D. Concealed Joint Fasteners: Threaded steel.

E. Panel Clips: Aluminum clips, 1/4 inch thick by full length of panel.

1. Product: Panelclip manufactured by Brooklyn Hardware LLC Manufacturing: www.panelclip.com.

F. Nails: Size and type to suit application, plain finish.

G. Bolts, Nuts, Washers, Blind Fasteners, Lags, and Screws: Size and type to suit application; plain.

H. Joint Sealants: As specified in Section 07 92 00 - Joint Sealants.

2.06 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Wood Filler: Solvent base, tinted to match surface finish color.

2.07 LUMBER SELECTION

A. Selection of Lumber Pieces:

1. Carefully select all members. Select individual pieces so that obvious defects are not on exposed surfaces and will not interfere with proper nailing or fastener connections.
2. Lumber may be rejected by Architect whether or not it has been installed for reasons of: excessive warp, twist, bow, crook, mildew or fungus, mold, as well as for improper cutting and fitting.

2.08 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.
B. Fit exposed sheet material edges with matching veneer edging. Use one piece for full length only.
C. Fabricate wood casings to fit to hollow metal door frames with applied casings. Match existing casings for size and thickness.
D. Fabricate wood panels with wood veneer edging at all edges. Provide balancing veneer on concealed backside of panels and prime paint prior to installation.
E. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.09 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.
B. Apply wood filler in exposed nail and screw indentations.
C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.
D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 5 Varnish Conversion.
      b. Sheen: Semigloss.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.
B. Verify hollow metal door frames are installed and ready to receive applied wood casings.
C. Verify that gypsum board substrates have received a coat of primer prior to installation of wainscots and wood panels.
D. Verify the substrates behind open joints between wainscots and between adjacent wall panels have been painted black prior to installation of panels.

3.02 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
B. Set and secure materials and components in place, plumb and level.
C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
D. Install with blind nailing typical; use finish nails at all applications unless detailed otherwise.
E. **WD-1** - Wood Wall Panels, General: Paint substrate behind panels as indicated on Drawings for exposed joints between panels.
   1. Install trim pieces as detailed. Miter all corners for a neat, finished appearance.
   2. Space panels as indicated on Drawings.
   3. Install with manufacturer recommended adhesive, no exposed fasteners.

4. Kerf cut as required to fit shape of cabinets.

3.03 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops, including the following:
   1. **PL-1 / PL-2 / PL-3** - Plastic laminate.
   2. **SSM-1** - Solid-surfacing material.

B. Hardware.

C. Installation of countertop support framing.

D. Preparation for installing utilities.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 06 20 00 - Finish Carpentry: Finish carpentry items not included in this Section.

C. Section 07 92 00 - Joint Sealants.

D. Section 09 91 23 - Interior Painting: Field finishing of cabinet exterior.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard.

B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications.

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

D. AWI (QCP) - Quality Certification Program.

E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition.

F. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards.

G. BHMA A156.9 - Cabinet Hardware.

H. ISFA 2-01 - Classification and Standards for Solid Surfacing Material.

I. NEMA LD 3 - High-Pressure Decorative Laminates.

J. PS 1 - Structural Plywood.

K. SCAQMD 1168 - Adhesive and Sealant Applications.

1.04 PREINSTALLATION CONFERENCE

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.05 DEFINITIONS

A. Definitions in the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" apply to the work of this Section.

B. MDF: Medium-density fiberboard.

C. Hardwood Plywood: A panel product composed of layers or plies of veneer, or of veneers in combination with lumber core, hardboard core, MDF core, or particleboard core, joined with adhesive and faced both front and back with hardwood veneers.

1.06 DESIGN REQUIREMENTS

A. Seismic Performance: Comply with ASCE 7: Section 9, "Earthquake Loads" based upon seismic design criteria indicated.

B. Quality Standard: Unless otherwise indicated, comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.

1. Grade: Premium.
2. Provide labels and certificates from AWI certification program indicating that casework, including installation, complies with requirements of grades specified.

C. Product Designations: Drawings indicate sizes, configurations, and finish materials of manufactured wood-veneer-faced casework by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes and door and drawer configurations, of same finish materials, and complying with the Specifications may be considered. See Section 01 60 00 Product Requirements.

D. Product Designations: Drawings indicate configurations of manufactured wood-veneer-faced casework by referencing designations of Casework Design Series numbering system in Appendix A of the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."

1.07 SUBMITTALS

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

B. Informational Submittals: Quality Standard Compliance Certificates: AWI Quality Certification.

C. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, cutouts and holes for items installed in casework, accessory listings, hardware location and schedule of finishes.

1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
2. Provide the information required by AWI/AWMAC/WI (AWS).
3. Indicate seismic bracing and fastening requirements.

D. Resubmittal of Shop Drawings: If field measurements result in significant changes to the casework design, resubmit all shop drawings after field dimensions have been verified.

1. Indicate on resubmitted drawings all dimensions which were verified.
2. Indicate significant changes to casework resulting from field-measured conditions. Do not proceed with fabrication until approved by Architect.

E. Product Data: Provide data for panel products, countertop materials and hardware accessories.

1. For installation adhesives, include printed statement of VOC content.
2. For each composite-wood product used, provide documentation indicating that the bonding agent contains no urea formaldehyde.
3. For each adhesive used, provide documentation indicating that the adhesive contains no urea formaldehyde.

F. Selection Samples: Submit actual samples of the full range of available colors for the following items:

1. Solid-surfacing materials.
2. Plastic edge banding materials.

G. Samples:

1. Submit 2 samples of each plastic laminate color specified.
2. Submit 2 samples of SSM-1, minimum 6-inches square showing edge treatment and finish.

H. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

I. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

J. Sustainable Design Submittal: Documentation for sustainably harvested wood-based components.

K. Maintenance Data: Submit manufacturer's card and maintenance data for solid-surfacing materials, including repair and cleaning instructions. Include maintenance kit for finishes.

L. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Magnetic Catches: Quantity equivalent to 2 percent of amount provided for project.
   3. Extra Elbow Catches: Quantity equivalent to 2 percent of amount provided for project.

1.08 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
   2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

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

C. Recycled Content of Medium-Density Fiberboard and Particleboard: Provide products with an average recycled content so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 20 percent.

D. Formaldehyde Free Panel Products: Provide fiberboard, particleboard and plywood products made with binders and adhesives containing no urea formaldehyde.

1.09 DELIVERY, STORAGE, AND HANDLING

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

B. Protect units from moisture damage.

1.10 FIELD CONDITIONS

A. Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

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

C. Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of casework that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Delamination of components or other failures of glue bond.
      b. Warping of components.

c. Failure of operating hardware.
d. Deterioration of finishes.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The following manufacturers are approved subject to conformance with Specifications:
1. Advance Cabinet Designs, Inc; Eugene, OR 541-465-3394.
2. Cascade Casework Corp; Lebanon, OR; 541-258-3255.
3. Commercial CabinetWorks LLC; Ridgefield WA 360-857-3130
4. Custom Source Woodworking Inc; Olympia, WA; 360-491-9365.
5. Fremont Millwork Co; Klamath Falls, OR; 541-884-5554.
6. Genothen; Tumwater, WA; 360-352-3636.
7. ISEC Cabinets; Vancouver, WA; 360-885-3100.
8. Kriegsco Manufacturing, Inc; Hubbard, OR; 503-981-9083.
9. Legend Custom Woodworking, Inc; Portland, OR; 503-669-1000.
10. Neil Kelly Cabinets; Portland, OR; 503-664-9288.
11. Pacific Cabinets, Inc; Ferdinand, ID; 208-962-5546.
12. Specialty Cabinets; Amity, OR; 971-241-4761.
13. Salem Wood Products: www.salemcabinetcompany.com
14. Huetter Mill and Cabinet, Murray, UT; 801 266 3222

B. Substitutions: See Section 01 60 00 - Product Requirements.
1. Substitution requests shall be accompanied by a mock-up of a typical cabinet produced by the manufacturer showing quality of workmanship normally produced for custom-grade work. Mock-up shall include a door and drawer combination with related specified hardware, countertop with edge and base. Mock-up shall meet quality and specified requirements of cabinets and hardware specified herein.

C. Single Source Responsibility: Provide and install this work from single fabricator.

2.02 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Cabinets:
1. Finish - Exposed Exterior Surfaces: Decorative laminate.
2. Finish - Exposed Interior Surfaces: Decorative laminate.
3. Finish - Semi-Exposed Surfaces: Decorative laminate
4. Finish - Concealed Surfaces: Manufacturer's option.
5. Casework Construction Type: Type B - Face-frame.
6. Cabinet Design Series: As indicated on drawings.
7. Adjustable Shelf Loading: 40 psf.
   a. Deflection: L/144.
8. Cabinet Style: As indicated for each location.
9. Drawer Side Construction: Multiple-dovetailed.
10. Drawer Construction Technique: Dovetail joints.

2.03 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

B. Wood fabricated from timber recovered from riverbeds or otherwise abandoned is permitted, unless otherwise noted, provided it is clean and free of contamination; identify source; provide lumber re-graded by an inspection service accredited by the American Lumber Standard

Committee, Inc.

2.04 MATERIALS

A. Low-Emitting Materials: Fabricate manufactured wood casework, including countertops, with adhesives and composite wood products containing no urea formaldehyde.

B. Low-Emitting Materials: Adhesives and composite wood products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Softwood Plywood: DOC PS 1.

D. Particleboard: ANSI A208.1, Grade M-2 made with binder containing no urea formaldehyde.

E. MDF: ANSI A208.2, Grade 130; made with binder containing no urea formaldehyde.

F. Edgebanding: Rigid PVC extrusions, through color with satin finish, 3 mm thick at doors and drawer fronts, 1 mm thick elsewhere.

1. Colors: As selected by Architect from manufacturer's full range.

2.05 COLORS AND FINISHES

A. Wood Colors and Finishes: As indicated on Drawings.

B. PVC Edgebanding Color: As selected from casework manufacturer's full range.

2.06 LUMBER MATERIALS

A. Softwood Lumber: Graded in accordance with AWI/AWMAC/WI (AWS), Custom Grade; average moisture content of 5-10 percent; species as recommended by manufacturer.

1. Exposed Surfaces: Not allowed.
2. Semi-Exposed Surfaces: Not allowed.

2.07 PANEL MATERIALS

A. All panel products shall be manufactured with minimal to no formaldehyde content.

B. Softwood Plywood: PS 1, Medium Density Overlay.

C. Moisture-Resistant Particleboard: ANSI A208.1; medium density industrial type as specified in AWI/AWMAC/WI (AWS), composed of wood chips bonded with moisture resistant grade adhesive, under heat and pressure; sanded faces; thickness as indicated, use for countertops containing sinks.

1. Available Products:
   a. Evergreen Engineering: www.evergreenengineering.com.
   b. Ultra Moisture Resistant MR Particleboard manufactured by Arauco: na.arauco.com.
   c. Skyblend Particleboard manufactured by Roseburg: www.roseburg.com.
   d. Encore MR50 manufactured by Timber Products: www.timberproducts.com.
   e. TemStock-MR Particleboard manufactured by Georgia-Pacific: www.buildgp.com.

D. Medium Density Fiberboard (MDF): ANSI A208.2; type as specified in AWI/AWMAC/WI (AWS); composed of wood fibers pressure bonded with interior grade adhesive, containing NAF or ULEF resins to suit application; sanded faces; thickness as required.

1. Use for painted components and concealed components.
2. Product: Medite II manufactured by Roseburg: www.roseburg.com.

2.08 LAMINATE MATERIALS

A. Manufacturers:

1. Formica Corporation: www.formica.com/#sle.
2. Panolam Industries International, Inc; Nevamar: www.nevamar.com.
3. Wilsonart: www.wilsonart.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
   1. Provide specific types as indicated.
      a. Horizontal Surfaces: HGS, 0.048 inch nominal thickness.
      b. Vertical Surfaces: VGS, 0.028 inch nominal thickness.
      c. Cabinet Liner: CLS, 0.020 inch nominal thickness, or decorative thermoset panels.
   2. Colors: As indicated per Drawings

2.09 COUNTERTOPS / CASEWORK

A. **PL-1 / PL-2 / PL-3** - Plastic Laminate Countertops: Particleboard covered with high-pressure laminate.

2.10 SOLID SURFACING FABRICATIONS

A. **SSM-2** - Solid Surfacing: Densified, homogeneous, nonporous castings fabricated into sheets; composed of acrylic resins, fillers, color chips, and pigment and performance-enhancing additives.
   1. Standard Type: Comply with minimum performance and engineering properties of ISFA 2-01.

B. Applications: Dias Accent Wrap.
   1. Style: As indicated on drawings.
   2. Height: As indicated on drawings.
   3. Thickness: 1/2 inch.
   4. Edge Profile at Vertical Joints: As indicated on drawings.
   5. Finish on Exposed Surfaces: Matte.
   6. Color: Architect to select from full range of colors.
   7. Opacity: 100% opaque.
   8. Products:
      a. **Basis of Design**: 3Form: www.3form.com
      b. Lumicor: www.lumicor.com
      c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Forming: Form products to shapes indicated using the appropriate method listed below. Comply with manufacturer's written instructions
   1. Hot Bending

D. Bonding:
   1. Manufacturer must have an in-field seaming process and fabrication kit including necessary adhesive and tools

2.11 ACCESSORIES

A. Adhesive: Type recommended by AWI/AWMAC to suit application.
   1. VOC Limits for Installation Adhesives and Glues: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.
      a. Wood Glues: 30 g/L.
      b. Contact Adhesive: 80 g/L.

B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; of width to match component thickness.
   1. Color: As selected by Architect from manufacturer's standard range.
   2. Color: To match adjacent plastic laminate color.
   3. Use 3 mm at all exposed edges, doors and drawer fronts, vertical case ends, bottoms and sub-tops.
   4. Do not use adhesives that contain urea formaldehyde.

5. Manufacturers: Dollken Woodtape: www.doellken-woodtape.com, 800-426-6362 or equal.

C. Fasteners: Size and type to suit application.

D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

E. Concealed Joint Fasteners: Threaded steel.

F. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

G. Dias Name Plate:
   1. Anodized aluminum name plate holder.
   2. Size: 2 inches by 8 inches.
   3. Signage: polyester sign panel
      a. 1/16 inch direct print UV-cured recessed character. Font style and size by Owner.
   4. Fastener: recessed.
   5. Bracket: stainless steel standoff posts. 3/4 inch standoff minimum.

2.12 HARDWARE

A. Hardware, General: Unless otherwise indicated, provide manufacturer's standard commercial-quality, heavy-duty hardware.
   1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard, except where hardware is through bolted from back side.

B. Countertop Support Brackets: Fixed, L-shaped, face-of-stud mounting.
   1. Materials: Steel plates.
   2. Products:
      a. A&M Hardware, Inc; Hybrid Brackets: www.aandmhardware.com/#sle.
      b. **Basis of Design** - Rakks/Rangine Corporation; EH Series Brackets: www.rakks.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Drawer and Door Pulls: "U" shaped wire pull, stainless steel with satin finish, 4 inch centers.

D. Drawer and Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish. Key to building master keyway.

E. Cabinet Catches and Latches:

F. Elbow Catches: Aluminum, satin nickel finish; install on left-hand door of double door cases where locks are indicated.
   1. Products: No. 2 A92 Elbow Catch manufactured by Ives: www.iveshinges.com, or approved equal.

G. Drawer Slides:
   1. Type: Full extension.
      a. BHMA A156.9, Type B05091
   2. Typical Drawers: Steel ball bearings, full extension, progressive action, side mounting, with load rating of 100 pounds with polymer stop cushions.
      a. Products:
         1) Model 7432 manufactured by Accuride International, Inc: www.accuride.com.
         2) No. 8400 manufactured by Knape & Vogt: www.knapeandvogt.com.
   3. File Drawers: Steel ball bearings, full extension, progressive action, side mounting, with load rating of 150 pounds with hold-in feature to prevent bounceback.
      a. Products:
         1) Model 4034 manufactured by Accuride International, Inc: www.accuride.com.

2) No. 8500 manufactured by Knape & Vogt: www.knapeandvogt.com.

4. Static Load Capacity: Commercial grade.
5. Mounting: Side mounted.
6. Stops: Integral type.
7. Features: Provide self closing/stay closed type.
8. Manufacturers:
   a. Accuride International, Inc; Heavy-Duty Drawer Slides: www.accuride.com/#sle.
   b. Knape & Vogt Manufacturing Company; Heavy-Duty Drawer Slides: www.knapeandvogt.com/#sle.
   c. Sugatsune America, Inc: www.sugatsune.com/#sle.
   d. Substitutions: See Section 01 60 00 - Product Requirements.

H. Hinges: Five knuckle, fixed pin in chrome finish. Steel hinge 2-3/4 inches high with 270 degree opening.
   1. Finish: 26D Satin Chrome.
   2. Products:
      a. No. EBB-1-26D-03 manufactured by E.B. Bradley Co: www.ebbradley.com.
      b. No. 376 manufactured by RPC Rockford Process Control, Inc, www.rockfordprocess.com.

2.13 FABRICATION

A. Laminate Finished Surface Definitions: Comply with requirements of AWI/AWMAC/WI (AWS) and the following:
   1. Exposed portions of casework include all surfaces visible when doors and drawers are closed, interior faces of cabinet doors and exposed surfaces of open cases including top and bottom of shelving, interior cabinet surfaces visible behind glass doors.
   2. Semi-exposed surfaces of casework include those members behind opaque doors such as shelves, drawers, dividers, interior faces of ends, case backs and backs and bottoms.
   3. Concealed portions of casework include sleepers, dust panels, and other surfaces not visible after installation.

B. Cabinet Style: As indicated for each location.

C. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

D. Construct cabinets without integral base. Provide separate structural base as specified below.

E. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

F. Cabinet Backs: Provide minimum 1/2-inch thick cabinet back. Where back of cabinet is exposed to view, provide 3/4-inch particleboard with high pressure laminate facing.

G. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

H. Base Construction: Construct cabinet bases of 3/4-inch thick MDF, glued and screwed. Provide reinforcing blocks as required for maximum strength. Recess base for toe space as indicated. Set base on floor where casework is to be installed. Level top surface and scribe bottom surface to floor line leaving a height of 4-inches between floor and bottom of casework.

I. Countertops:
   1. Plastic Laminate Countertops: High-pressure laminate bonded to particleboard top over wood framing.
      a. At areas with sinks, provide moisture-resistant particleboard. Provide shop installed 1/4-inch maximum radius integral coved backsplashes and mechanically attached end splashes. If sink counter configuration is "L" or "U" shape, miter corners and

continue integral coved backsplash detail for entire counter assembly. Scribe countertops or backsplashes to abutting wall surfaces for hairline joint. Seal joint with mildew-resistant silicone sealant as specified in Section 07 92 00 - Joint Sealants.

b. Coordinate with plumbing and electrical installation of pipes, drains, electrical outlets and fixtures.

J. Solid-Surfacing Accent: Fabricate components to greatest extent practical to sizes and shapes indicated. Form joints between components using manufacturer's recommended joint adhesive without conspicuous joints (match color). Reinforce with strip of solid polymer material, 2 inches wide.

1. Edge Profile: Eased edges 1/8 inch radiussed.
2. Finish: Matte, gloss range of 5-20
3. Color: As indicated per Drawings.
4. Seams/joints as per details.

K. Filler Panels: Provide 3/4-inch thick filler panels covered with matching plastic laminate to fill in all voids between cabinets and walls.

L. Plastic Laminate, General: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
2. Balanced construction on all laminate-finished panels is mandatory. Unfinished stock surfaces, including all concealed surfaces and edges will not be permitted.

M. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and as follows:

N. Provide cutouts for plumbing fixtures, outlet boxes, and fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with Work of this section.

3.02 INSTALLATION

A. Install seismic bracing and fastening in accordance with approved shop drawings.

B. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

C. Cabinets:

1. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
2. Shim as required using concealed shims.
3. Use fixture attachments in concealed locations for wall mounted components.
4. Use concealed joint fasteners to align and secure adjoining cabinet units.
5. Attach wall-mounted cabinets with concealed continuous cleats screwed to solid framing or blocking.
6. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
7. Install to a tolerance of 1/8 inch in 8 feet for plumb and level, and with 1/32 inch maximum offset in flush adjoining surfaces, and 1/16 -inch maximum offset in revealed adjoining surfaces.
8. Drill pilot holes at corners prior to making field-cutouts.
9. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures and fittings. Verify location of cutouts from field-verified dimensions. Seal contact surfaces

of cut edges.

10. Secure cabinets to floor using appropriate angles and anchorages.
11. Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation.

D. Countertops and Backsplashes:

1. Secure countertops to grounds, furring and blocking with concealed or countersunk fasteners and by blindnailing. Fasteners shall not be exposed to view.
2. Abut top and edge surfaces in one true plane, with internal supports placed to support joints in substrates and to avoid deflection. Use clamping devices to provide flush, hairline joints.
3. Fasten countertop support brackets at maximum of 48-inches on center under unsupported counter surfaces. At corners, provide two brackets minimum - one at each unsupported corner, perpendicular to each wall surface. Provide even spacing of brackets beneath each countertop.
4. Provide holes and cutouts neatly cut where required for mechanical and electrical services.
5. Scribe backsplash at juncture with walls and other surfaces as recommended by AWI standards. Seal where backsplashes and endsplashes meet different surface materials with mildew-resistant silicone sealant as specified in Section 07 92 00 - Joint Sealants.

E. Solid-Surfacing:

1. Install components plumb, level and rigid, scribed to adjacent finishes.
   a. Form field joints using manufacturer's recommended adhesives with joints inconspicuous in finished work.
   b. Cut and finish component edges with clean, sharp returns.
   c. Anchor securely to base cabinets or other supports.
   d. Install countertops with no more than 1/8 inch sag, bow or other variation from a straight line.

3.03 ADJUSTING

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

B. Clean, lubricate and adjust hardware.

C. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

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

B. Provide protection of installed casework from damage until final acceptance by Architect.

1. Cover casework with 4-mil polyethylene film for protection against dust and soiling. Maintain for duration of construction period.
2. Do not allow use of casework for storage of construction equipment or materials.
3. Do not allow use of casework as scaffolding for construction operations.
4. Do not allow use of countertops as construction work surfaces.

C. Repair or replace defective portions of Work as directed prior to Substantial Completion.

D. Remove plastic film and thoroughly clean as required prior to Punchlist review.

3.05 SCHEDULES

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, exterior penetrations, and other items indicated in Schedule.

B. Sealants for joints within sheet metal fabrications.

C. Self-adhered weather barrier membrane.

D. Self-adhered high temperature sheet.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

B. Section 08 91 00 - Louvers: Flashing around exterior louver.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM A755/A755M - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

D. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

E. ASTM B32 - Standard Specification for Solder Metal.

F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

G. ASTM D1204 - Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature.

H. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

I. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.

J. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

K. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free.

L. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.04 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Water Infiltration: Provide sheet metal flashing and trim that does not allow water infiltration to building interior.

1.05 SUBMITTALS

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

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details. Include the following:
   1. Identification of material, thickness, weight and finish for each item and location in Project.
   2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams and dimensions.
   3. Details for joining, supporting and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, saddles and other attachments. Include pattern of seams.
   4. Details of special conditions.
   5. Details of connections to adjoining work.
   6. Detail formed flashing and trim at a scale of not less than 3 inches per 12 inches.
C. Samples: Submit two samples 6 by 6 inch in size illustrating metal finish color.
D. Warranties: Special warranties specified in this Section.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.
B. Fabricator andInstaller Qualifications: Company specializing in sheet metal work with ten years ofdocumented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

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

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
B. Special Project Warranty: Submit Installer's warranty, on Installer's standard or customized form, signed by Installer, covering the Work of this Section, including all components of flashing and sheet metal against defects in materials and workmanship, for the following warranty period:
   1. Warranty Period: Two years from date of Substantial Completion.
C. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: Provide aluminum-zinc alloy-coated steel according to ASTM A792/A792M, Class AZ50 coating designation, Grade 40; pre-painted by coil-coating process to comply with ASTM A755/A755M; minimum 24 gage (0.0239 inch) thick base metal.
   1. PVDF (Polyvinylidene Fluoride) Coating: Thermally cured fluoropolymer finish system containing not less than 70 percent PVDF resin by weight in color coat. Kynar 500 or equal.
   2. Color: Match existing sheetmetal color on building.

2.02 FABRICATION

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA (ASMM) that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
   1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
   2. Obtain field measurements for accurate fit before shop fabrication.
   3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
   4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Shop Forming Requirements:
   1. Fabricate sheet metal flashing and wall liners as detailed and in accordance with reviewed shop drawings. Use the SMACNA Architectural Sheet Metal Manual as a guide and basis for fabrication wherever applicable.
   2. Provide for thermal movement of sheet metal.
   3. Angle bottom edges of exposed vertical surfaces to form hemmed drip edge.
   4. Fabricate to dimensions indicated on shop drawings.
   5. Fabricate sheet metal with lines, brakes and angles sharp and true, and surfaces free from oil canning, wave, warp or buckle.
   6. Fold exposed edges of sheet metal back to form 1/2-inch wide hem on side concealed from view.
   7. Provide galvanic protection in areas where dissimilar metals are adjacent to each other.

C. Field verify dimensions prior to fabrication.

D. Form sections true to shape, accurate in size, square, and free from distortion or defects.

E. Form pieces in longest possible lengths.

F. Hem exposed edges on underside 1/2 inch; miter and seam corners.

G. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

2.03 EXTERIOR PENETRATION FLASHING PANELS

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

2.04 ACCESSORIES

A. Fasteners: Wood screws, flat head screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and appropriate for the substrates encountered
   1. Exposed Fasteners: Stainless steel hex head with EPDM bonded washers.
   2. Unexposed Fasteners: Stainless steel flat head.
   3. Blind Fasteners: High-strength stainless steel rivets suitable for metal being fastened.

B. Underlayment: Polyethylene, 6 mil thick.

C. Water Resistive Barrier (vertical surfaces): Water resistive / air barrier membrane; 26-mil thick, triple layer polypropylene fabric sheet; maximum permeance rating of 50 perms; self-adhering.
   1. Products:
      a. Soprema; Sopraseal Stick VP
      b. Henry Company; Blueskin VP 160
      c. GCP Applied Technologies; Perm-A-Barrier VPS
   2. Location of Use: As indicated in Drawings.

D. Self-Adhering, High-Temperature Sheet (SAHTS): Minimum 30 to 45 mils thick, consisting of polyethylene film coated on one side with a layer of butyl rubber adhesive.
   1. Max In-Service Temperature: 300 degrees F per ASTM D1204.
   2. Low-Temperature Flexibility: Unaffected at -20 degrees F per ASTM D1970/D1970M.
   3. Products:
      a. GCP Applied Technologies: Grace Ultra.
      b. Protecto; Jiffy Seal Ice and Water Guard HT Butyl
      c. Tremco Incorporated; ExoAir 110AT
      d. Substitutions: See See Section 01 60 00 - Product Requirements.
   4. Locations of Use: As indicated on the Drawings.
E. Primer: Zinc chromate type.
F. Protective Backing Paint: Asphaltic mastic, ASTM D4479 Type I.
G. Concealed Sealants: Non-curing butyl sealant.
H. Sealant to be Concealed in Completed Work: Single-Component, Solvent-Release, Butyl Rubber Sealant, Polyisobutylene Plasticized, Heavy Bodied: ASTM C1311.
   1. Products:
      a. Pecora Corporation; BC-158.
      b. Tremco Incorporated; Butyl Sealant.
      c. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Locations of Use: As indicated in Drawings.
I. Sealant to be Exposed in Completed Work: Reference Section 07 92 00 - Joint Sealants for Silicone Sealants
   1. Products:
      a. Dowsil 795
      b. Tremco Incorporated; Dymonic FC.
      c. ChemLink; M-1.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
J. Solder: ASTM B32; Sn50 (50/50) type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not proceed with Work until construction to receive the Work is completed.
B. Examine substrates and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected. Surfaces to receive sheet metal shall be clean, even, smooth, dry and free from defects and projections that might adversely affect the application. Verify slope prior to installation.

3.02 INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA (ASMM). Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
B. Install Work watertight and weathertight, without oil canning, buckles, tool marks, fastening stresses, distortion or defects which impair strength or mar appearance.
C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
   1. Coat back side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet.
3. Reference Chart:

D. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.

E. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

F. Install high-temperature self-adhered membrane (SAHTS) flashing where indicated. Apply primer if required by manufacturer. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days or as required by underlayment manufacturer.

G. Seal metal joints watertight.

H. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant.

I. Opening Flashings in Frame Construction: Install continuous head, sill, jamb and similar flashings to extend 4 inches beyond wall openings.

J. Wall Flashing: Fabricate and install with interlocking seams at bottom as indicated in SMACNA Figure 3-9 with alternate fastening method. Provide 24 inch wide panels with flat seams (Alternate Section A-A).

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.04 SCHEDULE

A. Fabricate sheet metal flashing and trim from the following materials of the minimum thicknesses indicated, unless otherwise required on the Drawings or to meet performance requirements.

B. Counterflashing:
1. Galvanized Steel: 24 gage (0.0239 inch) thick.
2. Joint Style: Lapped and sealed with interlocking hems.

C. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot- long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 45 degree cant as profiled in Drawings and with 2-inch-high end dams where flashing is discontinuous.
1. Stainless Steel: 24 gage (0.025 inch) thick.
2. Joint Style: Lapped and sealed with interlocking hems.

D. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams.
1. Pre-Finished Galvanized Steel: 24 gage (0.028 inch) thick.
2. Joint Style: Lapped and sealed with interlocking hems.

END OF SECTION

SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

E. ITS (DIR) - Directory of Listed Products.

F. FM (AG) - FM Approval Guide.

G. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168.

H. UL 1479 - Standard for Fire Tests of Penetration Firestops.

I. UL (FRD) - Fire Resistance Directory.

1.03 SUBMITTALS

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

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
   1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
   1. Include printed statement of VOC content and chemical components.

D. Delegated-Design Submittal: For penetration firestopping indicated to comply with performance requirements and design criteria, including product data and, where applicable, engineering judgment drawings signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Submit submittals as "Deferred Submittals" in accordance with Section 01 30 00 - Administrative Requirements. Transmit a copy of each submittal indicating agency approval to the Architect for record.

E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Certificate from authority having jurisdiction indicating approval of materials used.

1.04 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide fire ratings equal to the fire rating of the assembly penetrated when tested in accordance with methods indicated.
   1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
   2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.

3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Manufacturer's Representative: A manufacturer's direct representative (not distributor or agent) shall be on-site during initial installation of systems to train appropriate personnel in proper selection and installation procedures.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

D. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

1.05 PREINSTALLATION CONFERENCE

A. Preinstallation Conference: Conduct conference at Project site.
   1. Coordinate the conference to include the Building Inspector and provide the Inspector with a list of materials and assemblies proposed for use, type of penetrations where each material or assembly will be used, and UL listing and approval information.

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.

B. Mold Resistance: Provide firestopping materials with mold and mildew resistance rating of 0 as determined by ASTM G21.

C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.02 FIRESTOPPING SYSTEMS

A. Manufacturers:
   1. A/D Fire Protection Systems Inc.
   2. Grace Construction Products.
   3. Hilti, Inc.
   4. Johns Manville.
   5. Nelson Firestop Products.
   6. RectorSeal Corporation.
   7. Specified Technologies Inc.
   8. 3M Fire Protection Products.
   9. Tremco, Inc; Tremco Fire Protection Systems Group.
   10. Substitutions: See Section 01 60 00 - Product Requirements.

B. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Fire Ratings: Use any system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

C. Exposed Penetration Firestopping: Provide products with flame-spread and smoke- developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

D. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

D. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

C. Do not cover installed firestopping until inspected by authorities having jurisdiction.

3.04 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
   1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage" or similar indication that the penetration is fire-rated.
   2. Contractor's name, address, and phone number.
   3. Designation of applicable testing and inspecting agency.
   4. Date of installation.
   5. Manufacturer's name.
   6. Installer's name.

3.05 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION

A. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Joint sealants.

B. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

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

1.03 REFERENCE STANDARDS

A. ASTM C834 - Standard Specification for Latex Sealants.

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants.

E. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.

F. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.

G. OSSC - Oregon Structural Specialty Code, Section 1811, Radon Control Methods Public Buildings.

H. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

I. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168.

J. SWRI (VAL) - SWR Institute Validated Products Directory.

1.04 SUBMITTALS

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

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
   5. Substrates for which use of primer is required.
   6. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
   7. Sample product warranty.
   8. SWRI Validation: Provide currently available sealant product validations as listed by SWRI (VAL) for specified sealants.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.
   3. Joint-sealant formulation.
   4. Joint-sealant color.

E. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

1.05 WARRANTY

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

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period for Silicone Sealants: 20 years from Date of Substantial Completion.
   2. Warranty Period for Polyurea Sealants: 1 year from Date of Substantial Completion.
   3. Warranty Period for All other Types of Sealants: 5 years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on the drawings, unless specifically indicated not to be sealed.
   2. Interior Joints: Seal interior joints unless specifically indicated not to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, storefront and other frames and adjacent construction.
      b. All joints between dissimilar materials.
      c. Other joints indicated below.
   3. Do not seal the following types of joints.
      a. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
      b. Joints where installation of sealant is specified in another section.

2.02 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.
   1. Architectural Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

B. 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.

C. Colors: As selected by Architect from manufacturer's full range.

2.03 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 50, for Use NT.
   1. Products:
      a. Dow Corning Corporation; 795.
      b. Momentive Performance Materials; SilPruf SCS2000.
      c. Pecora Corporation; 864.
      d. Sika Corporation, Construction Products Division; Sikasil WS-295.
      e. Tremco Commercial Sealants & Waterproofing; Spectrem 2.
   2. Locations of Use:
      a. Control, expansion and isolation joints in steel or aluminum.

B. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use NT.
   1. Products:
      a. Dow Corning Corporation; 790.

b. Momentive Performance Materials; SilPruf LM SCS2700.
c. Pecora Corporation; 890.
d. Sika Corporation, Construction Products Division; Sikasil WS-290.
e. Tremco Commercial Sealants & Waterproofing; Spectrem 1.

2. Sanding of Joints: Provide sanded joints at joints occurring in masonry surfaces.
3. Locations of Use:
   a. Exterior joints in vertical and nontraffic surfaces, unless otherwise indicated.
   b. Vertical control and expansion joints on exposed interior surfaces of exterior walls.
   c. Interior perimeter joints of exterior openings.

C. Mildew-Resistant, Single-Component, Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, for Use NT.
1. Products:
   a. Dow Corning Corporation; 786 Mildew Resistant.
   b. Momentive Performance Materials (formerly GE Advanced Materials); Sanitary SCS1700.
   c. Pecora Corporation; 898.
   d. Sika Corporation, Construction Products Division; Sikasil-GP.
   e. Tremco Commercial Sealants & Waterproofing; Tremsil 200 Sanitary or Tremsil 600.
2. Locations of Use:
   a. Interior joints between plumbing fixtures and adjoining walls, floors and counters.
   b. Interior joints between cabinetry and counters and adjoining walls.

2.04 URETHANE JOINT SEALANTS

A. Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, for Use T.
1. Products:
   a. BASF Building Systems; MasterSeal NP 2.
   b. Pecora Corporation; Dynatred.
   c. Sika Corporation, Construction Products Division; Sikaflex - 2c NS.
   d. Tremco Commercial Sealants & Waterproofing; Dymeric 240FC.
2. Locations of Use:
   a. Interior ceramic tile expansion control and isolation joints in vertical surfaces.

B. Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C920, Type M, Grade P, Class 25, for Use T and I.
1. Products:
   a. BASF Building Systems; MasterSeal SL 2.
   b. Pecora Corporation; Urexpan NR-200.
   c. Sika Corporation, Construction Products Division; Sikaflex - 2c SL.
   d. Tremco Commercial Sealants & Waterproofing; THC 901 or Vulkem 455 SL.
2. Locations of Use:
   a. Interior ceramic tile expansion, control, construction and isolation joints in horizontal traffic surfaces.

2.05 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
1. Products:
   a. Pecora Corporation; AC-20+.
   b. Tremco Commercial Sealants & Waterproofing; Tremflex 834.
2. Locations of Use: Perimeter joints between interior wall surfaces and frames of interior doors.

2.06 POLYUREA JOINT SEALANTS

A. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, aromatic polyurea with a Type A shore durometer hardness range of 80 to 95 per ASTM D2240.
1. Products:

a. BASF Building Systems; MasterSeal CR 100.
b. Euclid Chemical Company, QUIKjoint 200.
c. L&M Construction Chemicals, Inc; Joint Tite 750.
d. Sika Corporation, Construction Products Division; Loadflex 524.

2. Locations of Use:
   a. Interior joints in floor slabs.

2.07 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
   1. Products:
      a. Pecora Corporation; AC-20 FTR
      b. Tremco Commercial Sealants & Waterproofing; Tremflex 834.
      c. Tremco Commercial Sealants & Waterproofing; Tremco Acoustical Sealant (where fully concealed from view).
      d. USG Corporation; SHEETROCK Acoustical Sealant or Firecode Smoke-Sound Sealant (where fully concealed from view).

2.08 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application. Oversize 30 to 50 percent larger than joint width.
   1. Manufacturers:
      a. Sof Rod manufactured by Nomaco Inc.
      b. MasterSeal 921 manufactured by BASF.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; non-staining. Confirm requirements based on preconstruction field testing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.
   1. Remove existing sealant residue as required to provide a solid bond with new sealants. Where necessary to expose clean, sound surfaces, use wire brush, grind, sandblast or solvent clean as recommended by sealant manufacturer.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
   1. Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction field 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. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Comply with requirements of OSSC Section 1811 relative to sealing of construction joints, penetrations, cracks and other connections through foundation walls and slabs-on-grade.

D. Seal all exposed joints of dissimilar materials and elsewhere as indicated

E. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

F. 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.

G. Install bond breaker backing tape where backer rod cannot be used or where 3-sided adhesion may occur.

H. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

I. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

J. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

K. Seal bottoms of hollow metal frames to floor at resilient flooring.

3.05 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.

B. Protect sealants until cured.

END OF SECTION

SECTION 08 12 13
HOLLOW METAL FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal frames for non-hollow metal doors.

1.02 RELATED REQUIREMENTS

A. Section 08 14 16 - Flush Wood Doors: Non-hollow metal door for hollow metal frames.
B. Section 08 71 00 - Door Hardware: Hardware and silencers.
C. Section 09 96 00 - High-Performance Coatings: Field painting and primer coordination.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.
B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames.
C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).
D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
F. ASTM A879/A879M - Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface.
G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.
H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
I. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
J. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C.
K. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames.
L. ICC A117.1 - Accessible and Usable Buildings and Facilities.
M. ITS (DIR) - Directory of Listed Products.
N. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames.
O. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames.
P. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames.
Q. NAAMM HMMA 862 - Guide Specifications for Forced Entry/Bullet Resistant (FE/BR) Security Hollow Metal Doors and Frames.
R. NAAMM HMMA 865 - Guide Specifications for Sound Control Hollow Metal Door and Frame Assemblies.
S. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
T. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
U. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.
V. UL (DIR) - Online Certifications Directory.
W. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

X. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.04 SUBMITTALS

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

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.

C. Shop Drawings: Details of each opening, showing elevations, glazing, metal thickness and frame profiles.

D. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Frames with Applied Casings, Prefinished:

1. IDP - International Door Products Corp; F Series Standard Steel Door Frame: www.idpframes.com/#sle.
2. Timely Industries, Inc: www.timelyframes.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Refer to Door and Frame Schedule on drawings for frame sizes, fire ratings, sound ratings, finishing, door hardware to be installed, and other variations, if any.

B. Door Frame Type: Provide hollow metal door frames with applied casings.

C. Requirements for Hollow Metal Frames.

1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Hardware Preparations, Selections and Locations: Comply with BHMA A156.115, NAAMM HMMA 830, NAAMM HMMA 831 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
   a. Hinges: 0.167 inch, 7 gage.
   b. All other surface applied hardware: 0.067 inch, 14 gage.

2.03 HOLLOW METAL DOOR FRAMES WITH APPLIED CASINGS

A. Frame Type: Knockdown, slip-on drywall frames; separate jambs and head with separate snap-on casings both sides; factory-applied finish on exposed surfaces.

1. Frame Material: Cold-rolled steel complying with ASTM A1008/A1008M.
2. Casing Material: None, for wood casing by others.
3. Casing Profile: As indicated.
4. Finish: Factory-applied baked enamel finish, or electrostatically applied water-based paint.
   a. Color: To match existing.

B. Interior Door Frames, Non-Fire-Rated:

1. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.

C. Interior Door Frames, Fire-Rated: Provide smoke gaskets.
   1. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.
   2. Frames in Wet Areas: Electro-galvanize components prior to finishing in accordance with ASTM A879/A879M, with manufacturer's standard coating thickness.
   3. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C or NFPA 252 ("positive pressure fire tests").
      a. Provide units listed and labeled by testing agency acceptable to authorities having jurisdiction, ITS (DIR), or UL (DIR).
      b. Attach fire rating label to each fire rated unit.
   4. Smoke and Draft Control Doors (Indicated with Letter "S" on Drawings and/or Door Schedule): In addition to required fire rating, provide door assemblies tested in accordance with UL 1784 with maximum air leakage of 3.0 cfm/sq ft of door opening at 0.10 inch w.g. pressure at both ambient and elevated temperatures; with "S" label; if necessary, provide additional gasketing or edge sealing.

2.04 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, and compatible with finish coats specified in Division 09.

B. Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.
   1. Color: To match existing.

2.05 ACCESSORIES

A. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners with hairline joints; prepared for countersink style tamper proof screws.

C. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

D. Jamb Anchors:
   1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

E. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick. Provide clip-type anchors, with two holes to receive fasteners.

2.06 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. 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. Floor Anchors: Provide adjustable base anchors at bottom of jambs. Provide fixed anchors at mullions.
   2. Jamb Anchors: Provide number and spacing of anchors as follows:
      a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
         1) Four anchors per jamb up to 90 inches high.
         2) Five anchors per jamb from 90 to 96 inches high.
         3) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

3. Silencers: Except on weatherstripped or gasketed 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.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

A. Install frames in accordance with manufacturer's instructions and related requirements of specified frame standards or custom guidelines indicated.
B. Install prefinished frames after painting and wall finishes are complete.
C. Install fire rated units in accordance with NFPA 80.
D. Coordinate frame anchor placement with wall construction.
E. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
F. Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
G. Install door hardware as specified in Section 08 71 00.

3.03 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
B. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

END OF SECTION

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush configuration; fire rated and non-rated.
B. Factory finishing.

1.02 RELATED REQUIREMENTS

A. Section 08 12 13 - Hollow Metal Frames.
B. Section 08 71 00 - Door Hardware.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard.
B. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
C. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.
D. ASTM E336 - Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings.
E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition.
F. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards.
G. ICC (IBC) - International Building Code.
H. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
I. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives.
J. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
K. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.
L. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.
M. WDMA I.S. 1A - Interior Architectural Wood Flush Doors.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
B. Product Data: Indicate compliance with WDMA standards, door core materials and construction; veneer species, type and characteristics.
C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
D. Manufacturer's Installation Instructions: Indicate special installation instructions.
E. Specimen warranty.
F. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.
B. Fire-Rated Door Assemblies: 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 10C.
C. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.
D. Quality Standard: In addition to requirements specified, comply with WDMA I.S. 1A.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.
B. Accept doors on site in manufacturer's packaging and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges if stored more than one week. Break seal on site to permit ventilation.

1.07 WARRANTY

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

B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:

1. Construction Specialties, Inc; Acrovyn Flush Doors: www.c-sgroup.com/#sle.
2. Algoma Hardwoods: www.algomahardwoods.com.
3. Eggers Industries: www.eggersindustries.com/#sle.
4. Lynden Door, Inc: lyndendoor.com.
5. Masonite Architectural; Aspiro Select Wood Veneer Doors: www.architectural.masonite.com/#sle.
6. Oregon Door: www.oregondoor.com/sle.
7. Oshkosh Door Company: www.oshkoshdoor.com.
8. Vancouver Door Company: www.vancouverdoorco.com.
9. VT Industries, Inc: www.vtindustries.com.
10. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOORS

A. Doors: See drawings for locations and additional requirements.

1. Quality Standard: Custom Grade, Extra Heavy Duty performance, in accordance with WDMA I.S. 1A.
2. Wood Veneer Faced Doors: 5-ply. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.

B. Interior Doors: 1-3/4 inches thick; flush construction.

1. Provide solid core doors at all locations.
2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
   a. Provide Category A doors (no additional intumescent required).
3. Smoke and Draft Control Doors (Indicated as "S" on Drawings): In addition to required fire rating, provide door assemblies tested in accordance with UL 1784 with maximum air leakage of 3.0 cfm per sq ft of door opening at 0.10 inch wg pressure at both ambient and elevated temperatures for "S" label; if necessary, provide additional gasketing or edge sealing.
4. Wood veneer facing with factory transparent finish.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), ANSI A208.1, Grade LD-2, plies and faces as indicated above, made with binder containing no added urea-formaldehyde resin or provide certification for low chemical emissions complying with CA 01350 noted above.

B. Fire Rated Doors: Mineral core, Type FD, plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting. This includes, but is not limited to, blocking for locksets, exit devices, closers and flush bolts.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: White maple, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
   1. Vertical Edges: Same species as face veneer.
   2. "Running Match" each pair of doors and doors in close proximity to each other.
   3. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.

B. Facing Adhesive: Type I - waterproof.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Blocking: Provide minimum 5 inch top rail blocking for all doors with closers. Provide 5 inch bottom rail for auxiliary hardware and undercut flexibility.

C. Stiles (Vertical Edges): Provide manufacturer's standard laminated edge construction with improved screw-holding capability and split resistance. Both inner and outer stiles cannot contain salt treating.

D. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge, top of door for closer, and bottom rail in doors indicated to have kick or armor plates for hardware reinforcement. Provide midrail blocking in doors indicated to have exit devices.
   2. Provide solid blocking for other through-bolted hardware.

E. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

F. Factory fit factory finished doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard except as follows:
   1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
   2. Comply with requirements in NFPA 80 for fire-rated doors.

G. Bevel edges 1/8 inch in 2 inches at lock and hinge edges.

H. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System – 1, Lacquer, Nitrocellulose.
      b. Stain: Match existing stain and finish on existing doors.
      c. Sheen: Flat.

B. Finish doors at factory that are indicated to receive transparent finish.

2.07 ACCESSORIES

A. Hollow Metal Frames: See Section 08 12 13.

B. Door Hardware: See Section 08 71 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

1. Install fire-rated doors in accordance with NFPA 80 requirements.
2. Install smoke and draft control doors in accordance with NFPA 105 requirements.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

C. Rehang or replace doors that do not swing or operate freely.

D. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood doors.

B. Hardware for fire-rated doors.

C. Seals and door gaskets.

D. Door hardware schedule.

1.02 RELATED REQUIREMENTS

A. Section 08 12 13 - Hollow Metal Frames.

B. Section 08 14 16 - Flush Wood Doors.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.

B. BHMA A156.18 - American National Standard for Materials and Finishes.

C. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.

D. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors.

E. ICC A117.1 - Accessible and Usable Buildings and Facilities.

F. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

G. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.

H. NFPA 101 - Life Safety Code.

I. UL (DIR) - Online Certifications Directory.

J. UL 305 - Standard for Panic Hardware.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware will be installed upon.

B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

C. Convey Owner's keying requirements to manufacturers.

D. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 PREINSTALLATION CONFERENCE

A. Preinstallation Conference: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by all affected installers.

1.06 SUBMITTALS

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

B. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes. Clearly indicate hardware items represented within the submittal. Submittals containing complete product line catalogs will be rejected without review.

C. Door Hardware Sets: Prepared by or under the supervision of Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
2. Content: Include the following information:
   a. Identification number, location, hand, fire rating, and material of each door and frame, as applicable.
   b. Type, style, function, size, quantity, and finish of each door hardware item identified by BHMA designation. Include description and function of each lockset and exit device.
   c. Complete designations of every item required for each door or opening including name and manufacturer.
   d. Fastenings and other pertinent information.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.
   h. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
   i. List of related door devices specified in other Sections for each door and frame.

D. Keying Schedule: Submit for approval of Owner.

E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

F. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
   1. Submit manufacturer's parts lists and templates.
   2. Bitting List: List of combinations as furnished.
   3. Provide factory invoice number for each item.

G. Hardware Supplier Qualifications: Verification that hardware supplier meets specified requirements.

H. Architectural Hardware Consultant Qualifications: Verification that architectural hardware consultant meets specified requirements.

I. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

J. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Tools: One set of all special wrenches or tools applicable to each different or special hardware component, whether supplied by the hardware component manufacturer or not.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

B. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with 5 years of experience in the vicinity of the Projects. Supplier must maintain factory direct status with manufacturers listed.
   1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
   2. Installer shall have warehousing facilities in Project's vicinity. Installer shall maintain a limited parts inventory of items supplied for future service to the Owner.
   3. Scheduling Responsibility: Preparation of door hardware and keying schedules.

C. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services

for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
1. Consultant must be an employee of the supplier and readily available for consultation with Architect, Owner and Contractor.
2. The Consultant will obtain keying information in a meeting with the Owner.
3. Consultant shall make at least two jobsite inspections during installation of hardware and one final inspection to see that all hardware has been installed according to manufacturer's recommendations.
4. Consultant shall be knowledgeable on local, State and Federal life safety, fire and accessibility codes and shall assist Architect as required.

D. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
1. Test Pressure: After 5 minutes into the test, neutral pressure level in furnace shall be established at 40 inches or less above the sill.

E. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with ICC A117.1.
1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
2. Comply with the following maximum opening-force requirements for closers:
a. Exterior Doors: 8.5 lbf applied perpendicular to the door.
b. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

F. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

G. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 8.5 lbf to open door to minimum required width.

H. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

I. Keying Conference: Conduct conference at Project site. In addition to Owner, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.09 WARRANTY

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

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Structural failures including excessive deflection, cracking, or breakage.

b. Faulty operation of operators and door hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: One year from date of Substantial Completion, except as follows:
a. Locks: Seven years from date of Substantial Completion.
b. Exit Devices: Three years from date of Substantial Completion.
c. Manual Closers: 30 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hinges:
1. Bommer Industries, Inc: www.bommer.com.
2. Ives: http://us.allegion.com/brands/ives.
3. McKinney: www.mckinneyhinge.com
4. Stanley Hardware: www.stanleyworks.com.

B. Lock and Latch Sets:
1. Best Access Systems: www.bestlock.com.
2. Schlage: http://us.allegion.com/brands/schlage.

C. Push/Pulls:
1. Ives: http://us.allegion.com/brands/ives.

D. Cylindrical Locksets:
1. Best Access Systems: www.bestlock.com.
2. Schlage: http://us.allegion.com/brands/schlage.

E. Mortise Locksets:
1. Best Access Systems: www.bestlock.com.
2. Schlage: http://us.allegion.com/brands/schlage.

F. Exit Devices:
1. Precision: www.precisionhardware.com.
2. Von Duprin: http://us.allegion.com/brands/von_duprin.

G. Closers:
1. LCN: http://us.allegion.com/brands/lcn.
2. Stanley: www.stanleydoorclosers.com

H. Overhead Holders/Stops:
1. ABH: www.abs-hardware.com.
2. Glynn-Johnson: http://us.allegion.com/brands/glynn-johnson.

I. Wall and Floor Stops/Holders:
1. Ives: http://us.allegion.com/brands/ives.

J. Gasketing and Thresholds:
1. Pemko: www.pemko.com.
2. Zero International, Inc: www.zerointernational.com.

K. Protection Plates:
1. Ives: http://us.allegion.com/brands/ives.

L. Silencers:
1. Ives: http://us.allegion.com/brands/ives.
2. Trimco Inc: www.trimcobbw.com.

M. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 GENERAL REQUIREMENTS

A. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.

B. Provide all items of a single type of the same model by the same manufacturer.

C. Provide products that comply with the following:
   1. Applicable provisions of federal, state, and local codes.
   2. Accessibility: ADA Standards and ICC A117.1.
   3. Applicable provisions of NFPA 101, Life Safety Code.
   4. Fire-Rated Doors: NFPA 80.
   5. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

D. Function: Lock and latch function numbers and descriptions of manufactures series as specified in Section 08 71 01 - Hardware Schedule.

E. Finishes: Identified in schedule specified in Section 08 71 01 - Hardware Schedule.
   1. Finish Definitions: BHMA A156.18.
   2. Exceptions:
      a. Where base metal is specified to be different, provide finish that is an appearance equivalent according to BHMA A156.18.
      b. Hinges for Fire-Rated Doors: Steel base metal.

2.03 LOCKS AND LATCHES

A. Lock Cylinders: Manufacturer’s SFIC tumbler type, seven-pin small format interchangeable core.
   1. Provide cams and/or tailpieces as required for locking devices required.

B. Lockset/Latchset Design:
   1. All locks to have a 2-3/4 inch backset, unless otherwise indicated.
   2. Provide strikes with appropriate lip length to suit conditions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Do not install surface mounted items until finishes applied to substrate are complete.

D. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.

E. Mounting heights for hardware from finished floor to center line of hardware item.
   1. For steel frames: Comply with DHI (LOCS) - DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."
   2. For Wood Doors: Comply with DHI WDHS.3 - DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."

3.03 FIELD QUALITY CONTROL

A. Provide an Architectural Hardware Consultant to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.04 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   1. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

B. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.06 PROTECTION

A. Protect finished Work under provisions of Section 01 70 00 - Execution.

B. Do not permit adjacent work to damage hardware or finish.

3.07 SCHEDULE

HW SET: 001
DOOR NUMBER:
A100A

EACH TO HAVE:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM SECURITY	99-LD-996L-F	626	VON
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4111 EDA TBWMS 90DEG	689	LCN
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	S88	BLK	PEM

HW SET: 002
DOOR NUMBER:
A101A A102A

EACH TO HAVE:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CORRIDOR LOCK	L9456L 06A L583-363 L283-722	626	SCH
1	EA	MORTISE CYLINDER	20-061-ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	AUTOMATIC DOOR BOTTOM	STC411	ALM	PEM
1	EA	SURFACE CLOSER	4111 EDA TBWMS 90DEG	689	LCN
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	S88	BLK	PEM

HW SET: 003
DOOR NUMBER:
A201A A202B

EACH TO HAVE:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM SECURITY	99-LD-996L-F	626	VON
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4111 EDA TBWMS 90DEG	689	LCN
1	EA	HOLD OPEN STOP	WS40	630	IVE
3	EA	SILENCERS	SR64	GRY	IVE

.

END OF SECTION

SECTION 08 91 00
LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
C. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating.
D. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices.
E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.
C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.
D. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior and interior surfaces.
E. Test Reports: Independent agency reports showing compliance with specified performance criteria.

1.04 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
B. Provide five-year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.
   1. Finish: Include twenty-year coverage against degradation of exterior finish.
C. Provide manufacturer's warranty against degradation of exterior finish.
   1. Warranty Period: 20 years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Louvers:
   1. Airolite Company, LLC: www.airolite.com.
   2. American Warming and Ventilating: www.awv.com/#sle.
   3. Construction Specialties, Inc: www.c-sgroup.com.
   4. Greenheck: www.greenheck.com.
   5. Ruskin Company; Louvers: www.ruskin.com/#sle.
   6. Vent Products Co, Inc: www.ventproducts.com.
   7. Wonder Metals: www.wondermetals.com.
   8. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.

1. Wind Load Resistance: Design to resist positive and negative wind load of 25 psf without damage or permanent deformation.
2. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
3. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
4. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

B. Stationary Louvers: Horizontal blade, formed galvanized steel sheet construction.

1. Free Area: 50 percent, minimum.
2. Blades: Straight.
3. Frame: 4 inches deep, channel profile; corner joints mitered and, with continuous recessed caulking channel each side.
4. Steel Thickness, Galvanized: Frame 16 gauge, 0.0598 inch minimum base metal; blades 16 gauge, 0.0598 inch minimum base metal.
5. Steel Finish: Superior performing organic coating, finished after fabrication.

2.03 MATERIALS

A. Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

2.04 FINISHES

A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.

B. Superior Performing Organic Coatings System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.

C. Color: Custom, to match approved sample.

2.05 ACCESSORIES

A. Blank-Off Panels: Same material as louver, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.

B. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.

C. Bird Screen: Interwoven wire mesh of steel, 14 gauge, 0.0641 inch diameter wire, 1/2 inch open weave, diagonal design.

D. Fasteners and Anchors: Stainless steel.

E. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.

F. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

B. Verify that field measurements are as indicated.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Set sill members and sill flashing in continuous bead of sealant.
D. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
E. Secure louver frames in openings with concealed fasteners.
F. Coordinate with installation of mechanical ductwork.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal stud wall framing.

B. Grid suspension system for ceilings.

C. Acoustic insulation.

D. Tile backing board.

E. Cementitious backing board.

F. Gypsum wallboard.

G. Joint treatment and accessories.

H. Backing for wall mounted accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Acoustic sealants installed as Work of this Section.

B. Section 10 28 00 – Toilet, Bath, and Laundry Accessories: Wall mounted accessories requiring backing.

1.03 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute.

B. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units.

C. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units.

D. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

F. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.

G. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

H. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.

I. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

J. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

K. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.

L. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.

M. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.

N. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

O. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base.

P. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

Q. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.

R. ASTM C1278/C1278M - Standard Specification for Fiber-Reinforced Gypsum Panel.

S. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing.

T. ASTM C1325 - Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.

U. ASTM C1396/C1396M - Standard Specification for Gypsum Board.

V. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.

W. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels.

X. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

Y. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

Z. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

AA. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

AB. ASTM E413 - Classification for Rating Sound Insulation.

AC. GA-214 - Recommended Levels of Gypsum Board Finish.

AD. GA-216 - Application and Finishing of Gypsum Board.

AE. GA-234 - Control Joints for Fire-Resistance Rated Systems.

AF. GA-600 - Fire Resistance Design Manual.

AG. ICC (IBC) - International Building Code.

AH. SCAQMD 1113 - South Coast Air Quality Management District Rule No.1113.

AI. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168.

AJ. SFIA - Steel Framing Industry Association.

AK. SSMA - Steel Stud Manufacturers Association.

1.04 SUBMITTALS

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

B. Delegated-Design Submittal: For gypsum board assemblies, wall elements, soffits and ceiling indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Submit submittals as "Deferred Submittals" in accordance with Section 01 30 00 - Administrative Requirements. Transmit a copy of each submittal indicating agency approval to the Architect for record.

C. Product Data: Provide data on metal framing, gypsum board, glass mat faced gypsum board, accessories, and joint finishing system.
   1. Indicate profiles and products for wall and ceiling trim accessories.

D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

E. Test Reports: For stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

1. Submit Underwriters Laboratories, Inc design numbers for fire-rated assemblies as required by governing agencies.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum five years of experience.

1.06 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products 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

2.01 GYPSUM BOARD ASSEMBLIES

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

B. Delegated Design: Design gypsum board assemblies for wall elements and ceilings, including comprehensive engineering analysis by a qualified professional engineer licensed in the State of Oregon, using performance requirements and design criteria indicated. Connections shall be designed to transfer loading from one assembly to the other assembly and to the superstructure.
   1. Wall Stud Demand: The greater of 5 psf or seismic demand as determined by ASCE 7/10 [Sds + 0.659].
   2. Maximum Stud Wall Deflection: Length of stud/360.
   3. Deflection Head:
      a. Studs connecting to a floor/ceiling assembly or roof of the building need to accommodate 1-1/4 inch deflection.
   4. Ceiling Framing: The greater of 5 psf dead load or actual weight of ceiling and finish.
   5. Header/Sills at Openings (Doors, Windows, Relites, Ducting Penetrations, etc.): The greater of 5 psf dead load or actual weight of wall and finish. Design members and connections for out of plane load demand listed in the Wall Studs above.

C. Interior Partitions: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: 44 minimum calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, unless otherwise indicated.

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories: All products to be manufactured by current members of the Steel Stud Manufacturers Association (SSMA) or the Steel Framing Industry Association (SFIA).
   1. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com.
   2. SCAFCO Corporation: www.scafco.com.
   3. Steeler, Inc: steeler.com
   4. The Steel Network, Inc: www.SteelNetwork.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
   1. Studs: "C" shaped with flat or formed webs with knurled faces.
      a. Minimum Base-Metal Thickness (Gage): 0.0312 inch (20 gage), unless otherwise indicated.
         1) Provide 0.0312 inch (20 gage) supporting tile backer board.
         2) Provide 0.0312 inch (20 gage) supporting impact-rated wall board.
      b. Depth: As indicated.
   2. Runners: U shaped, sized to match studs.
   3. Furring: Hat-shaped sections, minimum depth as indicated on Drawings.
   4. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
      a. Minimum Base-Metal Thickness: 0.0312 inch (20 gage), unless otherwise indicated.

C. Loadbearing Studs for Application of Gypsum Board: As specified in Section 05 40 00.

D. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
   1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.

E. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
   1. Products:
      a. Steel Network Inc (The); VertiClip SLD Series.
      b. Superior Metal Trim; Superior Flex Track System (SFT).
   2. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems of fire rating and movement required.
   3. Deflection and Firestop Track:
      a. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-rating of the wall assembly.
      b. Products:
         1) ClarkDietrich Building Systems; MaxTrak: www.clarkdietrich.com.
         2) Fire Trak Corp.; Fire Trak attached to studs with Posi Klips: www.firetrak.com.
         3) Metal-Lite, Inc; The System: www.metallite.net.
         4) Substitutions: See Section 01 60 00 - Product Requirements.

2.03 GRID SUSPENSION SYSTEM FOR CEILINGS

A. Grid Suspension System for Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.
   1. Products:
      a. Armstrong World Industries, Inc; Drywall Grid Systems.
      b. USG Corporation; Drywall Suspension System.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 BOARD MATERIALS

A. Gypsum Board, General: Provide Type X or Type C as required for fire-resistant ratings indicated on Drawings.
   1. Lightweight gypsum wallboard is not allowed.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

a. Moisture-resistant board is required whenever board is being installed before the building is enclosed and conditioned.

3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
4. Thickness:
   a. Vertical Surfaces: 5/8 inch.
   b. Ceilings: 5/8 inch.
   c. Multi-Layer Assemblies: 5/8 inch, unless otherwise indicated on drawings.
5. Edges: Tapered.
6. Paper-Faced Products:
   a. American Gypsum Company; FireBloc Type X and FireBloc Type C Gypsum Wallboard.
   b. CertainTeed Corporation; ProRoc Brand Gypsum Board or CertainTeed Gypsum Board.
   c. Georgia-Pacific Gypsum; ToughRock, ToughRock Fireguard, and ToughRock FireGuard C Gypsum Wallboard.
   d. National Gypsum Company; Gold Bond Brand Gypsum Wallboard.
   e. USG Corporation; Sheetrock Brand Firecode and Firecode C Gypsum Panels.
   f. Substitutions: See Section 01 60 00 - Product Requirements.

C. Moisture Resistant Wallboard:
1. Application: Walls and ceilings in toilet rooms where not indicated to receive tile, custodial rooms, adjacent to drinking fountains, and elsewhere as indicated.
2. Thickness: 5/8 inch.
3. Edges: Tapered.
4. Mold Resistant Paper Faced Products:
   a. American Gypsum Company; M-Bloc.
   b. CertainTeed Corporation; ProRoc Brand Moisture & Mold Resistant Gypsum Board with M2 Tech or M2Tech Gypsum Board or AirRenew Gypsum Board with M2Tech.
   c. Georgia-Pacific Gypsum; ToughRock Mold-Guard and ToughRock Mold-Guard Type X Gypsum Wallboard.
   d. National Gypsum Company; Gold Bond Brand XP Gypsum Board.
   e. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels.
   f. Substitutions: See Section 01 60 00 - Product Requirements.
5. Glass Mat Faced Products:
   a. Georgia-Pacific Gypsum; DensArmor Plus.
   b. National Gypsum Company; Gold Bond eXP Interior Extreme Gypsum Panel.
   c. USG Corporation; Sheetrock Brand Glass-Mat Panels Mold Tough Firecode X.
   d. Substitutions: See Section 01 60 00 - Product Requirements.
6. Unfaced Products:
   a. USG Corporation; Fiberock Aqua-Tough Interior Panels.
   b. Substitutions: See Section 01 60 00 - Product Requirements.

D. Tile Backing Board: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
1. Application: Vertical surfaces behind thinset tile.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Thickness: 5/8 inch.
4. Edges: Tapered.
5. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
   a. Products:
      1) National Gypsum Company; PermaBase Cement Board: www.nationalgypsum.com/#sle.

2) USG Corporation; Durock Brand Cement Board: www.usg.com.
3) Substitutions: See Section 01 60 00 - Product Requirements.

6. Glass-Mat-Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
   a. Products:
      1) CertainTeed Corporation; Diamondback Tile Backer.
      2) Georgia-Pacific Gypsum LLC; DensShield Tile Backer.
      3) USG Corporation; Durock Glass-Mat Tile Backerboard.
      4) Substitutions: See Section 01 60 00 - Product Requirements.
7. Unfaced Products:
   a. USG Corporation; Fiberock Brand Aqua-Tough Interior Panel.
   b. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness to fit wall cavity, unless otherwise indicated.

B. Mineral Fiber Insulation: 1.5 to 3.0 lb/cf glass or mineral fiber insulation for packing voids where indicated.

C. Acoustic Sealant: As specified in Section 07 92 00 - Joint Sealants.
   1. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by SCAQMD 1168.
      a. Architectural Sealants: 250 g/L.
      b. Sealant Primers for Nonporous Substrates: 250 g/L.
      c. Sealant Primers for Porous Substrates: 775 g/L.

D. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
   1. Cornerbead.
   2. L-Bead: L-shaped; exposed long flange receives joint compound.
   3. U-Bead: J-shaped; exposed short flange does not receive joint compound.
   4. Expansion (control) joint.

E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Tape: 2 inch wide, coated glass fiber tape for joints and corners.
   2. Tape: 2 inch wide, creased paper tape for joints and corners.
   3. Ready-mixed vinyl-based joint compound.
   4. Chemical hardening type compound.

F. All paints and coating wet applied on the building interior must meet the applicable limits of SCAQMD 1113.

G. Basecoat/Surfacer: Flat latex basecoat for use on surfaces indicated to receive Level 4 finish. Basecoat is in addition to primer specified in Section 09 91 23 - Interior Painting.
   1. Products:
      a. "PrepRite High Build Interior Latex Primer/Surfacer", B28W601; Sherwin Williams.
      b. "SHEETROCK Brand Primer-Surfacer, Tuff-Hide; USG Corporation.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

H. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness: ASTM C1002; self-piercing tapping screws, corrosion resistant.

I. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.

J. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence. Start of wall and ceiling system Work will indicate acceptance of surfaces and conditions within each area.

B. Protection: Provide temporary covering to eliminate splattering of joint compound onto adjacent surfaces.

3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Studs: Space studs at 16 inches on center, unless otherwise indicated on Drawings.
   1. At areas to receive tile backing panels, space studs at 16 inches on center.
   2. Extend partition framing to structure in all locations.
   3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
   4. 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.

C. Openings: Reinforce openings as required for weight of doors or operable panels using not less than double 0.0312 inch (20 gage) studs at jambs.

D. Blocking: Install mechanically fastened steel sheet blocking for support of:
   1. Framed openings.
   2. Wall mounted cabinets.
   3. Countertop supports.
   4. Plumbing fixtures.
   5. Toilet partitions.
   6. Grab bars.
   7. Toilet accessories.
   8. Wall mounted door hardware, including wall stops and electromagnetic door holders.
   9. Heavy trim.

3.03 GRID SUSPENSION SYSTEM INSTALLATION

A. Installing Grid Suspension System for Ceilings:
   1. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
   2. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
   3. Suspend hangers from building structure as follows:
      a. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
         1) Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
      b. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

3.04 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

Press blankets firmly in place against the back of one of the layers of gypsum board. Tightly butt ends of blankets, leaving no voids.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Place two beads continuously on substrate before installation of perimeter framing members.
   2. Place continuous bead at perimeter of each layer of gypsum board.
   3. In non-fire-rated construction, seal around all penetrations by items such as conduit, pipe, ducts, and rough-in boxes.

3.05 GYPSUM BOARD AND GLASS MAT FACED BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board perpendicular to framing, with ends and edges occurring over firm bearing.

C. Double-Layer Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Moisture Protection: Treat cut edges and holes in moisture-resistant gypsum board with sealant.

F. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

G. Glass Mat Faced Backing Board: Install over steel framing members where indicated, in accordance with manufacturer's instructions. Install with 1/4 inch gap where panels abut other construction or penetrations.

H. Installation on Metal Framing: Use screws for attachment of gypsum board.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated. In public areas, confirm locations with Architect for visual effect. Frame both sides of joints independently.
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
   2. Fire-Rated Joints: Comply with Gypsum Association GA-234 for control joints in fire-rated assemblies.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.
   1. U-Bead: Use at exposed panel edges.
   2. L-Bead: Use at all exposed terminations of gypsum board, at all floor joints and joints to receive sealants.

3.07 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board: Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound, unless another type is required to meet fire ratings.

B. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.

C. Finish gypsum board in accordance with levels defined in ASTM C840 or GA-214, except as indicated below and as follows:
   1. Level 4:
      a. Locations of Use:
         1) Walls and ceilings at all public areas.

2) Exterior soffits.

b. Apply one coat of specified basecoat/surfacer to entire surface at manufacturer's recommended coverage rate of mil thickness.

c. Primer and its application to surfaces are specified in Section 09 91 23 - Interior Painting and are in addition to basecoat/surfacer.

2. Level 2: In utility areas such as Janitors Closets, Electrical Closets and Storage Rooms, in areas behind cabinetry and on backing board to receive tile finish.

3. Level 1: Wall areas above finished ceilings and permanently concealed areas, whether or not accessible in the completed construction, except provide a higher level of finish as required to comply with fire resistance ratings and acoustical ratings.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

1. Feather coats of joint compound so that camber is maximum 1/32 inch.

3.08 TOLERANCES

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

END OF SECTION

SECTION 09 30 00
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Ceramic trim.

D. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

B. Section 09 21 16 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).
   1. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar.
   2. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar.
   3. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement.
   4. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive.
   5. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
   6. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy.
   7. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout.
   8. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.
   9. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework.
   10. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar.
   11. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.
   12. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive.
   13. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar.
   14. ANSI A118.5 - American National Standard Specifications for Chemical Resistant Furan Mortars and Grouts for Tile Installation.
   15. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation.
   16. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation.
   17. ANSI A137.1 - American National Standard Specifications for Ceramic Tile.

18. ANSI A137.2 - American National Standard Specifications for Glass Tile.
19. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products.

B. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168.

C. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.

1.04 PREINSTALLATION CONFERENCE

A. Preinstallation Conference: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
   1. For sealants, include printed statement of VOC content.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Selection Samples: Provide manufacturer's full range of available colors for grout selection.

E. Jobsite Samples: Mount tile and apply grout on one plywood panel, minimum 24 x 24 inches in size for tile patterns illustrating pattern, color variations, and grout joint size variations. Maintain at jobsite for Architect's review.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Provide 2 percent of each size, color, and surface finish of tile specified.

1.06 QUALITY ASSURANCE

A. Maintain one copy of and ANSI A108/A118/A136.1 and TCNA (HB) on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

C. Installer Qualifications: Installer specializing in performing tile installation, with minimum of 5 years of documented experience and approved by product manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

1.08 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

PART 2 PRODUCTS

2.01 TILE

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

B. Manufacturers:
   1. Dal-Tile Corporation: www.daltile.com.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

C. Ceramic Mosaic Floor Tile, Type CT-1: ANSI A137.1, standard grade.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 2 by 2 inch, nominal.
   3. Shape: Square.
   4. Surface Finish: Unglazed.
   5. Color(s): As indicated on the drawings.
   6. Trim Units: Matching built-up cove shapes in sizes coordinated with field tile.

D. Glazed Wall Tile, Type CT-2 and CT-3: ANSI A137.1, standard grade.
   1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
   2. Size: 6 by 6 inch, nominal.
   3. Edges: Cushioned.
   4. Surface Finish: Semi-Gloss.
   5. Color(s): As indicated on the drawings.
   6. Trim Units: Matching bullnose and surface bullnose shapes in sizes coordinated with field tile.

2.02 TRIM AND ACCESSORIES

A. Ceramic Trim: Matching bullnose, surface bullnose, and cove base ceramic shapes in sizes coordinated with field tile.
   1. Applications:
      a. Open Edges: Bullnose.
      b. Inside Corners: Jointed.
      c. Floor to Wall Joints: Built-up CT-1 cove base B-2.
   2. Manufacturers: Same as for tile.

B. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
   1. Applications:
      a. Transition between floor finishes of different heights.
      b. Thresholds at door openings.
   2. Manufacturers:
      a. Blanke Corporation: www.blankecorp.com.
      b. Schluter-Systems: www.schluter.com.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Sealants and Primers: As specified in Section 07 92 00 - Joint Sealants.
   1. Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.
      a. Architectural Sealants: 250 g/L.
      b. Sealant Primers for Nonporous Substrates: 250 g/L.
      c. Sealant Primers for Porous Substrates: 775 g/L.
   2. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.
   3. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

D. Trowelable Underlayments, Self-Leveling Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
   1. Available Products: Ardex Engineered Cements, self-leveling underlayments and pre-tile repair mortar.

E. Sealer:
   1. Available Products:
      a. Aqua Mix Sealer's Choice Gold.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Locations of Use: All grout joints that are not epoxy.

2.03 SETTING MATERIALS

A. Tile Setting Materials - General: Provide only products having lower volatile organic compound (VOC) content than required by SCAQMD 1168.

B. Manufacturers:
   1. ARDEX Engineered Cements: www.ardexamericas.com.
   2. Custom Building Products: www.custombuildingproducts.com.
   3. LATICRETE International, Inc: www.laticrete.com/sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

C. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4 or ANSI A118.5
   1. Applications: Use this type of bond coat where indicated.
   2. Products:
      a. ARDEX Engineered Cements; ARDEX X 5: www.ardexamericas.com.
      b. LATICRETE International, Inc; LATICRETE 254 Platinum: www.laticrete.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 GROUTS

A. Manufacturers:
   1. ARDEX Engineered Cements: www.ardexamericas.com.
   2. Flextile Ltd.: www.flextile.net.
   3. LATICRETE International, Inc: www.laticrete.com/#sle. (Basis-of-Design)
   4. TEC: www.tecspecialty.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
   1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
   2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
   3. Color(s): As selected by Architect from manufacturer's full line.
   4. Products:
      a. ARDEX Engineered Cements; ARDEX FG-C MICROTEC for joints up to 1/4 inch or ARDEX FL for joints 1/8 inch to 1/2 inch, as applicable to joint width: www.ardexamericas.com.
      b. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
   1. Applications: All floor and shower installations.
   2. Color(s): As selected by Architect from manufacturer's full line.
   3. Products:
      a. ARDEX Engineered Cements; ARDEX WA: www.ardexamericas.com.
      b. LATICRETE International, Inc; LATICRETE SPECTRALOCK 2000 IG: www.laticrete.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORY MATERIALS

A. Waterproofing Membrane: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
   1. Fluid or Trowel Applied Type:
      a. Material: Synthetic rubber.
      b. Products:
         1) LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com/#sle.
         2) Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that masonry substrate joints have been struck flush.

D. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI for installations indicated.

E. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.1b for installations indicated.
   1. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
   2. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

F. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

G. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

H. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

I. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer. Level existing substrate surfaces to acceptable flatness tolerances.

3.03 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor, base, and wall joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
   1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
   1. Unglazed Floor Tile: 1/8 inch.
   2. Glazed Wall Tile: 1/8 inch.
   3. Glass Tile: 1/8 inch.

G. Form internal angles square and external angles bullnosed.

H. Install non-ceramic trim in accordance with manufacturer's instructions.

I. Sound tile after setting. Replace hollow sounding units.

J. Keep control and expansion joints free of mortar, grout, and adhesive.
   1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
   2. Space control joints at 12 foot to 16 foot intervals in each direction, unless otherwise indicated.
   3. Provide joints at perimeter walls and at fixtures or structural elements.

K. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

L. Grout tile joints unless otherwise indicated.

M. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F115, with epoxy grout.

3.05 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244.

B. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.

C. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat, unless otherwise indicated.

3.06 CLEANING

A. Clean tile and grout surfaces.

B. Apply sealer to all grout joints that are not epoxy grout.

3.07 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient base.
B. Installation accessories.

1.02 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
B. ASTM F1861 - Standard Specification for Resilient Wall Base.
C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
D. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
E. NSF 332 - Sustainability Assessment for Resilient Floor Coverings.
F. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings.
G. SCAQMD 1168 - Adhesive and Sealant Applications.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
C. Verification Samples: Submit two samples, 8 by 8 inch in size illustrating color and pattern for each resilient flooring product specified.
D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

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

1.06 FIELD CONDITIONS

A. Store materials for not less than 72 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 68 degrees F.

PART 2 PRODUCTS

2.01 RESILIENT BASE

A. **B-1 / B-2** - Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
   1. Manufacturers:
      a. Johnsonite, a Tarkett Company: www.johnsonite.com.

b. Roppe Corporation; Contours Profiled Wall Base System: www.roppe.com/#sle.
c. Substitutions: See Section 01 60 00 - Product Requirements.

2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648, NFPA 253, ASTM E 648, or NFPA 253.
3. Height: 4 inch.
4. Thickness: 0.125 inch.
5. Finish: Satin.
6. Length: Roll.
7. Color: As shown on drawings (to match existing).
8. Accessories: Premolded external corners and internal corners.

2.02 ACCESSORIES

A. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer. Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
C. Install resilient flooring material and accessories after other finishing operations, including painting, have been completed.

3.02 PREPARATION

A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).
B. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.
C. Do not install floor coverings until they are same temperature as space where they are to be installed.
   1. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
D. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.
B. Install in accordance with manufacturer's written instructions.
C. Adhesive-Applied Installation:
   1. Spread only enough adhesive to permit installation of materials before initial set.
   2. Fit joints and butt seams tightly.
   3. Set flooring in place, press with heavy roller to attain full adhesion.
D. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
E. Install flooring in recessed floor access covers, maintaining floor pattern.
F. Unroll floor coverings and allow them to stabilize before cutting and fitting.
G. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.

H. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.04 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.05 CLEANING

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

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

C. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Perform initial maintenance on installed products in accordance with manufacturer's instructions, prior to owner's acceptance. Remove construction site debris from project site and legally dispose of debris.

1. Remove visible adhesive and other surface blemishes using cleaning methods recommended by flooring manufacturer.
2. Sweep vacuum floor after installation.
3. Do not perform initial maintenance for a minimum of 5 days after installation has been completed to allow the adhesive the proper time to set.
4. Damp mop flooring to remove black marks and soil.

END OF SECTION

SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paint systems indicated as "P" (Paint) and "EP" (Epoxy) on the following substrates:

1. Gypsum board.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
5. Floors, unless specifically indicated.
6. Glass.
7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 09 96 00 - High-Performance Coatings: Painting of metals with high-performance coatings indicated as "HPC" on Drawings.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

B. Paint Gloss and Sheen: Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following values:

Gloss Level	Description	Units @ 60 Degrees	Units @ 85 Degrees
G1	Matte or Flat Finish	0 to 5	10 maximum
G2	Velvet Finish	0 to 10	10 to 35
G3	Eggshell Finish	10 to 25	10 to 35
G4	Satin Finish	20 to 35	35 minimum
G5	Semi-Gloss Finish	35 to 70	
G6	Gloss Finish	70 to 85	
G7	High-Gloss Finish	85	

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.

C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating.

D. SCAQMD 1113 - Architectural Coatings.

E. SSPC-SP 3 - Power Tool Cleaning.

1.05 SUBMITTALS

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

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   2. Manufacturer's installation instructions.
   3. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.
C. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   2. Include printed statement of VOC content and chemical components.
D. Samples for Verification: For each color and material to be applied, provide three 8-inch by 10-inch color drawdowns with texture to simulate actual conditions, and representing color and sheen.
E. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.
F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
   1. At project completion, provide an itemized list complete with manufacturer, paint type and color coding for all colors used for Owner's later use in maintenance.
   2. Include color drawdowns and sample chips for each color and sheen.
G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
   3. Label each container with color, sheen, and sheen in addition to the manufacturer's label.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.
D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.
E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Products: Provide one of the products listed in Part 2.

C. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in Part 2:

1. Kelly-Moore Paints (Kelly).
2. Miller Paint Co. (Miller).
3. Rodda Paint / Cloverdale Paint Co. (Rodda).
4. Sherwin-Williams Co. (S-W).

D. Provide paints and finishes from the same manufacturer to the greatest extent possible.

1. If a single manufacturer cannot provide specified products; minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
2. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.

E. Substitutions: Not permitted.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.

1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
4. Supply each paint material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:

1. All paints and coating wet applied on site must meet the applicable limits of the SCAQMD 1113. VOC shall not exceed the limits indicated below:
   a. Dry Fog Coatings: 50 g/L.
   b. Flat Paints: 50 g/L.
   c. Nonflat Paints: 50 g/L.
   d. Primers, Sealers and Undercoaters: 100 g/L
   e. Rust Preventative Coatings/Industrial Maintenance Coatings: 100 g/L.
   f. Clear Wood Finishes, Lacquer: 275 g/L.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings.

1. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - INTERIOR

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

1. Eggshell, Acrylic-Enamel Finish: 2 finish coats over a primer.
   a. Primer Over Existing Painted Surfaces:
      1) Kelly: 295 Kel-Bond Universal Acrylic Primer.
      2) Miller: 470011 Miller Prime All Purpose Acrylic Primer.
      3) Rodda:501601 First Coat Bonding Primer
      4) S-W: PrepRite ProBlock Latex Primer/Sealer, B51W620
   b. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
      1) Kelly: 976 Kel-Bond Interior PVA Primer/Sealer.
      2) Miller: 230011 Performance Plus Primer Sealer.
      3) Rodda:403601 Master Painter Zero.
      4) S-W: PrepRite ProBlock Latex Primer/Sealer, B51W620
   c. First and Second Coats: Eggshell or satin, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils.
      1) Kelly: 1010 Premium Professional Low VOC Interior Eggshell Enamel.
      2) Miller: 1204XX Premium Satin or 3880 Premium Eggshell.
      3) Rodda:423601 Master Painter Zero Satin
      4) S-W: ProMar 200 Zero VOC Eg-Shel, B20-2600 Series.
2. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
   a. Primer Over Existing Painted Surfaces:
      1) Kelly: 295 Kel-Bond Universal Acrylic Primer.
      2) Miller: 470011 Miller Prime All Purpose Acrylic Primer.
      3) Rodda:501601 First Coat Bonding Primer.
      4) S-W: PrepRite ProBlock Latex Primer/Sealer, B51W620
   b. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
      1) Kelly: 976 Kel-Bond Interior PVA Primer/Sealer.
      2) Miller: 230011 Performance Plus Primer Sealer.
      3) Rodda:403601 Master Painter Zero Primer Sealer.
      4) S-W: PrepRite ProBlock Latex Primer/Sealer, B51W620
   c. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils.
      1) Kelly: 1050 KM Professional Acrylic Semi-Gloss Enamel.
      2) Miller: 1205XX Premium Semi-Gloss.
      3) Rodda:453601 Master Painter Zero Semi-Gloss.
      4) S-W: ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series.
3. Semigloss, Water-Based Epoxy (EP): 2 finish coats over a primer.
   a. Primer Over Existing Painted Surfaces:
      1) Kelly: 295 Kel-Bond Universal Acrylic Primer.
      2) Miller: 470011 Miller Prime All Purpose Acrylic Primer.
      3) Rodda:501601 First Coat Bonding Primer
      4) S-W: PrepRite ProBlock Latex Primer/Sealer, B51W620
   b. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils.
      1) Kelly: Sierra Performance S30 Griptec Sandable Primer.
      2) Miller: 230011 Performance Plus Primer Sealer.

3) Rodda:403601 Master Painter Zero Primer Sealer.
4) S-W: PrepRite ProBlock Latex Primer/Sealer, B51W620

c. First and Second Coats: Odorless, semigloss, interior water-based epoxy enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 3 mils.
1) Kelly: Sierra Performance S-16 Epoxy Acrylic Semi-Gloss.
2) Miller: 1835XX Water Base Epoxy.
3) Rodda:449001 Protech Pre-Catalyzed Epoxy Semi-Gloss.
4) S-W: Pro Industrial Pre-Catalyzed Waterbased Catalyzed Epoxy, K46-1150 Series.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
B. Patching Material: Latex filler.
C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.
B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.
D. Test shop-applied primer for compatibility with subsequent cover materials.
E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
1. Gypsum Wallboard: 12 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
C. Remove or repair existing paints or finishes that exhibit surface defects.
D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
1. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating or nomenclature plates.
E. Seal surfaces that might cause bleed through or staining of topcoat.
F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
G. 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.
H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair. Do not begin paint application until finishing compound is dry and sanded smooth.

3.03 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. If spray equipment is utilized, a spray/backroll application is considered one coat of paint.
3. 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.
4. Continue paint finish behind all wall-mounted items.

B. 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.

C. Paint access doors, prime coated hardware, exposed piping and electrical panels to match adjacent surfaces in color, texture and sheen, unless otherwise noted or where pre-finished.
   1. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

D. When the color of a door frame changes from side to side, the change shall be made at the edge of the stop, where the transition is not visible when the door is in a closed position.

E. Apply products in accordance with manufacturer's written instructions.

F. Prime surfaces to receive cabinetry and similar items.
   1. Provide primer and all finish coats behind wainscots, wall coverings, markerboards, tackboards, and tack surfaces.

G. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

H. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

I. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

J. Regardless of number of coats specified, apply as many coats as necessary for complete hide.

K. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

L. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

B. Painted surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent to Architect.
   1. Brush/roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, or foreign materials in paint coatings.
   2. Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners, reentrant angles or similar conditions.
   3. Damage due to touching before paint is sufficiently dry or any other contributory cause.
   4. Damage due to application on moist surfaces or caused by inadequate protection from the weather.
   5. Damage and/or contamination of paint due to blown contaminants (dust, spray paint, etc.).

C. Painted surfaces shall be considered unacceptable if any of the following are evident under natural lighting source for exterior surfaces:
   1. Visible defects are evident on vertical or horizontal surfaces when viewed at normal viewing angles from a distance of not less than 39 inches.
   2. Visible defects are evident on ceilings, soffits and other overhead surfaces when viewed at normal viewing angles.
   3. When the final coat on any surface exhibits a lack of uniformity of color, sheen texture and hiding across full surface area.

4. Dry mil thicknesses do not meet manufacturer's recommended thickness or specified thickness.

D. Owner may provide field inspection and testing.
1. Painted surfaces will be tested for dry mil thickness for each coat.
2. Shop primers and painted surfaces will be tested for adhesion.
3. Surfaces will be tested at frequency discussed in the preinstallation conference and as deemed appropriate by Owner.

E. Touch-up and restore painted surfaces damaged by testing.
1. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from 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.

3.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.07 SCHEDULE - PAINT SYSTEMS

A. Gypsum Board - Eggshell Acrylic Finish:
1. Provide primer without finish coats at areas indicated to receive fixed equipment, cabinetry and similar fixed items.

B. Gypsum Board - Semigloss, Acrylic-Enamel Finish.
1. Provide primer without finish coats at areas indicated to receive fixed equipment, cabinetry and similar fixed items.
2. Provide primer and all finish coats behind wainscots, wall covering, markerboards, tackboards, and tack surfaces.

C. Gypsum Board: Semigloss, Water-Based Epoxy:
1. Walls and ceilings in toilet rooms.

D. Refer to Section 09 96 00 - High-Performance Coating for metals not listed to be painted as Work of this Section.

E. Steel Frames: As specified in Section 09 96 00 - High-Performance Coatings.

END OF SECTION

SECTION 09 96 00
HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. High performance coatings (HPC) for the following conditions:
   1. Interior Substrates:
      a. Steel.

B. Surface preparation.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 08 12 13 - Hollow Metal Frames: Shop priming of metal substrates with primers compatible with primers specified in this Section.

C. Section 09 91 23 - Interior Painting: Requirements for mechanical and electrical equipment surfaces.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.

B. ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test.

C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating.

D. SCAQMD 1113 - Architectural Coatings.

E. SSPC-PA 2 - Procedure For Determining Conformance To Dry Coating Thickness Requirements.

F. SSPC-SP 1 - Solvent Cleaning.

G. SSPC-SP 2 - Hand Tool Cleaning.

H. SSPC-SP 3 - Power Tool Cleaning.

I. SSPC-SP 6 - Commercial Blast Cleaning.

J. SSPC-SP 7 - Brush-Off Blast Cleaning.

1.04 SUBMITTALS

A. See Section 01 30 00-Admin, for submittal procedures.

B. Product Data: Provide complete list of all products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. Include printed statement of VOC content and chemical components for interior coatings.
   3. Cross-reference to specified coating system(s) product is to be used in; include description of each system.

C. Samples for Verification: For each type of coating system and in each color and gloss of finish coat indicated.

D. Product List: For each product indicated. Cross-reference products to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules.

E. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation requirements, perimeter conditions requiring special attention, surface preparation requirements, and surface preparation requirements.

F. Maintenance Data: Include cleaning procedures and repair and patching techniques.
   1. At project completion, provide an itemized list complete with manufacturer, coating type and color coding for all colors used for Owner's later use in maintenance.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Coating Materials: 1 gallon of each type and color. All extra stock containers are to be new and unopened.
   2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.05 QUALITY ASSURANCE

A. Surface Preparation: Obtain written confirmation of the specific surface preparation procedures and primers used for all fabricated steel items from the fabricator(s) to ascertain appropriate and manufacturer compatible finish coat materials to be used before painting any such work.

B. Comply with requirements of SSPC-PA 2 for measurement of coating thickness.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the coating product manufacturer.

C. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.

D. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

F. Restrict traffic from area where coating is being applied or is curing.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Products: Provide one of the products listed in Part 2.

B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in Part 2:
   1. Kelly-Moore Paints (Kelly).
   2. Miller Paint Co. (Miller).
   3. Rodda Paint / Cloverdale Paint Co. (Rodda).
   4. Sherwin-Williams Co. (S-W).

C. Substitutions: Not permitted.

2.02 HIGH-PERFORMANCE COATINGS

2.03 MATERIALS

A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated.
   1. For shop primed items, omit specified primer if shop primer is compatible with finish coats and in good condition as determined by finish coating manufacturer.

B. Material Compatibility: Provide materials for use within each coating 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.

C. Volatile Organic Compound (VOC) Content:

1. All paints and coating wet applied on site must meet the applicable limits of the SCAQMD 1113. VOC shall not exceed the limits indicated below:
   a. Rust Preventative Coatings/Industrial Maintenance Coatings: 100 g/L.

D. Colors: As indicated on drawings.
   1. Lead Content: Not greater than 0.06 percent by weight of total nonvolatile content.
   2. Chromium Content, as Hexavalent Chromium, Zinc Chromate, or Strontium Chromate: None.
   3. Volatile Organic Compound (VOC) Content: See Section 01 61 16.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

2.05 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Ferrous Metal: Provide the following finish systems over interior ferrous metal. Primer is not required on appropriately shop-primed items.
   1. Semi-Gloss, Two-Component, VOC Compliant or Waterborne Pigmented Aliphatic Acrylic Polyurethane: One or two finish coats, of two-component, aliphatic acrylic polyurethane coating, over metal primer with total dry film thickness not less than 6.0 mils, unless noted otherwise.
      a. 1st Coat:
         1) Miller: PPG Dimetcote 21-5 Waterbase inorganic zinc primer.
         2) Moore: Ultra Spec Acrylic Metal Primer HP04.
         3) Rodda: Precision Coatings DTM 1300v100 HB Epoxy Primer.
         4) S-W: Macropoxy 646-100 Epoxy, B58-620 Series at 2 - 4 mils DFT
      b. 2nd Coat:
         1) Miller: PPG Pitthane Ultra 95-812 Low Gloss.
         2) Moore: Waterborne Aliphatic Acrylic Urethane V540.
         3) Rodda: Precision Coatings PC3v100 Acrylic Polyurethane Semi-Gloss.
         4) S-W: Pro Industrial Waterbased Acrolon 100 Polyurethane, B65-720 Series at 2 - 4 mils DFT.
      c. 3rd Coat:
         1) Miller: PPG Pitthane Ultra 95-812 Low Gloss.
         2) Moore: Waterborne Aliphatic Acrylic Urethane V540.
         3) Rodda: Precision Coatings PC3v100 Acrylic Polyurethane Semi-Gloss.
         4) S-W: Pro Industrial Waterbased Acrolon 100 Polyurethane, B65-720 Series at 2 - 4 mils DFT.

B. Zinc-Coated Metal: Provide the following finish systems over zinc-coated metal:
   1. Semi-Gloss, Two-Component, VOC Compliant or Waterborne Pigmented Aliphatic Acrylic Polyurethane: Two finish coats, of two-component, aliphatic acrylic polyurethane coating, over metal primer with total dry film thickness not less than 6.0 mils, unless noted otherwise.
      a. 1st Coat:
         1) Miller: PPG PMC Amerlock 2 High Solids Epoxy Coating
         2) Moore: P04 Acrylic Metal Primer.
         3) Rodda: Precision Coatings DTM 1300v100 HB Epoxy Primer.
         4) S-W: Macropoxy 646-100 Epoxy, B58-620 Series at 2 - 4 mils DFT
      b. 2nd Coat:
         1) Miller: PPG Pitthane Ultra 95-812 Low Gloss.
         2) Moore: Waterborne Aliphatic Acrylic Urethane V540.
         3) Rodda: Precision Coatings PC3v100 Acrylic Polyurethane Semi-Gloss.
         4) S-W: Waterbased Acrolon 100 Polyurethane at 2 - 4 mils DFT.

c. 3rd Coat:
   1) Miller: PPG Pitthane Ultra 95-812 Low Gloss.
   2) Moore: Waterborne Aliphatic Acrylic Urethane V540.
   3) Rodda: Precision Coatings PC3v100 Acrylic Polyurethane Semi-Gloss.
   4) S-W: Waterbased Acrolon 100 Polyurethane at 2 - 4 mils DFT.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.
B. Do not begin application of coatings until substrates have been properly prepared.
C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.
D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
E. Test shop-applied primer for compatibility with subsequent cover materials.
F. Proceed with coating application only after unacceptable conditions have been corrected.
   1. Commencing coating application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION

A. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
   1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
B. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers as required to produce coating systems indicated.
   2. At interior steel abrade the top layer of primer, unless otherwise required by coating manufacturer.
C. Steel Substrates: Remove rust and loose mill scale.
   1. Prepare interior surfaces as recommended by coating system manufacturer and according to SSPC-SP 3 "Power Tool Cleaning."
   2. Level of surface preparation specified is a minimum. If the coating manufacturer requires a higher degree of preparation, comply with the coating manufacturer's recommendations.
D. Remove finish hardware, fixture covers, and accessories and store.
E. Existing Painted and Sealed Surfaces:
   1. Strip existing paint and coatings from surface.
   2. Remove loose, flaking, and peeling paint. Feather edge and sand smooth edges of chipped paint.
   3. Clean with mixture of trisodium phosphate and water to remove surface grease and foreign matter.
F. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.
G. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.

2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning", and protect from corrosion until coated.

3.03 PRIMING

A. Apply primer to unprimed surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.04 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified. Use applicators and techniques suited to coating and substrate indicated.

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color and appearance.

D. When the color of a door frame changes from side to side, the change shall be made at the edge of the stop, where the transition is not visible when the door is in a closed position.

3.05 FIELD QUALITY CONTROL

A. Painted surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent to Architect.
   1. Brush/roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, or foreign materials in paint coatings.
   2. Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners, reentrant angles or similar conditions.
   3. Damage due to touching before paint is sufficiently dry or any other contributory cause.
   4. Damage due to application on moist surfaces or caused by inadequate protection from the weather.
   5. Damage and/or contamination of paint due to blown contaminants (dust, spray paint, etc.).

B. Painted surfaces shall be considered unacceptable if any of the following are evident under natural lighting source for exterior surfaces:
   1. Visible defects are evident on vertical or horizontal surfaces when viewed at normal viewing angles from a distance of not less than 39 inches.
   2. Visible defects are evident on ceilings, soffits and other overhead surfaces when viewed at normal viewing angles.
   3. When the final coat on any surface exhibits a lack of uniformity of color, sheen texture and hiding across full surface area.
   4. Dry mil thicknesses do not meet manufacturer’s recommended thickness or specified thickness.
   5. Lack of adhesion. Test surfaces indicating lack of adhesion in accordance with ASTM D3359 or as recommended by coating manufacturer.

C. Owner may provide field inspection and testing.
   1. Painted surfaces will be tested for dry mil thickness for each coat.
   2. Shop primers and painted surfaces will be tested for adhesion.
   3. Surfaces will be tested at frequency discussed in the preinstallation conference and as deemed appropriate by Owner.

D. Touch-up and restore painted surfaces damaged by testing.

1. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.06 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

E. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.07 PROTECTION

A. Protect finished work from damage.

3.08 INTERIOR SCHEDULE

A. Steel: Semigloss, Two-Component, Pigmented Aliphatic Acrylic Polyurethane:

1. Hollow metal frames.

B. Colors: As indicated on the Drawings.

END OF SECTION

SECTION 10 14 00
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and door signs.

1.02 REFERENCE STANDARDS

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

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
C. Shop Drawings: Layout drawings for each sign.
D. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
E. Samples: Submit two samples, of size similar to that required for project, illustrating sign style, font, and method of attachment.
F. Verification Samples: Submit samples showing colors specified.
G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.
B. Store tape adhesive at normal room temperature.

1.05 FIELD CONDITIONS

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

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
    1. Failures include, but are not limited to, the following:
        a. Deterioration of metal and polymer finishes beyond normal weathering.
        b. Deterioration of embedded graphic image colors and sign lamination.
    2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flat Signs:
    1. Architectural Metalcrafters: www.amcrafters.com.
    2. ASI Sign Systems: www.asisignage.com.
    3. Best Sign Systems, Inc: www.bestsigns.com.
    4. Cosco Industries (ADA signs); ADA Series 1: www.coscoarchitecturalsigns.com/#sle.

5. FastSigns, 3259 NW 29th Avenue, Portland, OR 97210: www.fastsigns.com.
6. Innerface Sign Systems, Inc: ww.innerface-signage.com.
7. Martin Bros. Inc: www.martin-bros.com.
8. Mohawk Sign Systems, Inc: www.mohawksign.com.
9. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SIGNAGE APPLICATIONS

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

B. Room and Door Signs:
   1. Sign Type: Flat signs with photopolymer panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
   3. Sign Size: As indicated on the Drawings.
   4. Provide tactile signs at all panel sign locations.
   5. Rest Rooms: Identify with pictograms, room numbers to be determined later, and braille as indicated on the drawings.

2.03 SIGN TYPES

A. Refer to Drawings for Sign Details.

B. Flat Signs: Signage media without frame.
   1. Edges: Square.
   2. Corners: Square.
   3. Comply with requirements indicated for materials, finishes, colors, designs, shapes, sizes, and details of construction.
      a. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.
      b. Position text and symbols as detailed.
      c. Braille color shall match background color.
   4. Wall Mounting of One-Sided Signs: Tape adhesive.

C. Color and Font: Unless otherwise indicated:
   1. Character Font: Calibri, size and spacing as indicated.
   2. Character Case: Upper case only.
   3. Background Color: Pantone 429C.
   4. Character Color: White.

2.04 SIGN TYPES

A. Refer to Drawing A6102 for Sign Type 1.

B. Type 1: ADA text and Braille, size and text as indicated on Drawings. Provide International Accessibility Symbol (IAS) pictogram where indicated.

2.05 ACCESSORIES

A. Tape Adhesive: Double sided VHB tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and accessibility requirements.

B. Install neatly, with horizontal edges level.

C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1, using mounting methods of types described and complying with manufacturer's written instructions.
   1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
   2. Interior Wall Signs: Install tactile signs on walls adjacent to latch side of door where applicable.
D. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
   1. Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for rough surfaces.
E. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 28 00

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.
B. Under-lavatory pipe supply covers.
C. Related Items Owner Furnished and Contractor Installed (OFCI).

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: OFCI requirements.
B. Section 09 21 16 – Gypsum Board Assemblies: Concealed supports for accessories, including in wall framing and plates.
C. Section 09 30 00 - Tiling: Coordination for installation of accessories.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.
B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
F. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
G. ASTM C1036 - Standard Specification for Flat Glass.
H. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
I. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror.
J. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping.
K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
L. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
M. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.
B. Install work in conformance with ADA Accessibility Standards.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. AJW Architectural Products: www.ajw.com.
   2. American Specialties, Inc: www.americanspecialties.com.
   3. Bobrick (Basis-of-Design): www.bobrick.com.
   4. Bradley Corporation: www.bradleycorp.com.
   5. Seachrome: www.seachrome.com
   6. Substitutions: Section 01 60 00 - Product Requirements.
B. Under-Lavatory Pipe Supply Covers:
   1. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.
   2. Substitutions: Section 01 60 00 - Product Requirements.
C. Provide products of each category type by single manufacturer.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.
B. Keys: Provide keys for each accessory to Owner; master key all lockable accessories.
C. Stainless Steel Sheet: ASTM A666, Type 304.
D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
F. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
G. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
H. Adhesive: Contact type, waterproof.
I. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
J. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FABRICATION

A. Fabricated Components: Grind welded joints smooth.
B. Form exposed surfaces from a single sheet of stock, free of joints.
C. Form surfaces flat, without distortion. Maintain true, flat surfaces without scratches or dents.
D. Shop assemble accessories and package complete with all fasteners, anchors, and fittings.
E. Provide all steel anchor plates, adapters, and other installation components.

2.04 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.
B. Chrome/Nickel Plating: ASTM B456, SC 2, satin finish, unless otherwise noted.
C. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.
D. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.
E. Back paint components where contact is made with building finishes to prevent electrolysis.

2.05 COMMERCIAL TOILET ACCESSORIES

A. Mirrors: Stainless steel framed, 1/4 inch thick tempered safety glass; ASTM C1048.

1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
2. Size: As follows:
   a. **M-1**: 24 x 36 inches.
3. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
4. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
5. Products: B-2908 Series manufactured by Bobrick.
   a. Substitutions: Section 01 60 00 - Product Requirements.

B. Grab Bars: Stainless steel, smooth surface.
1. Standard Duty Grab Bars:
   a. Push/Pull Point Load: 250 pound-force, minimum.
   b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
   c. Finish: Satin.
   d. Length and Configuration: As indicated on drawings.
   e. Products:
      1) Seachrome Corporation: www.seachrome.com/#sle.
      2) Substitutions: Section 01 60 00 - Product Requirements.

2.06 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
3. Construction: 1/8 inch flexible PVC.
   a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   b. Comply with ASTM C1822, type indicated.
   c. Comply with ICC A117.1.
   d. Microbial and Fungal Resistance: Comply with ASTM G21.
4. Color: White.
5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.
6. Products:
   a. Plumberex Specialty Products, Inc; Plumberex Handy-Shield Maxx: www.plumberex.com/#sle.

2.07 ITEMS OWNER FURNISHED AND CONTRACTOR INSTALLED (OFCI)

A. Provide complete installation of the following items, one per restroom or at multiple locations as required by fixture type at location. Coordinate with Architect prior to installation if items are not shown on Drawings.
1. **SD -** Soap Dispenser: One at each lavatory or hand washing sink.
2. **PT# -** Paper Towel Dispenser: One at each lavatory or hand washing sink.
3. **TP -** Toilet Paper Dispenser: One at each fixture.
4. **SCD** - Seat Cover Dispenser: One at each fixture in unisex and adult restrooms.
5. **ND** - Sanitary Napkin Disposal: At locations shown on Drawings

B. Obtain product data from the Owner to correctly locate blocking for each item and to determine correct mounting height and placement for accessibility.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.
B. Verify exact location of accessories for installation.
C. Verify that field measurements are as indicated on drawings.
D. See Section 09 21 16 – Gypsum Board Assemblies for installation of blocking, reinforcing plates, and concealed anchors in walls.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.
B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
B. Install plumb and level, securely and rigidly anchored to substrate.
C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
   1. Grab Bars and other accessories: As indicated on drawings.
   2. Other Accessories: As indicated on drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 13 48 53

SEISMIC ANCHORAGE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The purpose of this section is to provide instructions relating to the design and construction of anchorage requirements for mechanical and electrical items, equipment and other components. It is required that these items be anchored to the facility in a manner whereby the overall reliability of the facility is not compromised.

1. Provide bracing and anchorage as required to meet Oregon Structural Specialty Code (OSSC) requirements.

B. Unless otherwise determined by the Architect, it is not intended that any item of purchased equipment be modified to meet the requirements of this section.

1.02 SYSTEM DESCRIPTION

A. General Connection Requirements:

1. All supports and connections in construction shall be provided by the Contractor in accordance with the code for the criteria per contractor-supplied Structural Drawings, coordinated with the particular items included in the contract. The Contractor shall retain a registered professional engineer licensed in the State of Oregon to perform and seal this design work.

1.03 DESIGN REQUIREMENTS

A. Delegated Design: Design seismic anchorage, including comprehensive engineering analysis by a registered professional engineer licensed in the State of Oregon, using performance requirements and design criteria indicated.

B. Code: 2022 Oregon Structural Specialty Code shall be used for the design of seismic restraints of items indicated, with the additional requirements dictated by the referenced standards and the specific requirements and exceptions specified in this section.

C. Acquisition of design data and installation of gravity and seismic anchorages (restraints) shall be the responsibility of the Contractor unless otherwise noted in this section. Design data and shop drawings shall be provided for review and approval in accordance with the General Guidelines for Connecting to Structure below.

D. Distribution of Gravity and Seismic Loads to Structure:

1. It is the responsibility of the Contractor to see that the combined equipment, system and piping loads do not exceed the capacity of any individual supporting structural member or group of structural members prior to the construction of the supporting members. If modifications are required, these modifications shall be brought to the attention of the Structural Engineer of Record.
2. Supplemental structural distribution members shall be required when equipment gravity and seismic loads exceed design loads shown on the structural drawings and specifications.
3. All systems, equipment and casework, shall be connected to the buildings structural system in a rigid manner except units with special vibration isolation mounting requirements.
4. The Contractor shall make available to the Architect information required to verify the anchorage (restraint) of the following critical equipment as applicable to the project, including, but not limited to:
   a. Exhaust fans/supply fans.
5. Information to be included, but not limited to the following:
   a. Center of gravity

b. Weight
c. Footprint
d. Space envelope
e. Tie-down provisions

1.04 SUBMITTALS

A. See Section 01 33 00 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide Structural characteristics of all proposed components.
C. Shop Drawings: Indicate actual components and field configuration or limitations for each seismic restraint. Provide structural calculations.
D. Delegated Design and Certification of Connection Design:
1. All design data and shop drawings shall be sealed by a professional engineer licensed in the State of Oregon and submitted for review to the Architect and structural engineer of record before submittal to the Authority Having Jurisdiction (AHJ). Obtain approval for the AHJ before the equipment anchorage is fabricated or installed. Allow 4 weeks from time of Architect's receipt of submittal of design data and shop drawings for review. The following information must be included in the design data and shop drawings.
a. Exact dimension and intended locations of each unit.
b. Verification and location of weight relative to existing and new building structures (e.g., plan and height location of the center of gravity).
c. Scale drawings showing base details with original intended connection system.
d. Anchors to be installed per manufacturer's recommendations or as indicated. All anchors subject to field testing where loading appears to approach or exceed capacity of the anchor.
2. Submit submittals as "Deferred Submittals" in accordance with Section 01 30 00 - Administrative Requirements. Transmit a copy of each submittal indicating agency approval to the Architect for record.

1.05 QUALITY ASSURANCE

A. Perform design under direct supervision of a registered professional engineer experienced in design of this Work and licensed in Oregon.

PART 2 PRODUCTS

2.01 CONNECTION REQUIREMENT BY LOCATION AND STRUCTURAL MEMBER

A. Concrete Floor Slabs:
1. Conduits, pipe and ducts may be fastened to the grade slab with supports spaced in accordance with the requirements of Divisions 21, 22, 23, 26, 27 and 28.
2. For heavy building equipment (400 pounds or more), submit information on the following for review:
a. Weight
b. Dimensions
c. Center of gravity
d. Vibration criteria
e. Base connection details
3. The type of fastener to be used on the grade slab connections shall be either cast-in-place anchor bolts or wedge-anchors as specified below.
B. Suspended Ceilings: Support and brace in accordance with code and specified requirements.
C. Light Fixtures: In suspended ceilings, provide auxiliary supports to the structure in accordance with code requirements.
D. Maximum spacing of supports of equipment and systems suspended from underside of structure.

1. Provide gravity hangers or frames for conduit and pipes (copper or steel) running perpendicular to the joists or beams. Space the hangers as follows:

Pipe Size	Maximum Spacing
2-1/2-inch	11 feet
4-inch	14 feet
5-inch	16 feet
6-inch	16 feet
8-inch	14 feet
10-inch and over	Layout subject to approval of Architect

Note that sizes smaller than 2-1/2-inch shall be determined by analysis.

2. Provide gravity hangers at 10 feet maximum for ducts running perpendicular to joists and beams.
3. Pipes, conduits and ducts that are oriented parallel to joists or beams shall have vertical supports spaced at a maximum of 10 feet. Supports shall be attached to spreader beams connected to two or more joists as required by the Architect.
4. Lateral or transverse seismic sway bracing shall be provided at 20 feet maximum. It may be anchored at each girder that is oriented perpendicular to the pipe, conduit or duct. Location of the intermediate bracing between main girders lines shall be staggered to the individual runs and trades to avoid the concentration of loads on any individual joist or beam.
5. Longitudinal seismic bracing may be located at girders, with a maximum spacing of 40 feet on center and at ends, turns and bends with the same restriction as noted in paragraphs above.
6. Vertical Runs Between Floors: Provide tube or metal stud supports in accordance with requirements of this section. Connect to concrete floor or steel framing as noted in the General Guidelines for Connecting to Structure (below).

2.02 GENERAL GUIDELINES FOR CONNECTION TO STRUCTURE

A. Wedge-anchors (approved by ICC) may be used as attachments to the concrete slabs. For seismic design of the anchorage, a safety factor of 3 shall be used with the ultimate-rated capacity of the anchorage. For gravity load design at working stress, a safety factor of 5 shall be applied to the ultimate-rated capacity of the anchorage.

B. At suspended slabs, wedge-anchors shall be located at the thickened areas of slabs with metal deck.

C. Welded and bolted connections are not permitted to the main structural members (e.g., beams girders, columns, braces, etc.) except as noted in the following or by special approval:

1. Clip angles or plate angles may be welded to structural columns, girders and beams (flanges and webs) with 3/16-inch by 3-inch maximum fillet welds.
2. All bolted connections used to webs of steel shapes shall be verified by the Architect.

D. Clamps with positive grip or threaded fasteners may be used to attach to steel beam or girder webs. No "C" clamps are permitted.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00.

1. Installation of all wedge-anchors shall be performed under the continuous inspection of a certified inspector.
2. Field tests of the anchorage shall be performed by a licensed testing laboratory under the supervision of a certified inspector.

B. Field Tests:

1. A calibrated torque wrench shall be used to field test the installation of selected wedge anchorage. The wrench shall be calibrated by a licensed testing laboratory through

tensile tests on the wedge-anchors. In the field verification test, the wedge-anchors shall be torque-tested to 1/2 the ultimate pull-out capacity.

2. Fifty percent of the wedge-anchors shall be field tested if their design tensile load is more than 250 pounds. If the design tensile load is 250 pounds or less, 10 percent of the anchorages shall be field tested.
3. One percent of the wedge-anchors shall be field tested for withdrawal at 1-1/2 times the design loading.

END OF SECTION

SECTION 21 00 00
FIRE SUPPRESSION BASIC REQUIREMENTS

PART 1 - GENERAL

1.01 DESIGN-BUILD SUMMARY

A. Work included in 21 00 00 applies to Division 21, Fire Suppression work to provide materials, labor, tools, permits and incidentals to make fire suppression systems ready for Owner's use for proposed project.

1.02 DESIGN-BUILD INSTRUCTIONS

A. This document is issued to give Bidders a basis for preparing a proposal to design and install a complete Fire Suppression system for this project.

B. Alternates to this Document may be offered as a separate proposal.

1.03 DESIGN-BUILD APPROACH

A. Use this Specification for design/engineering requirements, workmanship and materials or construction. Utilize design-build concept throughout construction phase of project.

B. Investigate and be apprised of applicable codes, rules, and regulations as enforced by AHJ.

C. Visit the Site of the proposed construction. Verify and inspect the existing site to determine conditions that affect this work.

1.04 DESIGN-BUILD CRITERIA

A. Related Work Specified Elsewhere: Contents of Section apply to Division 21, Fire Suppression Specifications. Requirements of Section are a minimum for Division 21, Fire Suppression Sections, unless otherwise stated in each Section, in which case that Section's requirements take precedence.

B. Reference Basis of Design narrative document.

C. Fire Suppression Design Criteria: Refer to individual Division 21, Fire Suppression Sections for fire suppression system design criteria.

D. Fire Suppression Equipment: Refer to individual Division 21, Fire Suppression Sections for fire suppression equipment requirements.

1.05 SECTION INCLUDES

A. Work included in 21 00 00, Fire Suppression Basic Requirements applies to Division 21, Fire Suppression work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of fire protection systems for proposed project.

B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.

C. Definitions:

1. Provide: To furnish and install, complete and ready for intended use.
2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete Item of work furnished.
4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent," substitution requests must be submitted to Engineer for consideration,

in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted Item.

5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and other reviewing entity whose approval is required to obtain systems acceptance.

1.06 RELATED SECTIONS

A. Content of Section applies to Division 21, Fire Suppression Contract Documents.

B. Related Work:

1. Additional conditions apply to this Division including, but not limited to:
   a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
   b. Drawings
   c. Addenda
   d. Owner/Architect Agreement
   e. Owner/Contractor Agreement
   f. Codes, Standards, Public Ordinances and Permits

1.07 REFERENCES AND STANDARDS

A. References and Standards per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, individual Division 21, Fire Suppression Sections and those listed in this Section.

B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:

1. State of Oregon:
   a. OAR - Oregon Administrative Rules
   b. 2021 OESC - Oregon Electrical Specialty Code
   c. 2019 OFC - Oregon Fire Code
   d. 2019 OMSC - Oregon Mechanical Specialty Code
   e. 2021 OPSC - Oregon Plumbing Specialty Code
   f. 2019 OSSC - Oregon Structural Specialty Code
   g. 2021 OEESC - Oregon Energy Efficiency Specialty Code
   h. 2011 Oregon Elevator Specialty Code

C. Reference standards and guidelines include but are not limited to the latest adopted editions from:

1. ABA - Architectural Barriers Act
2. ADA - Americans with Disabilities Act
3. AHRI - Air-Conditioning Heating & Refrigeration Institute
4. ANSI - American National Standards Institute
5. ASCE - American Society of Civil Engineers
6. ASCE-7 Minimum Design Loads for Buildings and Other Structures
7. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers
8. ASHRAE Guideline 0, the Commissioning Process
9. ASME - American Society of Mechanical Engineers
10. ASPE - American Society of Plumbing Engineers
11. ASSE - American Society of Sanitary Engineering
12. ASTM - ASTM International
13. AWWA - American Water Works Association

14. CFR - Code of Federal Regulations
15. EPA - Environmental Protection Agency
16. ETL - Electrical Testing Laboratories
17. FCC - Federal Communications Commission
18. FM - FM Global
19. FM Global - FM Global Approval Guide
20. IAPMO - International Association of Plumbing and Mechanical Official
21. ICC - International Code Council
22. IEC - International Electrotechnical Commission
23. ICC-ESR - International Code Council Evaluation Service Reports
24. HI - Hydraulic Institute Standards
25. ISO - International Organization for Standardization
26. MSS - Manufacturers Standardization Society
27. NEC - National Electric Code
28. NEMA - National Electrical Manufacturers Association
29. NFPA - National Fire Protection Association:
    a. NFPA 13 - Standard for the Installation of Sprinkler Systems
    b. NFPA 24 - Standard for Installation of Private Fire Service Mains and Their Appurtenances
    c. NFPA 25 - Standard for Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
    d. NFPA 70 - National Electrical Code
    e. NFPA 72 - National Fire Alarm and Signaling Code
30. NRCA - National Roofing Contractors Association
31. NSF - National Sanitation Foundation
32. OSHA - Occupational Safety and Health Administration
33. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Inc.
34. TIMA - Thermal Insulation Manufacturers Association
35. UL - Underwriters Laboratories Inc.

D. See Division 21, Fire Suppression individual Sections for additional references.

1.08 SUBMITTALS

A. See Division 01, General Requirements for Submittal Procedures as well as specific individual Division 21, Fire Suppression sections.

B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.

C. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.

D. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail. For electronic format, provide one file per division containing one bookmarked PDF file with each bookmark corresponding to each Specification Section. Arrange bookmarks in ascending order of Specification Section number. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. Copy Architect on all transmissions/submissions.

E. Submit shop drawings and product data sheets as one complete stand-alone package to AHJ, Owner's insurance underwriter and Engineer.

F. Product Data: Provide Manufacturer's descriptive literature for products specified in Division 21, Fire Suppression Sections.

G. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.

1. Label submittal to match numbering/references as shown in Contract Documents. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed Item. Highlight connections by/to other trades.
2. Include technical data, installation instructions and dimensioned drawings for products, equipment and devices installed, furnished or provided. Reference Division 21, Fire Suppression specification Sections for specific Item required in product data submittal outside of these requirements.
3. Provide pump curves, operation characteristics, capacities, ambient noise criteria, etc. for equipment.
4. For vibration isolation of equipment, list make and model selected with operating load and deflection. Indicate frame type where required. Submit manufacturer's product data.
5. See Division 21, Fire Suppression Sections for additional submittal requirements outside of these requirements.

H. Maximum of two reviews provided of complete submittal package. Arrange for additional reviews and/or early review of long-lead items; bear costs of additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to Contractor without review.

I. Resubmission Requirements: Make corrections or changes in submittals as required, and in consideration of Engineer’s comments. Identify Engineer’s comments and provide an individual response to each of the Engineer’s comments. Cloud changes in the submittals and further identify changes which are in response to Engineer’s comments.

J. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-16 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.

K. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 21, Fire Suppression coordination documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical and Division 28, Electronic Safety submittals.

L. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.

M. Substitutions and Variation from Basis of Design:

1. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed

acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.

2. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals". For any product marked "or approved equivalent", a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.

N. Shop Drawings:

1. Provide coordinated Shop Drawings which include physical characteristics of all systems, equipment and piping layout, pipe layout, hanger layout, sway brace layout, seismic restraints, drains, location of drain discharge, risers, valves, details, physical device layout plans, and control wiring diagrams. Reference individual Division 21, Fire Suppression Sections for additional requirements for shop drawings outside of these requirements.
2. Shop Drawings and the like to be prepared under the direct supervision and control of a Professional Engineer competent to do such work and licensed in the state of Oregon. Drawings and calculations to bear the seal and wet signature of the Professional Engineer.
3. Provide Shop Drawings which indicate information required by NFPA 13. Include room names and fire sprinkler occupancy hazard classifications.
4. Utilizing the Reflected Ceiling backgrounds, provide Shop Drawings illustrating locations of fire sprinklers and piping.
5. Utilizing the Structural backgrounds, provide Shop Drawings illustrating locations and types of hangers and sway braces.
6. Provide Shop Drawings illustrating each type of hanger, including fasteners to structure.
7. Provide Shop Drawings illustrating each type of branchline restraint and sway brace, including length of sway brace member, sway brace fittings, minimum and maximum angles from vertical of sway brace member, method of attachment to structure, size, length and embedment of attachment to structure and size and type of structural member to which sway brace will be attached. Number each type of restraint and sway brace. Indicate on Drawings locations of each type of numbered restraint and sway brace.
8. Provide details for any hanger, attachment, or sway brace to be attached to any I-joist, structural insulated panels (SIPs), cross laminated timber, and similar engineered structural products according to the specifications of the engineered product manufacturer.
9. Provide Shop Drawings illustrating information for Sprinkler System General Information Sign.
10. Shop Drawings to include a cross-sectional view that shows the sprinkler heads and piping in relation to the building's architectural and structural information. View to be chosen based on a location that will display the most information.

11. When required, provide Coordination Drawings.
12. Provide Shop Drawings indicating access panel locations, size and elevation for approval prior to installation.
13. Provide details of hanger, sway bracing and branch line restraint attachments to structure and to piping. Include details on the size and load capacities of fasteners. Provide verification of the structural capacity to withstand seismic load.
14. Clearly indicate the elevation of the highest sprinkler in relation to the elevation of the flow test pressure gauge monitor hydrant.
15. Provide a schedule of signage to be installed at each flexible sprinkler hose fitting.
16. On the drawings, provide a list of number, model, temperature, sprinkler Identification number, manufacturer, orifice, deflector type, thermal sensitivity and pressure rating, quantity of each type to be contained in the spare sprinkler cabinet and the issue date or revision date of the list.
17. Spare sprinkler head cabinet size indicating the number of spare sprinkler head to be contained therein.

O. Samples: Provide samples when requested by individual Sections.

P. Resubmission Requirements:
1. Make any corrections or change in submittals when required. Provide submittals as specified. The Engineer will not be required to edit and/or interpret the Contractor's submittals. Indicate changes for the resubmittal in a cover letter with reference to page(s) changed and reference response to comment. Clearly indicate changes on Drawings and cloud changes in the submittals.
2. Resubmit for review until review indicates no exceptions taken or make "corrections as noted".

Q. Operation and Maintenance Manuals/Owner's Instructions:
1. Submit, at one time, electronic files (PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or Item requiring servicing. Include valve charts. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
   a. Include copies of certificates of code authority acceptance, code-required acceptance tests; test reports and certificates.
   b. Include Warranty per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Sections.
   c. Catalog description of each Item of equipment actually installed on job.
   d. Instructions for operation and maintenance of fire suppression systems composed of operating instructions, maintenance instructions and manufacturer's literature as follows:
      1) Testing and Maintenance Schedule Chart: Provide an 8-1/2- by 11-inch typewritten list of each item of installed equipment requiring testing inspection, lubrication or service, describing and scheduling performance of maintenance.
      2) Manufacturer's Literature: Provide copies of manufacturer's instructions for operation and maintenance of fire suppression equipment, including replacement parts list with name and address of nearest distributor. Mark each copy with equipment identification label as listed in equipment schedule, i.e. F-5 etc.
   e. Include product certificates of warranties and guarantees.

f. Include Record Drawings.
g. Include Contractor’s Material and Test Certificates for Aboveground Piping/Underground Piping.
h. Include a copy of NFPA 25.
i. Include a copy of valve charts and whether normally open or normally closed.
j. Include a copy of drain, auxiliary, and low point drains charts.
k. Include a copy of the list to be included in the spare sprinkler head box.
l. Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.
m. Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, and quantities relevant to each piece of equipment: i.e. belts, motors, lubricants, and filters.
n. Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub-assemblies.
o. Include copy of startup and test reports specific to each piece of equipment.
p. Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.

2. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 21 00 00, Fire Suppression Basic Requirements, Article titled "Demonstration".
3. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

R. Record Drawings:
1. Maintain at site at least one set of Drawings for recording “As-constructed” conditions. Indicate on Drawings changes to original documents by referencing revision document, and include buried elements, location of cleanouts, and location of concealed mechanical Item. Include items changed by field orders, supplemental instructions, and constructed conditions.
2. Record Drawings are to include equipment and fixture/connection schedules that accurately reflect "as constructed or installed" for project.
3. At completion of project, input changes to original project on CAD Drawings and make one set of black-line drawings created from CAD Files in version/release equal to contract drawings. Submit CAD Files and drawings upon substantial completion.
4. Invert elevations and dimensioned locations for water services and drainage piping below grade extending to 5-feet outside building line.
5. Record Drawings to include site information or reference site information for complete understanding of the fire protection system between the building and the point of connection to the water supply and location of flow test pressure hydrants.

6. See Division 21, Fire Suppression individual Sections for additional items to include in Record Drawings.

1.09 QUALITY ASSURANCE

A. Regulatory Requirements: Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

B. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.

C. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. They are not intended to show every Item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., piping) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.

D. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.

E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.

F. Provide products that are UL listed.

G. Piping Insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.

1.10 WARRANTY

A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty under Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

1.11 COORDINATION DOCUMENTS

A. Prior to construction, prepare and submit coordinated layout drawings (composite drawings), to coordinate installation and location of ductwork, grilles, diffusers, piping, fire sprinklers, fire alarm, plumbing, cable trays, lights, and electrical services. Composite Drawings show services on single sheet. Key Drawings to structural column identification system. Prior to completion of Drawings, coordinate proposed installation with architectural and structural requirements, and other trades (including plumbing, HVAC, electrical, fire alarm ceiling suspension and tile systems, etc.), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling and finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.

B. Prepare Drawings as follows:
   1. Provide drawings in CAD Format. CAD format release equal to design documents. Drawings to be same sheet size and scale as Contract Drawings and indicate location, size and elevation above finished floor of equipment and distribution systems.
   2. Review and revise, as necessary, section cuts in Contract Drawings after verification of field conditions.
   3. Indicate fire protection system piping including fittings, hangers, access panels, valves, and bottom of pipe elevations above finished floor.
   4. Indicate inverts and provision for piping that must be graded to have right-of-way over more flexible Item. Drawings also to indicate proposed ceiling grid and lighting layout as shown on electrical drawings, architectural reflected ceiling drawings and HVAC equipment, ductwork and piping. Drawings to indicate proposed and identified structural members to which hangers and sway braces will be attached as shown on structural drawings.
   5. Incorporate Addenda Item and change orders.
   6. Provide additional coordination as requested by other trades.

C. Advise Architect in event conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise AArchitect of conflict.

D. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer, including but not limited to sprinkler heads, pipe, fittings, hangers and bracing materials.

2.02 STANDARDS OF MATERIALS AND WORKMANSHIP

A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL, ETL, FM, and ICC-ES listed and labeled for their intended fire protection function or be approved by State, County, and City authorities prior to procurement and installation.

B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

C. Hazardous Materials:
   1. Comply with local, State of Oregon, and Federal regulations relating to hazardous materials.
   2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.
   3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

PART 3 - EXECUTION

3.01 ACCESSIBILITY AND INSTALLATION

A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Install equipment requiring access (i.e. drains, control operators, valves, motors, engines, pumps, controllers, air compressors, gauges, fill cups, tanks, cleanouts and the like) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.

C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing, and coordination with other trades and disciplines.

D. Earthwork:
   1. Confirm Earthwork requirements in Contract Documents. In absence of specific requirements, comply with the following:
      a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with the provisions specified. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.
      b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.
      c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.

E. Firestopping:
   1. Confirm Firestopping requirements in Division 07, Thermal and Moisture Protection.
   2. In absence of specific requirements, comply with individual Division 21, Fire Suppression Sections and coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping, ductwork and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM International E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

F. Pipe Installation:
   1. Provide installation of piping systems coordinated to account for expansion and contraction of piping materials and building as well as anticipated settlement or shrinkage of building. Install work to prevent damage to piping, equipment, and building and its contents. Provide piping offsets, loops, expansion joints, sleeves, anchors or other means to control pipe movement and minimize forces on piping. Verify anticipated settlement and/or shrinkage of building with Project Structural Engineer. Verify construction phasing, type of building construction products and rating coordinating installation of piping systems.
   2. Include provisions for servicing and removal of equipment without dismantling piping.

G. Plenums: Provide plenum rated materials that meet the requirements to be installed in plenums. Immediately notify Architect/Engineer of discrepancy.

3.02 SEISMIC CONTROL

A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 21, Fire Suppression Sections.

B. Provide fire suppression equipment and piping, both hanging and base mounted, with mounting connection points of sufficient strength to resist lateral seismic forces equal to lateral seismic forces as determined by building code and NFPA 13 calculations, whichever is more demanding.

C. See Structural Drawings for seismic design criteria for sway bracing and seismic restraint.

D. Earthquake resistant designs for Fire Protection (Division 21) equipment and distribution, i.e. fire sprinkler systems, fire standpipe systems, fire pumps, fire pump controllers, fire tanks, clean agent fire suppression systems, etc. to conform to regulations of jurisdiction having authority.

E. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.

F. Provide stamped Shop Drawings from licensed Engineer of seismic bracing and seismic movement assemblies for piping, equipment, tanks, pumps controllers and the like. Submit shop drawings along with equipment submittals.

G. Provide stamped Shop Drawings from licensed Engineer of seismic flexible joints for piping and crossing building expansion or seismic joints. Submit Shop Drawings along with seismic bracing details.

H. Provide details of flexible drops for sprinklers in conformance with Building Code and ASCE-7 requirements of ceilings. Coordinate with Architectural and Structural Drawings and Specifications.

I. Piping: Per NFPA 13, ASCE-7 and local requirements.

J. Equipment:

1. Per "Seismic Restraints Manual Guidelines for Mechanical Systems" latest edition published by SMACNA, ASCE 7 and local requirements.
2. Provide means to prohibit excessive motion of fire protection equipment during an earthquake.

3.03 REVIEW AND OBSERVATION

A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:

1. Underground piping installation prior to backfilling.
2. Prior to covering walls.
3. Prior to ceiling cover/installation.
4. When main systems, or portions of, are being tested and ready for inspection by AHJ.
5. When mains or branchlines are to be permanently concealed by construction or insulation systems.
6. When fire suppression systems, or portions of, are being tested and ready for inspection by AHJ.

C. Bear responsibility and cost to make piping accessible, to expose concealed lines, or to demonstrate acceptability of the system. If Contractor fails to notify Architect at times prescribed above, costs incurred by removal of such work are the responsibility of the Contractor.

D. Final Punch: Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

3.04 CONTINUITY OF SERVICE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 21, Fire Suppression Sections and the following:

1. During remodeling or addition to existing structures, while existing structure is occupied, current services to remain intact until new construction, facilities or equipment is installed.
2. Prior to changing over to new service, verify that every Item is thoroughly prepared. Install new piping, and wiring to point of connection.
3. Coordinate transfer time to new service with Owner. If required, perform transfer during off peak hours. Once changeover is started, pursue to its completion to keep interference at a minimum. If overtime is required, there will be no allowance made by Owner for extra expense for such overtime or shift work.
4. During entire time system, or part thereof, is not operational, provide a firewatch per Fire Code, including a watchperson whose sole duty is to watch for and report fires.
5. Organize work to minimize duration of power interruption.

3.05 CUTTING AND PATCHING

A. Confirm Cutting and Patching requirements in Division 01, General Requirements. In absence of specific requirements, comply with individual Division 21, Fire Suppression Sections and the following:

1. Cutting and patching performed under Division 21, Fire Suppression includes, but is not limited to:
   a. Cutting and patching of plaster or partitions.
   b. Cutting and patching of finished ceilings.
2. Perform cutting and patching by skilled craftsmen in trade of work to be performed. Fill holes which are cut oversized for completed work. Match refinished areas with existing adjacent finish in a manner acceptable to Architect.
3. When masonry to concrete construction must be penetrated, provide a steel pipe sleeve in opening and grout in place in a neat manner. Leave grout surface to match existing finish. Provide escutcheons. If sleeves are not provided, core drill penetrations.
4. Locate concealed utilities to eliminate possible service interruption or damage.
5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.
6. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
7. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftspeople of each respective trade in conformance with appropriate Division of Work.

8. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
9. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, landscaping, paving, and walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.
10. Repair mutilation of building around pipes, equipment, hangers, and braces.

3.06 EQUIPMENT SELECTION AND SERVICEABILITY

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing at no additional cost to Owner.

3.07 DELIVERY, STORAGE AND HANDLING

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 21, Fire Suppression Sections and the following:
1. Handle materials delivered to project site with care to avoid damage and deterioration. Store materials in original containers which identify manufacturer, name, brand and model numbers on site inside building or protected from weather, sun, dirt and construction dust. Insulation and lining that becomes wet from improper storage and handling to be replaced before installation. Products and/or materials that become damaged due to water, dirt and/or dust as a result of improper storage to be replaced before installation.
2. Protect equipment and pipe to avoid damage. Close pipe openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.
3. Protect bright finished shafts, bearing housings and similar items until in service.

3.08 DEMONSTRATION

A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Upon completion of work and adjustment of equipment and test systems, demonstrate to Owner's Authorized Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

D. Prior to acceptance of work and during time designated by Architect, provide necessary qualified personnel to operate system for a period of two hours.

E. Instruct the Owner in the operation of the sprinkler system, including main valve position (open or closed) recognition, system drainage, system testing, dry pipe valve reset and the relation to the fire alarm system.

F. Upon completion of work and adjustment of equipment, test systems to demonstrate to Owner's Authorized Representative and Architect that equipment is furnished and installed or connected under provisions of these Specifications.

3.09 CLEANING

A. Confirm Cleaning requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Upon completion of installation, except for sprinklers, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

C. Sprinklers may not be cleaned except for vacuuming in a manner in which no part of the sprinkler is touched by the vacuuming equipment. Replace sprinklers which bear traces of foreign substances with sprinklers of same model, temperature, K-factor, orifice, finish, style, orientation, and the like.

3.10 INSTALLATION

A. Confirm Installation requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Install equipment in accordance with manufacturer's installation instructions, plumb and level and firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.

C. Start-up equipment, in accordance with manufacturer's start-up instructions, in the presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment. Provide pump impellers to obtain Basis of Design design capacities.

D. Provide miscellaneous supports/metals required for installation of equipment and piping.

3.11 PAINTING

A. Confirm requirements in Division 01, General Requirements and Division 09, Finishes. In absence of specific requirements, comply with individual Division 21, Fire Suppression Sections and the following:

1. Ferrous Metal: After completion of fire protection work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces, i.e., hangers, hanger rods, equipment stands, with one coat of black asphalt varnish for exterior or black enamel for interior, suitable for hot surfaces.
2. After acceptance by Authority Having Jurisdiction (AHJ), in a mechanical room, on roof or other exposed areas, machinery and equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
3. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
4. Piping: Clean, primer coat and paint exposed piping on roof or at other exterior locations with two coats paint suitable for metallic surfaces and exterior exposures. Color selected by Architect.
5. Covers: Covers such as vault covers and the like will be furnished with finishes which resist corrosion and rust.

3.12 DEMOLITION

A. Confirm Demolition requirements in Division 01, General Requirements and Division 02, Existing Conditions. In absence of specific requirements, comply with individual Sections in Division 21, Fire Suppression and the following:

1. Scope:
   a. It is the intent of these documents to provide necessary information and adjustments to fire protection system required to meet code, and accommodate installation of new work.
   b. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas.
   c. Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to exactly locate and preserve underground utilities. Replace damaged Item with new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.
2. Equipment and Piping: Unless otherwise directed, equipment, piping, or fittings being removed as part of demolition process are Owner's property. Remove other Item not scheduled to be reused or relocated from job site as directed by Owner.
3. Unless specifically indicated on Drawings, remove exposed, unused piping to behind finished surfaces (floor, walls, ceilings, etc.). Cap piping and patch surfaces to match surrounding finish.
4. Unless specifically indicated on Drawings, remove unused equipment, fittings, rough-ins, and connectors. Removal is to be to a point behind finished surfaces (floors, walls, and ceilings).
5. Coordinate demolition of existing fire suppression systems with Contractor. Where applicable or possible, portions of fire suppression demolition work may be performed by Contractor. Verify with local AHJ as to limitations of demolition by others and not fire suppression trades. Coordinate extent of demolition of fire suppression work to be done by others and supervise this work. No extra costs will be approved by replacement of systems due to improper or excessive demolition.

3.13 ACCEPTANCE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Sections in Division 21, Fire Suppression and the following:

1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
   a. Testing reports including Contractor's Material and Test Certificate for Underground Piping, Contractor's Material and Test Certificate for Aboveground Piping, Contractor's Material and Test Certificate for Private Fire Service Mains, Fire pump acceptance test data report, and the like.
   b. Cleaning
   c. Operation and Maintenance Manuals
   d. Training of Operating Personnel
   e. Record Drawings
   f. Warranty and Guaranty Certificates
   g. Start-up/Test Document and Commissioning Reports
   h. Letter of Conformance

3.14 FIELD QUALITY CONTROL

A. Confirm Field Quality Control requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Upon completion of installation of equipment, sprinklers, hose valves and piping and after units are water pressurized, test system to demonstrate capability and compliance with requirements. When possible, correct malfunctioning items at site, then retest to demonstrate compliance; otherwise remove and replace with new Item and proceed with retesting.

C. Inspect each installed Item for damage to finish. If feasible, restore and match finish to original, except fire sprinklers, at site; otherwise, remove Item and replace with new Item. Feasibility and match to be judged by Architect. Remove cracked or dented Item and replace with new Item.

D. Fire sprinklers may not be reused, or cleaned, except for dusting. Replace damaged, field painted, oversprayed, overcoated or field coated sprinklers with new sprinklers of same manufacturer, model, finish, K-factor and performance characteristics. Where identical replacement sprinklers are not available, provide sprinklers of similar finish, style, K-factor and performance characteristics.

3.15 LETTER OF CONFORMANCE

A. Provide Letter of Conformance and copies of manufacturers' warranties and extended warranties with a statement that fire suppression items were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include Letter of Conformance, copies of manufacturers' warranties and extended warranties in Operation and Maintenance Manuals.

3.16 ELECTRICAL INTERLOCKS

A. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize fire protection equipment wiring diagrams to coordinate with electrical systems so that proper wiring of equipment involved is affected.

3.17 CONNECTIONS TO EXISTING

A. Prior to connection of piping to existing piping or utilities, field verify existing conditions and exact sizes and locations of existing piping. Provide additional offsets, transitions, joints, cut-ins, and replace portions of existing as required to facilitate connections of new.

END OF SECTION

SECTION 21 05 00
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Aboveground Black Steel Pipe and Fittings
   2. Wall and Floor Penetrations and Sleeves
   3. Switches, Valve Supervisory
   4. Switches, Water Detector
   5. Hangers and Supports
   6. Struts and Strut Clamps
   7. Restraints
   8. Seismic Separation Assembly
   9. Anchors and Attachments
   10. Valves
   11. Pipe, Valve, and Fire Protection Equipment Identification
   12. Signs
   13. Drains

1.02 RELATED SECTIONS

A. Contents of Division 21, Fire Suppression and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:
   1. Division 22, Plumbing
   2. Division 23, Heating, Ventilating and Air Conditioning
   3. Division 26, Electrical
   4. Division 28, Electronic Safety and Security
   5. Division 31, Earthwork
   6. Section 21 00 00, Fire Suppression Basic Requirements
   7. Section 21 13 00, Fire Suppression Sprinkler Systems

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

B. Meet requirements of ASCE 7, Minimum Design Loads for Buildings and Other Structures, by American Society of Civil Engineers, latest adopted edition.

1.04 SUBMITTALS

A. Submittals as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Material and Equipment: Listed for its intended fire protection use in current UL Fire Protection Equipment Directory, or UL Online Certifications Directory for Fire Protection, FM Global Approval Guide, and International Code Council Evaluation Service Reports. All material and equipment to be new and from a current manufacturer.
   2. Provide per AHJ requirements.

3. References to product Specifications for materials are listed according to accepted ANSI, ASTM, ASME, AWWA and other base standards. Materials to meet latest approved versions of these standards.
4. Fire Suppression Screw-Thread Connections: Comply with local fire department/fire marshal regulations for sizes, threading and arrangement of connections for fire department equipment to fire department connections.
5. Manufacturers: Unless an item is marked "No substitutions", submit substitution request for materials of other than named manufacturers.
6. Noise and Vibration:
   a. Install vibration isolators and measures required to prevent noise and vibration from being transmitted to occupied areas. Select equipment to operate within noise coefficient (NC) design level for particular type of installation in relation to its location.
   b. After installation, make proper adjustments to reduce noise and vibration to acceptable levels as defined by Architect.
   c. In acoustically sensitive areas, design system in a manner that minimizes the number of wall penetrations.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.07 SYSTEM IMPAIRMENT

A. When returning a water-based fire protection system to service after impairment or control valve closure, verify the system is in working order by performing a main drain test per NFPA 25.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Aboveground Black Steel Pipe and Fittings:
   1. Pipe:
      a. Bull Moose Tube
      b. Wheatland Tube Co.
      c. Youngstown Tube Co.
      d. Tex-Tube Co.
      e. State Pipe and Supply, Inc.
      f. Or approved equivalent
   2. Fittings, Mechanical and Grooved Couplings:
      a. Victaulic
      b. Gruvlok
      c. Shurjoint Piping Products Inc.
      d. Smith-Cooper International
      e. Tyco Fire & Building Products
      f. Viking Corp.
      g. Allied Rubber and Gasket Co. Inc., dba ARGCO
      h. Anvil International
      i. Dixon Valve & Coupling
      j. Or approved equivalent.
   3. Fittings, Threaded:
      a. Ward Mfg.
      b. Anvil International

c. Smith-Cooper International
d. Aegis Technologies
e. Or approved equivalent.

4. Fittings, Rubber Gasketed:
a. Victaulic
b. Anvil International
c. AnvilStar
d. EBAA Iron, Inc.
e. Shurjoint Piping Products, Inc.
f. Smith-Cooper International
g. Tyco Fire & Building Products
h. Viking Corp.
i. Ward Mfg.
j. Allied Rubber and Gasket Co. Inc., dba ARGCO
k. Dixon Valve & Coupling
l. Or approved equivalent.

5. Fittings, Welded:
a. Anvil International
b. Shurjoint Piping Products Inc.
c. Smith-Cooper International
d. State Pipe & Supply, Inc.
e. Or approved equivalent.

6. Fittings, Flanged:
a. Victaulic
b. United Brand Fittings
c. U.S. Pipe
d. Anvil S.P.F.
e. Iowa Fittings Co.
f. Tyco Fire Products
g. Or approved equivalent.

B. Wall and Floor Penetrations and Sleeves:
1. Allied Rubber and Gasket Co., Inc., dba ARGCO
2. Fire Protection Products Inc. (FPPI)
3. Or approved equivalent.

C. Switches, Valve Supervisory:
1. Potter Electric Signal Co.
2. System Sensor
3. Or approved equivalent.

D. Switches, Water Detector:
1. Water Flow Switches:
a. Wet Sprinkler Systems:
1) Potter Electric Signal Co.
2) System Sensor
3) Or approved equivalent.

2. Pressure Operated Alarm Switches:
a. Dry Pipe Sprinkler Systems:
1) Detection of Water Flow:
(a) Potter Electric Signal Co.
(b) System Sensor

(c) Or approved equivalent.

2) Detection of Low Pressure:

(a) Potter Electric Signal Co.

(b) System Sensor

(c) Or approved equivalent.

E. Hangers and Supports:

1. Cooper B-Line Tolco
2. Anvil International
3. ITW Buildex Sammys
4. Erico International
5. PHD Mfg. Inc.
6. Or approved equivalent.

F. Struts and Strut Clamps:

1. Cooper B-Line Tolco
2. Or approved equivalent.

G. Restraints:

1. Cooper B-Line Tolco
2. Anvil International
3. Erico International
4. PHD Mfg. Inc.
5. Or approved equivalent.

H. Seismic Separation Assembly:

1. Metraflex Fireloop
2. Anvil International
3. Unisource Mfg. Inc.
4. Mason Industries
5. Twin Cities Hose
6. Or approved equivalent.

I. Anchors and Attachments:

1. Concrete:

a. Cast-In Place Anchors for Hangers:

1) Cooper B-Line Tolco
2) Erico International
3) Or approved equivalent.

b. Cast-In Place Anchors for Braces:

1) Cooper B-Line Tolco
2) Anvil International
3) Erico International
4) Or approved equivalent.

c. Attachments as specified or described by structural. If not specified or described by structural, then as follows:

1) Hilti
2) Powers
3) Simpson Strong-Tie
4) DeWalt
5) Or approved equivalent.

2. Wood:

a. Cooper B-Line Tolco

b. Anvil International

c. Elco Construction Products
d. Erico International
e. ITW Buildex Sammys
f. Or approved equivalent.

3. Steel:
a. Cooper B-Line Tolco
b. Anvil International
c. Elco Construction Products
d. Erico International
e. ITW Buildex Sammys
f. Or approved equivalent.

J. Valves:
1. OS&Y Gate:
a. Victaulic
b. Nibco
c. Mueller
d. Or approved equivalent.

2. NRS Gate:
a. Nibco
b. Mueller
c. Victaulic
d. Or approved equivalent.

3. Swing Check:
a. Victaulic
b. Nibco
c. Mueller
d. Viking
e. Tyco
f. AnvilStar
g. Reliable
h. Or approved equivalent.

4. Wafer Check:
a. Nibco
b. Mueller
c. Viking
d. Tyco
e. Or approved equivalent.

5. Butterfly Valves:
a. Victaulic
b. Nibco
c. Tyco
d. Use lug body next to pumps; Nibco.
e. Reliable
f. Or approved equivalent.

6. Pressure Relief:
a. Watts
b. United Brass Works
c. AGF
d. Or approved equivalent.

7. Automatic Ball Drip Drain Valve:
   a. Tyco
   b. Reliable Automatic Sprinkler Co.
   c. Or approved equivalent.
8. Three-Way Gauge Valve:
   a. Fire Protection Products Inc. (FPPI)
   b. AGF Mfg. Inc.
   c. Nibco
   d. Or approved equivalent.
9. Automatic Air Release Valve:
   a. Potter Electric Signal Co.
   b. Or approved equivalent.
10. Ball Valve:
   a. Victaulic
   b. Apollo Valves
   c. Fire Protection Products Inc. (FPPI)
   d. Nibco
   e. Or approved equivalent.

K. Pipe, Valve, and Fire Protection Equipment Identification:
   1. Fire Protection Products, Inc. (FPPI)
   2. Allied Rubber and Gasket Co., Inc., dba ARGCO
   3. Or approved equivalent.

L. Signs:
   1. Tyco Fire Products
   2. Reliable Automatic Sprinkler
   3. Viking Corp.
   4. Allied Rubber and Gasket Co., Inc., dba ARGCO
   5. Or approved equivalent.

M. Drains:
   1. Reference Aboveground Black Steel Pipe and Fittings.
   2. AGF
   3. Victaulic
   4. Or approved equivalent.

2.02 ABOVEGROUND BLACK STEEL PIPE AND FITTINGS

A. Wet Pipe Systems:
   1. Pipe Size 2-inch Diameter and Smaller: ASTM A53, ASTM A135, or ASTM A795; minimum of Schedule 40 when installed with threaded fittings, minimum Schedule 10 when installed with grooved fittings.
   2. Pipe Size 2-1/2-inch Diameter and Larger: ASTM A53, ASTM A135, or ASTM A795; minimum of Schedule 10.
   3. Exposed pipe 8-feet or less above finished floor: A minimum of Schedule 40.

B. Dry Pipe Systems:
   1. Pipe Size 2-inch Diameter and Smaller: ASTM A53, ASTM A135, or ASTM A795; minimum of Schedule 40 when installed with threaded fittings, minimum Schedule 10 when installed with grooved fittings.
   2. Pipe Size 2-1/2-inch Diameter and Larger: ASTM A53, ASTM A135, or ASTM A795; minimum of Schedule 10.

C. Joints:
   1. Threaded, flanged or bevel welded.

2. Piping installed in plenums or shafts to have welded joints.

D. Fittings:
1. Threaded:
a. Malleable Iron: Class 150 and Class 300, ANSI B16.3.
b. Cast Iron: Class 125 and 250, ANSI B16.3.
2. Flanged:
a. Cast iron; Class 125 and 250, ASME B16.1.
b. Raised ground face, bolt holes spot faced.
3. Welded:
a. Carbon Steel: Long radius, standard weight or extra strong.
b. Factory Wrought Steel Buttweld Fittings: ASME B16.9.
c. Buttwelding Ends for Pipe, Valves, Flanges and Fittings: ASME B16.25.
d. Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures: ASTM A234.
e. Steel Pipe Flanges and Flanged Fittings: ASME B16.5.
f. Forged Steel Fittings, Socket Welded and Threaded: ASME B16.11.
4. Mechanical Fittings and Grooved Couplings:
a. Couplings: UL 213, AWWA C606, ASTM A536 ductile iron or ASTM A47 malleable iron, with enamel finish and grooves or shoulders designed to accept grooved couplings. Synthetic-rubber gasket with central-cavity, pressure-responsive design and ASTM A183 carbon-steel bolts and nuts.
b. FM Global approved.

E. Anti-Microbial Coating: Factory-applied coating to inhibit corrosion from microbiological organisms.

2.03 WALL AND FLOOR PENETRATIONS AND SLEEVES

A. Below Grade and High Water Table Areas: Waterproof elastomeric compound.

2.04 SWITCHES, VALVE SUPERVISORY

A. Provide to mount on applicable, compatible valve (OS&Y gate, or PIV), with SPDT switches to match requirements of fire alarm system. Provide with cover tamper switch where required by AHJ.

2.05 SWITCHES, WATER DETECTOR

A. Provide with cover tamper switch where required by AHJ.

B. Water Flow Switches:
1. Vane-type; SPDT switches; electronic retard, adjustable time delay (0 to 75 seconds).
2. Wet Sprinkler Systems: 450 PSI, 18-feet per second, 4-10 gpm.

C. Pressure Operated Alarm Switches: Pressure actuated with SPDT electrical switches and adjustable time delay (0 to 75 seconds).

2.06 HANGERS AND SUPPORTS

A. General: Select size of hangers and supports to exactly fit pipe size for bare piping.

B. Hangers: Ferrous.

C. Hanger Rods: Zinc electroplated carbon steel.

D. Finishes: Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

E. Materials:
1. Use carbon steel pipe hangers and supports, metal trapeze pipe hangers and attachments for general service applications.

2. Use stainless steel hangers, rods and attachments for corrosive environment applications. Examples of corrosive environment applications include, but are not limited to: swimming pools and spas, pool and spa equipment rooms and adjacent areas, chemical rooms, kidney dialysis areas, marine and beach environments, commercial laundries and the like.

2.07 STRUTS AND STRUT CLAMPS

A. Electro-galvanized steel.

B. Designed for supporting pipe runs from strut supports.

C. Stainless steel for corrosive environment applications. Examples of corrosive environment applications include, but are not limited to: swimming pools and spas, pool and spa equipment rooms and adjacent areas, chemical rooms, kidney dialysis areas, marine and beach environments, commercial laundries and the like.

2.08 RESTRAINTS

A. From a single manufacturer.

B. Stainless steel for corrosive environment applications. Examples of corrosive environment applications include, but are not limited to: swimming pools and spas, pool and spa equipment rooms and adjacent areas, chemical rooms, kidney dialysis areas, marine and beach environments, commercial laundries, and the like.

2.09 SEISMIC SEPARATION ASSEMBLY

A. Flexible expansion loop, designed for seismic movement for sprinkler pipe passing through or crossing building seismic joints. Impart no thrust loads to building structure.

B. Two flexible sections of hose and braid, two 90 degree elbows and 180 degree return. Factory supplied, center support nut located at the bottom of the 180 degree return, drain/air release plug. Provide materials of construction and end fitting type consistent with pipe material and equipment/pipe connection fittings.

2.10 ANCHORS AND ATTACHMENTS

A. General: Anchor supports to masonry, concrete and block walls per anchoring system manufacturer's recommendations, or as modified by project Structural Engineer.

B. Materials:

1. Ferrous.
2. Stainless steel for corrosive environment applications. Examples of corrosive environment applications include, but are not limited to: swimming pools and spas, pool and spa equipment rooms and adjacent areas, chemical rooms, kidney dialysis areas, marine and beach environments, commercial laundries, and the like.

C. Cast in Place Anchors for Hangers: Verify listing is for hangers, braces, or both.

D. Attachments in Concrete:

1. Suitable for hanging and bracing fire protection systems in concrete which is subject to cracking in a seismic event.
2. Seismic Design Areas C, D, E and F:
   a. Compatible with International Code Council Evaluation Service Acceptance Criteria AC-193 and AC308 for expansion, screw and adhesive anchors. Meet requirements of ACI 355.2, Qualification of Post-Installed Mechanical Anchors in Concrete and Commentary.
   b. All models of Hilti HDI and ITW Red Head Multi-Set II anchors are not approved for attaching fire protection systems in Seismic Design Areas C, D, E and F. No Exceptions.

E. ITW Buildex Sammys with FM Approval only are not allowed in certain seismic zones. Verify with FM that FM Approval is effective in project's seismic zone.

2.11 VALVES

A. OS&Y Gate:
   1. 2-1/2-inches and Larger: Iron body.
   2. 2-inches and Smaller: Bronze body.

B. NRS Gate:
   1. Iron body. Non-rising stem with indicator post.
   2. Underground Butterfly Valves: Telescopic barrel type.

C. Swing Check: Iron body, rubber and bronze faced checks.

D. Wafer Check: Iron body, rubber seat, spring actuated.

E. Butterfly Valves: Ductile iron body with factory-installed tamper switches. Use lug body next to pumps.

F. Pressure Relief: Bronze body, stainless steel spring.

G. Automatic Ball Drip Drain Valve: Bronze, spring-type.

H. Three-Way Gauge Valve: Brass; rated to 300 psi.

I. Automatic Air-Release Valve for Wet Systems:
   1. Rated to 175 psi.
   2. Automatic float-type with shutoff mounted in a water retention pan.
   3. Single set 24VAC@2A for electronic supervision.
   4. Ball valve switch with cover tamper.

J. Ball Valves: Brass body, brass stem; forged brass ball disc.

2.12 PIPE, VALVE, AND FIRE PROTECTION EQUIPMENT IDENTIFICATION

A. Engraved plastic laminate or corrosion resistant metal sign or plastic equipment marker.

B. Corrosion-resistant chain or permanent adhesive.

2.13 SIGNS

A. Engraved plastic laminate or corrosion resistant metal sign or plastic equipment marker.

B. Corrosion-resistant chain or permanent adhesive.

2.14 DRAINS

A. Reference Aboveground Black Steel Pipe and Fittings.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install in conformance with UL Listing, FM Approval or ICC-ES requirements and restrictions.

3.02 ABOVEGROUND BLACK STEEL PIPE AND FITTINGS

A. Piping Routing:
   1. Orient horizontal routes parallel with walls and beam lines.
   2. Install piping as shown or described by diagrams, details and notations on Drawings or, if not indicated, install piping to provide the shortest route which does not obstruct usable space or block access for servicing the building and its equipment.
   3. Install piping in concealed spaces above finished ceilings. Prior to design and installation. obtain pre-approval by Architect for exposed piping.
   4. In open-to-structure areas which are open to public view, route exposed piping to minimize visual impact. Obtain Architect's and Engineer's approval of exposed piping installation.
   5. Coordinate installation with other trades. Route piping as required to avoid building structure, equipment, plumbing piping, HVAC piping, ductwork, lighting fixtures, electrical conduits and bus ducts and similar work. Final location of lighting will have

priority over final sprinkler locations. Provide drains to trapped sections of system which result from such routing. Other trades take precedence for installation space.

6. Support piping adjacent to walls, overhead construction, columns and other structural and permanent enclosure elements of the building. Limit clearance to 2-inches wherever furring is indicated for concealment of piping. Allow for insulation thickness. Locate insulated piping to provide minimum 1-inch clearance outside insulation.
7. Wherever possible in finished and occupied spaces, conceal piping from view by locating within column or beam enclosures, hollow wall construction, or above suspended ceilings. Do not encase horizontal routes in solid partitions, except where approved.
8. General Electrical Equipment Clearances: Do not route piping through electrical rooms, transformer vaults, elevator equipment rooms and other electrical or electronic equipment spaces and enclosures. Do not route piping above electric power or lighting panel, switchgear, low voltage panel, or similar electric device.
9. Rooms Protected by Alternative Systems: Route water filled and dry system piping around rooms protected by pre-action systems, clean agent systems, gaseous suppression systems and other alternative fire suppression systems.
10. Install pipe runs to minimize obstruction to other work.
11. Pitch all dry and pre-action system piping 1/4-inch per 10-feet for mains and 1/2-inch per 10-feet for branch lines, including pipe passing through both warm and cold areas.

B. Couplings:
1. Install where indicated on Drawings and on each side of pieces of equipment to permit easy removal of equipment.
2. Deburr cut edges.

C. Pipe Penetrations: Wire pipe cutout coupon at point of pipe penetration.

D. Pipe and Pipe Fittings:
1. Expansion and Flexibility: Install work with due regard for expansion and contraction to prevent damage to the piping, equipment, building and its contents. Provide piping offsets, loops, approved type expansion joints, sway bracing, wire restraints, vertical restraints, flexible couplings or other means to control pipe movement and to minimize pipe forces.
2. Coordinate support of pipe 4-inches and larger with Structural Engineer.
3. Provide clearances around piping per NFPA 13.
4. Install dry and pre-action welded pipe with welds facing vertically up, or where this is not possible, as close as possible to vertical between 46 degrees and 234 degrees. Intent is to minimize corrosion caused by moisture in the bottom of pipes.

3.03 WALL AND FLOOR PENETRATIONS AND SLEEVES

A. Escutcheons: Install on exposed pipes passing through walls or floors.
1. Pipe Sleeves: Lay out work in advance of pouring concrete and furnish and set sleeves necessary to complete work.
2. Floor Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Extend sleeve 1-inch above finished floor. Caulk pipes passing through floor with nonshrinking fire and water resistant grout or approved equivalent caulking compound. Caulk/seal piping penetrations through fire rated building walls and floors with listed, fire-rated assemblies. Provide fire-rated assemblies per local AHJ requirements.

3. Wall Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Provide sleeve flush with finished face of wall. Caulk pipes passing through walls with non-shrinking caulking compound. Caulk/seal piping penetrations through fire rated building walls and floors with listed, fire-rated assemblies. Provide fire-rated assemblies per local AHJ requirements.
4. Beam Sleeves:
   a. Coordinate with trades for locations of pipe sleeves in reinforced concrete and steel beams. Penetrations must be indicated on structural shop drawings. See Drawings and Specifications for specific sleeve location limitations. Pipe sleeve locations must be indicated on reinforced concrete and steel beam shop drawings.
   b. Field cutting of beams not allowed without written approval of structural engineer. No extra costs allowed for failure to coordinate beam penetrations prior to reinforced concrete and steel beam shop drawing submittal.
5. Penetrations in Fire-Rated Wall/Floor Assemblies:
   a. Reference Division 07, Thermal and Moisture Protection.
   b. Coordinate with Drawings location of fire rated walls, ceilings and floors. When these assemblies are penetrated, seal around piping and equipment with approved firestopping material.
   c. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814 and NFPA.
   d. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814.

3.04 SWITCHES, VALVE SUPERVISORY

A. Coordinate with Division 28, Electronic Safety.

3.05 SWITCHES, WATER DETECTOR

A. Wire pipe cutout coupon at point of connection of switch to pipe.
B. Flow switches: Connect to system side of valves and drain connections.
C. Coordinate with Division 28, Electronic Safety.

3.06 HANGERS AND SUPPORTS

A. Installation of pipe hangers, inserts and supports to conform to NFPA 13. Provide adjustable hangers, inserts, brackets, clamps, supplementary steel and other accessory materials required for proper support of pipe lines and equipment. Provide supplementary materials for proper support and attachment of hangers.

3.07 STRUTS AND STRUT CLAMPS

A. Install per manufacturer's listed orientation.

3.08 RESTRAINTS

A. Locate per orientation and spacing as required by sway brace calculations.
B. Attach sway bracing directly to pipe or equipment being braced.
C. Do not attach sway bracing to bottom of truss members.

3.09 SEISMIC SEPARATION ASSEMBLY

A. Provide four-way sway braces upstream and downstream within 6-feet of the seismic separation assembly, attached to structure on opposite sides of the seismic joint. Do not attach bracing to seismic separation assembly.

3.10 ANCHORS AND ATTACHMENTS

A. In post-tension construction, determine location of post-tension cables and install anchors to avoid contact or interference with post-tension cables. Coordinate with Structural.

B. Do not use powder-driven attachments.

C. Building Attachments and Inserts: Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves and flanges, for sizes NPS 2-1/2 and larger. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

D. Hanger and Support Attachments:

1. Concrete:

a. Before Pouring: Prior to installation, coordinate locations of cast in place concrete inserts with other trades. Install in accordance with manufacturer's instructions.

b. After Pouring:

1) Where supports in slabs are required after concrete has been poured, provide drilled-in threaded inserts (mechanical-expansion anchors), installed in accordance with manufacturer's recommendations.

2) Install mechanical-expansion anchors after concrete is completely cured and in accordance with manufacturer's installation instructions.

3) Where anchors are to be installed in post-tension construction, determine and avoid locations of post-tension cables prior to drilling.

2. Metal Floor Deck: Support hangers per UL Listing or FM Approval for selected concrete insert before pouring of concrete topping, or from beam clamps fastened to structural steel.

3. Steel Joists: Support hangers from beam clamps fastened to bar joists or to auxiliary steel between bar joists as required.

4. C-Clamp Hangers: Do not attach to one side of double-angle bottom members.

5. Locate and install hangers, supports and attachments connecting to I-joists, structural insulated panels (SIPs), cross laminated timber and similar engineered structural products according to the structural product manufacturer specifications.

E. Make available to the Architect information required to verify the anchorage, sway bracing and restraint of fire protection systems.

3.11 VALVES

A. General:

1. Provide post indicator on buried control valves.

2. Inspect valves for leaks. Adjust or replace packing to stop leaks. Replace valve if leak persists.

B. Installation:

1. Install valves where required for proper operation, testing and drainage. Locate valves so as to be accessible and so that separate support can be provided when necessary. Install conveniently and accessibly located with reference to finished building for repairs, removal and service.

2. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to centerline of pipe. Install for proper direction of flow.

3. Wafer Check Valves: Install between two flanges in horizontal or vertical position, position for proper direction of flow.

C. Pressure Relief Valves: Provide piping to permanent drain.

3.12 PIPE, VALVE, AND FIRE PROTECTION EQUIPMENT IDENTIFICATION

A. Install engraved plastic laminate or corrosion resistant metal sign or plastic equipment marker, secured with corrosion-resistant chain or permanent adhesive on or near each Item of fire suppression equipment and each operational device, as specified in this specification if not otherwise specified for each Item or device.

B. Provide signs for the following general categories of equipment and operational devices: Valves, drains, pumps, standpipes, tanks and similar equipment.

C. Each new piece of equipment to bear a permanently attached identification plate, listing manufacturer's name, capacities, sizes and characteristics.

D. Piping to bear the manufacturer's name, schedule of thickness, size and ASTM identification number

E. Provide valve tag on every valve, control device, main drain, auxiliary drain, and drum drip in each system. Exclude check valves and valves within factory fabricated equipment units. List each tagged valve in valve schedule for each piping system.

F. List each tagged item and its location in valve schedule; identify on fire suppression drawings.

G. Install framed, glass or rigid transparent plastic covered, mounted valve schedule and valve location drawing in main riser or fire pump room.

H. Provide identification sign on ceiling tile below valve location.

I. Provide permanent identification sign at pressure regulating valves stating required setting of pressure regulator.

J. Adjusting: Relocate fire suppression identification device which has become visually blocked.

K. Cleaning: Clean face of identification devices and glass frames of valve charts.

3.13 SIGNS

A. General Information Signs: Provide a general information sign used to determine system design basis and information relevant to the inspection, testing and maintenance requirements required by NFPA 25, Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems. Such general information is to be provided with a permanently marked weatherproof metal or rigid plastic sign, secured with corrosion-resistant wire, chain, or other acceptable means. Such signs are to be placed at each system control rise loop and auxiliary system control valve. The sign is to include the following information:

1. Name and Location of the Facility Protected
2. Presence of High-Piled and/or Rack Storage
3. Maximum Height of Storage Planned
4. Flow Test Data
5. Location of Auxiliary Drains and Low Point Drains
6. Original Results of Main Drain Flow Test
7. Name of Installing Contractor or Designer
8. Indication of presence and location of other auxiliary systems.

B. Dry Signs: At system riser supplying dry systems, provide the following information: volume in gallons contained in each system.

3.14 DRAINS

A. Locate drain connections within 7-feet of floor. Provide piping capable of being fully drained.

B. Provide a drain vent at top of vertical drains. Coordinate with Division 22, Plumbing.

C. Coordinate location of auxiliary drains with Architect. Architect to approve location before drain is installed.
D. Protect drains from tampering and accidental operation.
E. Protect drain discharge at the exterior with a turned-down 45 degree elbow.

END OF SECTION

SECTION 21 13 00
FIRE SUPPRESSION SPRINKLER SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Sprinklers
   2. Flexible Sprinkler Hose Fitting Assembly - For fire sprinklers in suspended ceilings which are supplied by a wet pipe system.
   3. Riser Manifold
   4. Inspector's Test Connection
   5. Spare Sprinkler Cabinet
   6. Sprinkler Guards

B. This is a contractor designed system. Contact AHJ prior to bid to verify fire system requirements. Provide design compliant with codes as interpreted by AHJ.

C. Scope: Revision and extension of existing system to new and remodeled areas.

D. Coordinate location and type of tamper, flow and pressure switches and fire alarm system.

E. Provide electrical connections and wiring as required for a complete and operable system. Includes but is not limited to bells, air compressors, sump pumps, fire pumps, jockey pumps and pump controllers.

1.02 RELATED SECTIONS

A. Contents of Division 21, Fire Suppression and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:
   1. Division 22, Plumbing
   2. Division 23, Heating, Ventilating and Air-Conditioning
   3. Division 26, Electrical
   4. Division 28, Electronic Safety
   5. Section 21 00 00, Fire Suppression Basic Requirements
   6. Section 21 05 00, Common Work Results for Fire Suppression

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Hydraulic calculations.
   2. Sway brace calculations.
   3. Details of sway bracing.
   4. Details of interval and end of branch line restraints.
   5. Details of flexible sprinkler hose fitting assembly, including number and radius of bends, corresponding to equivalent feet used in hydraulic calculations. Provide details of sign to be installed at each flexible sprinkler hose fitting assembly.
   6. Details of oversized ceiling penetrations and oversized sprinkler escutcheons.
   7. Trapeze hanger details and calculations, including size, length and material. Additionally, provide size, weight and number of pipes to be carried on the trapeze.
   8. On submittal and As-Built drawings, provide text of sprinkler list to be installed in the spare sprinkler cabinet.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.07 SYSTEM DESCRIPTION

A. Provide coverage for entire building. Field verify field conditions prior to submittal of bid. Adjust bid to provide protection features in accordance with applicable codes and interpretations by AHJ. Provide design and installation based on more stringent requirements if this specification and AHJ requirements differ from Code.

B. Design Parameters:

1. Building Areas: Offices, Restrooms.
   a. Occupancy Classification: Light.
   b. Outside Hose Allowance: 100 GPM.
2. Building Areas: Electrical Rooms, Mechanical Rooms.
   a. Occupancy Classification: Ordinary Group 1.
   b. Outside Hose Allowance: 250 GPM.
3. Design parameters above are NFPA 13 minimums. Provide increased design densities, design areas and hose allowances to meet requirements of AHJ.

C. Sprinkler system design to include a 10 percent pressure and flow cushion between system demand point and available water supplies.

D. Extend hydraulic calculations from hydraulically most remote design area back to location of pressure hydrant of flow test or effective point of water supply where characteristics of water supply are known.

1.08 EXTRA STOCK

A. Provide extra sprinklers per code.

B. Provide suitable wrenches for each sprinkler type and metal storage cabinet in riser room.

1.09 CONTROL VALVES

A. Sprinkler system control valves to be OS&Y or butterfly valves located inside building in a room with outside door.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Sprinklers:

1. Finished Areas:
   a. Victaulic
   b. Viking
   c. Tyco
   d. Reliable
   e. Globe
   f. Senju
   g. Or approved equivalent.
2. Nonfinished Areas:
   a. Victaulic
   b. Viking
   c. Tyco
   d. Reliable
   e. Globe

f. Or approved equivalent.

3. Dry Sprinklers:
   a. Victaulic
   b. Viking
   c. Tyco
   d. Reliable
   e. Or approved equivalent.

B. Flexible Sprinkler Hose Fitting Assembly:
   1. Victaulic; VicFlex.
   2. Flexhead Industries
   3. SprinkFLEX
   4. Allied Rubber and Gasket Company, Incorporated, dba ARGCO
   5. Reliable Automatic Sprinkler Company
   6. Tyco Fire and Building Products
   7. Viking Corporation
   8. Or approved equivalent.

C. Riser Manifold:
   1. Viking EasyPac
   2. Reliable; Model CR.
   3. AGF; Model 8011.
   4. Tyco; Model RM-1
   5. Or approved equivalent.

D. Inspector's Test Connection:
   1. Combination Test and Drain:
      a. Victaulic; Series 720 TestMaster II Alarm Test Module with pressure relief valve.
      b. AGF; Model 1011, 2511, 3011, with pressure relief valve.
      c. Or approved equivalent.
   2. Dry System Inspector's Test Connection:
      a. AGF; Model 3011.
      b. Or approved equivalent.

E. Spare Sprinkler Cabinet:
   1. Victaulic
   2. Fire Protection Products, Inc. (FPPI).
   3. Tyco Fire & Building Products
   4. Allied Rubber and Gasket Co.
   5. Potter Roemer Fire Pro.
   6. Or approved equivalent.

F. Sprinkler Guards:
   1. Victaulic
   2. Viking
   3. Tyco
   4. Reliable
   5. Globe
   6. Senju
   7. Or approved equivalent.

2.02 SPRINKLERS

A. Finished Areas:
   1. Type: Glass-Bulb

2. Style: Concealed
3. Response: Quick-Response
4. Finish: White Polyester
5. Escutcheon: White Polyester
6. Coverplate for Concealed Sprinklers:
   a. Flat Plate
   b. White

B. Nonfinished Areas:
1. Type: Glass-Bulb
2. Response: Quick-Response
3. Finish: Brass

C. Dry Sprinklers:
1. Type: Glass-Bulb
2. Style:
   a. Concealed
   b. Recessed
3. Response: Quick-Response
4. Finish:
   a. Chrome
   b. White Polyester
5. Escutcheon:
   a. Chrome
   b. White Polyester
6. Coverplate for Concealed Sprinklers:
   a. Flat Plate
   b. Chrome
   c. White
7. Dry Sprinkler Boot: Manufactured for use with the dry sprinkler it protects.

D. Pendent sprinklers supplied by dry or preaction piping: Dry pendent type.

2.03 FLEXIBLE SPRINKLER HOSE FITTING ASSEMBLY

A. Fully welded non-mechanical fittings, stainless steel, braided, leak-tested with minimum 1-inch true-bore internal corrugated hose diameter. 175 psi.

B. Ceiling Bracket: Galvanized steel, direct attachment type, with integrated snap-on clip ends and removable flexible hose attachment with set screw. FM1637, UL 2443.

C. Affix permanent sign, label or decal at each flexible sprinkler hose fitting assembly anchoring component limiting the relocation of the sprinkler.

2.04 RISER MANIFOLD

A. Water-flow alarm, gauge, integral pressure relief valve connected to drain, pressure gauge with 3-way gauge control valve and drain valve, integral pressure relief valve connected to drain, sight glass, smooth bore orifice union of same size as smallest orifice sprinkler installed. Provide cover tamper switch when required by AHJ.

2.05 INSPECTOR'S TEST CONNECTION

A. Combination Test and Drain: Bronze body, brass stem, impregnated Teflon seat, chrome coated brass ball, steel handle with positive stops, tamper resistant test orifice, integral tamper resistant sight glasses, tapped and plugged port for system access, steel identification plate. Provide with pressure relief valve and drainage piping with bronze body and stainless steel spring.

B. Dry System Inspector's Test Connection: Bronze, brass stem, steel handle, chrome-plated bronze ball, Teflon valve seat, tamper and corrosion resistant orifice equivalent to smallest sprinkler orifice, sight flow connection.

2.06 SPARE SPRINKLER CABINET

A. NFPA 13 Systems: Sized to accommodate a minimum of two spare sprinklers of each Sprinkler Identification Number (SIN), manufacturer, model, orifice, deflector type, temperature and thermal sensitivity, or a minimum of six sprinklers for facilities having under 300 sprinklers, or a minimum of 12 sprinklers for facilities having 300 to 1000 sprinklers, or a minimum of 24 sprinklers for facilities having over 1000 sprinklers, whichever is more.

B. Welded steel with hinged steel cover.

C. Red enamel or polyester coated finish inside and out.

2.07 SPRINKLER GUARDS

A. Metal.

B. Listed for use with sprinkler model to which it is attached.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install per manufacturer's requirements and recommendations.

3.02 SPRINKLERS

A. Center sprinklers in center or quarter points of suspended ceiling tile.

B. Align sprinklers with architectural column lines, lighting, diffusers and other ceiling features. In unfinished ceilings, route piping to minimize visual impact. Sprinklers and piping not so aligned are to be removed and replaced at no additional cost to Owner.

C. Install dry sprinklers in a manner which does not trap water.

3.03 FLEXIBLE SPRINKLER HOSE FITTING ASSEMBLY

A. Install flexible sprinkler hose fitting assemblies where pendent sprinkler heads are located in acoustic ceiling tiles.

B. Install with no more bends than are included in equivalent footage used in hydraulic calculations.

C. Maintain manufacturer's recommended bending radius as included in equivalent footage used in hydraulic calculations.

D. Affix permanent sign, label or decal at each flexible sprinkler hose fitting assembly anchoring component limiting the relocation of the sprinkler.

3.04 RISER MANIFOLD

A. Install so valves and gauges are conveniently and accessibly located with reference to finished building for repairs, removal and service.

B. Provide connection to drain.

C. Pipe pressure relief valve to drain.

D. Install with supervised control valve(s) and check valve.

3.05 INSPECTOR'S TEST CONNECTION

A. Locate where full flow discharge or pressure relief valve discharge will not do damage, including damage to landscaping and will not cause dangerous conditions to walking surfaces or discoloration to building surfaces.

B. Locate within 5-feet of finished floor.

3.06 SPARE SPRINKLER CABINET

A. Attach to wall at the main sprinkler system riser.

B. Locate so cover is easy to open and readily accessible.

C. Locate in an area with a temperature between 40 and 100 degrees Fahrenheit.

D. Locate sprinkler wrenches inside cabinet.

E. Inside the cabinet, provide a list of sprinklers installed in the property, including sprinkler identification number, manufacturer, model, orifice, deflector type, thermal sensitivity and pressure rating, quantity of each type to be contained in the cabinet and issue or revision date of the list.

3.07 SPRINKLER GUARDS

A. Install per manufacturer's instructions and recommendations.

END OF SECTION

SECTION 22 00 00
PLUMBING BASIC REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work included in 22 00 00, Plumbing Basic Requirements applies to Division 22, Plumbing work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of plumbing systems for proposed project.

B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.

C. Definitions:

1. Provide: To furnish and install, complete and ready for intended use.
2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work furnished.
4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent", substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted items.
5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and other reviewing entity whose approval is required to obtain systems acceptance.

1.02 RELATED SECTIONS

A. Contents of Section applies to Division 22, Plumbing Contract Documents.

B. Related Work:

1. Additional conditions apply to this Division including, but not limited to:
   a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
   b. Drawings
   c. Addenda
   d. Owner/Architect Agreement
   e. Owner/Contractor Agreement
   f. Codes, Standards, Public Ordinances and Permits

1.03 REFERENCES AND STANDARDS

A. References and Standards per Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, individual Division 22, Plumbing Sections and those listed in this Section.

B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:

1. State of Oregon:
   a. OAR - Oregon Administrative Rules
   b. 2021 OESC - Oregon Electrical Specialty Code

c. 2019 OFC - Oregon Fire Code
d. 2019 OMSC - Oregon Mechanical Specialty Code
e. 2021 OPSC - Oregon Plumbing Specialty Code
f. 2019 OSSC - Oregon Structural Specialty Code
g. 2021 OEESC - Oregon Energy Efficiency Specialty Code
h. 2011 Oregon Elevator Specialty Code

C. Reference standards and guidelines include but are not limited to the latest adopted editions from:
1. ABA - Architectural Barriers Act
2. ADA - Americans with Disabilities Act
3. AHRI - Air-Conditioning Heating & Refrigeration Institute
4. ANSI - American National Standards Institute
5. ASCE - American Society of Civil Engineers
6. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers
7. ASHRAE Guideline 0, the Commissioning Process
8. ASME - American Society of Mechanical Engineers
9. ASPE - American Society of Plumbing Engineers
10. ASSE - American Society of Sanitary Engineering
11. ASTM - ASTM International
12. AWWA - American Water Works Association
13. CFR - Code of Federal Regulations
14. CGA - Compressed Gas Association
15. CISPI - Cast Iron Soil Pipe Institute
16. ETL - Electrical Testing Laboratories
17. EPA - Environmental Protection Agency
18. FM - FM Global
19. IAPMO - International Association of Plumbing and Mechanical Officials
20. GAMA - Gas Appliance Manufacturers Association
21. HI - Hydraulic Institute Standards
22. ISO - International Organization for Standardization
23. MSS - Manufacturers Standardization Society
24. NEC - National Electric Code
25. NEMA - National Electrical Manufacturers Association
26. NFGC - National Fuel Gas Code
27. NFPA - National Fire Protection Association
28. NRCA - National Roofing Contractors Association
29. NSF - National Sanitation Foundation
30. OSHA - Occupational Safety and Health Administration
31. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Inc.
32. TEMA - Tubular Exchanger Manufacturers Association
33. TIMA - Thermal Insulation Manufacturers Association
34. UL - Underwriters Laboratories Inc.

D. See Division 22, Plumbing individual Sections for additional references.

1.04 SUBMITTALS

A. See Division 01, General Requirements for Submittal Procedures as well as specific individual Division 22, Plumbing Sections.

B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.

C. In addition:
1. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.
2. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail. For electronic format, provide one file per division containing one bookmarked PDF file with each bookmark corresponding to each Specification Section. Arrange bookmarks in ascending order of Specification Section number. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. All transmissions/submissions to be submitted to Architect. At Contractor’s option, two separate submittals may be provided, consisting of underground work and building work. Deviations will be returned without review.
3. Product Data: Provide Manufacturer's descriptive literature for products specified in Division 22, Plumbing Sections.
4. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.
   a. Label submittal to match numbering/references as shown in Contract Documents and schedules. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.
   b. Include technical data, installation instructions and dimensioned drawings for products, fixtures, equipment and devices installed, furnished or provided. Reference Division 22, Plumbing Sections for specific items required in product data submittal outside of these requirements.
   c. Provide pump curves, operation characteristics, capacities, ambient noise criteria, etc. for equipment.
   d. For vibration isolation of equipment, list make and model selected with operating load and deflection. Indicate frame type where required. Submit manufacturer's product data.
   e. See Division 22, Plumbing Sections for additional submittal requirements outside of these requirements.
5. Maximum of two reviews of complete submittal package. Arrange for additional reviews and/or early review of long-lead items; Bear costs of additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to Contractor without review.
6. Resubmission Requirements: Make corrections or changes in submittals as required, and in consideration of Engineer’s comments. Identify Engineer’s comments and provide an individual response to each of the Engineer’s comments. Cloud changes in the submittals and further identify changes which are in response to Engineer’s comments.

7. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-16 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.
8. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 22, Plumbing Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical submittals.
9. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.
10. Substitutions and Variation from Basis of Design:
    a. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.
    b. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals". For any product marked "or approved equivalent", a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.
11. Resubmission Requirements:
    a. Make any corrections or change in submittals when required. Provide submittals as specified. The Engineer will not be required to edit and/or interpret the Contractor's submittals. Indicate changes for the resubmittal in a cover letter with reference to page(s) changed and reference response to comment. Cloud changes in the submittals.
        1) Resubmit for review until review indicates no exception taken or "make corrections as noted".
        2) When submitting drawings for Engineer's re-review, clearly indicate changes on drawings and "cloud" any revisions. Submit a list describing each change.
12. Operation and Maintenance Manuals, Owner's Instructions:
    a. Submit, at one time, electronic files (PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Include valve charts. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
        1) Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed

equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.

2) Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, quantities, relevant to each piece of equipment: belts, motors, lubricants, and filters.
3) Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub assemblies.
4) Include copy of startup and test reports specific to each piece of equipment.
5) Include copy of final water systems balancing log along with pump operating data.
6) Include commissioning reports.
7) Include copy of pressure, flow, leakage and purity test data and air and water systems test data, as applicable. Include copy of third-party and state and local jurisdiction inspection reports.
8) Include copy of valve charts/schedules.
9) Include Warranty per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.
10) Include product certificates of warranties and guarantees.
11) Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.

b. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 22 00 00, Plumbing Basic Requirements article titled "Demonstration".

c. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

13. Record Drawings:

a. Maintain at site at least one set of drawings for recording “As-constructed” conditions. Indicate on Drawings changes to original documents by referencing revision document, and include buried elements, location of cleanouts, and location of concealed mechanical items. Include items changed by field orders, supplemental instructions, and constructed conditions.

b. Record Drawings are to include equipment and fixture/connection schedules that accurately reflect "as constructed or installed" for Project.

c. At completion of project, input changes to original project on Revit Model and make one set of black-line drawings created from Revit Model in

version/release equal to contract drawings. Submit Revit Model and drawings upon substantial completion.

d. Provide Invert elevations and dimensioned locations for water services, building waste, and storm drainage piping below grade extending to 5-feet outside building line.

e. See Division 22, Plumbing individual Sections for additional items to include in record drawings.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

B. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.

C. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturers equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., piping) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.

D. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.

E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.

F. Provide products that are UL listed.

G. Piping Insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.

H. All potable water system components, devices, material, or equipment containing a weighted average of greater than 0.25 percent lead are prohibited, and shall be certified in accordance with current editions of the Safe Drinking Water Act (SDWA), NSF 61 & NSF 372. Endpoint devices used to dispense water for drinking shall meet the requirements of NSF 61.

I. ASME Compliance: ASME listed water heaters and boilers with an input of 200,000 BTUH and higher, hot water storage tanks which exceed 120 gallons, and hot water expansion tanks which are connected to ASME rated equipment or required by code or local jurisdiction.

1.06 WARRANTY

A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Contracting and Procurement Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty in Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

1.07 COORDINATION DOCUMENTS

A. Prior to construction, coordinate installation and location of HVAC equipment, ductwork, grilles, diffusers, piping, plumbing equipment/fixtures, fire sprinklers, plumbing, cable trays, lights, and electrical services with architectural and structural requirements, and other trades (including ceiling suspension, and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.

B. Advise Architect in the event a conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.

C. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

1.08 WORK INCLUDED

A. Furnish and install sleeves, inserts and anchorage required for the installation, which are embedded in work of other trades. Sleeve, wrap and seal piping in concrete.

B. Electrical: For plumbing trim/devices/equipment, provide, from the line voltage connection by Division 26, the low voltage electrical connections and wiring as required for complete and operable system. Includes, but is not limited to: Low voltage electrical raceway, wiring and accessories, such as step-down transformers as necessary for function of sensors and automatic valve and faucet controls. Supply step-down transformers and size wiring as recommended by manufacturer of plumbing trim/faucets requiring electrical low voltage connection.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer, including but not limited to fixtures, pumps, drains and equipment.

2.02 STANDARDS OF MATERIALS AND WORKMANSHIP

A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL or ETL listed and labeled or be approved by State, County, and City authorities prior to procurement and installation.

B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

C. Hazardous Materials:

1. Comply with local, State of Oregon, and Federal regulations relating to hazardous materials.
2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.
3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

PART 3 - EXECUTION

3.01 ACCESSIBILITY AND INSTALLATION

A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

B. Install equipment requiring access (i.e., drain pans, drains, control operators, valves, motors, cleanouts and water heaters) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.

C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing, and coordination with other trades and disciplines.

D. Plenums:

1. Provide plenum rated materials that meet the requirements to be installed in plenums. Immediately notify Architect/Engineer of discrepancy.

3.02 SEISMIC CONTROL

A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 22 Plumbing Sections.

B. General:

1. Earthquake resistant designs for Plumbing (Division 22) equipment and distribution, i.e. motors, plumbing systems, piping, equipment, water heaters, boilers, etc. to conform to regulations of jurisdiction having authority.
2. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.
3. Provide stamped Shop Drawings from licensed Structural Engineer of seismic bracing and seismic movement assemblies for piping equipment and water heaters. Submit Shop Drawings along with equipment submittals.
4. Provide stamped Shop Drawings from licensed Structural Engineer of seismic flexible joints for piping and crossing building expansion or seismic joints. Submit Shop Drawings along with seismic bracing details.

C. Piping:

1. Per "Seismic Restraints Manual Guidelines for Mechanical Systems" latest edition published by SMACNA or local requirements.

D. Provide means to prohibit excessive motion of plumbing equipment during earthquake.

3.03 REVIEW AND OBSERVATION

A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:

1. Prior to covering walls.
2. Prior to ceiling cover/installation.
3. When main systems, or portions of, are being tested and ready for inspection by AHJ.

C. Bear responsibility and cost to make piping accessible, to expose concealed lines, or to demonstrate acceptability of the system. If Contractor fails to notify Architect at times prescribed above, costs incurred by removal of such work are the responsibility of the Contractor.

D. Final Punch:
1. Prior to requesting a final punch visit from the Engineer, request from Engineer the Plumbing Precloseout Checklist, complete the checklist confirming completion of systems' installation, and return to Engineer. Request a final punch visit from the Engineer, upon Engineer's acceptance that the plumbing systems are ready for final punch.
2. Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

3.04 CONTINUITY OF SERVICE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 22, Plumbing Sections and the following:
1. During remodeling or addition to existing structures, while existing structure is occupied, current services to remain intact until new construction, facilities or equipment is installed.
2. Prior to changing over to new service, verify that every item is thoroughly prepared. Install new piping, and wiring to point of connection.
3. Coordinate transfer time to new service with Owner. If required, perform transfer during off peak hours. Once changeover is started, pursue to its completion to keep interference to a minimum.
   a. If overtime is necessary, there will be no allowance made by Owner for extra expense for such overtime or shift work.
4. Organize work to minimize duration of power interruption.

3.05 CUTTING AND PATCHING

A. Confirm Cutting and Patching requirements in Division 01, General Requirements. In absence of specific requirements, comply with individual Division 22, Plumbing Sections and the following:
1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftspeople of each respective trade in conformance with appropriate Division of Work.

3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
4. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing piping and devices are removed as part of this project. Where alterations disturb lawns, paving, and walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.
5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

3.06 EQUIPMENT SELECTION AND SERVICEABILITY

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

3.07 DELIVERY, STORAGE AND HANDLING

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 22, Plumbing Sections and the following:
1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust. Insulation and lining that becomes wet from improper storage and handling to be replaced before installation. Products and/or materials that become damaged due to water, dirt and/or dust as a result of improper storage to be replaced before installation.
2. Protect equipment and pipe to avoid damage. Close pipe openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.
3. Protect bright finished shafts, bearing housings and similar items until in service.

3.08 DEMONSTRATION

A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

B. Upon completion of work and adjustment of equipment and test systems, demonstrate to Owner's Authorized Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

3.09 CLEANING

A. Confirm cleaning requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

B. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

3.10 INSTALLATION

A. Confirm installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

B. Install equipment and fixtures in accordance with manufacturer's installation instructions, plumb and level and firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.

C. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

1. Do not place equipment in sustained operation prior to initial balancing of plumbing systems.
2. Provide pump impellers to obtain Basis of Design design capacities.

D. Provide miscellaneous supports/metals required for installation of equipment and piping.

3.11 PAINTING

A. Confirm requirements in Division 01, General Requirements and Division 09, Finishes. In absence of specific requirements, comply with individual Division 22, Plumbing Sections and the following:

1. Ferrous Metal: After completion of plumbing work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces, i.e., hangers, hanger rods, equipment stands, with one coat of black asphalt for exterior or black enamel for interior, suitable for hot surfaces.
2. In a mechanical room, on roof or other exposed areas, machinery and equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
3. See individual equipment Specifications for other painting.
4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
5. Piping: Clean, primer coat and paint exposed piping on roof or at other exterior locations with two coats paint suitable for metallic surfaces and exterior exposures. Color selected by Architect.
6. Covers: Covers such as manholes, cleanouts and the like will be furnished with finishes which resist corrosion and rust.

3.12 DEMOLITION

A. Confirm Demolition requirements in Division 01, General Requirements and Division 02, Existing Conditions. In absence of specific requirements, comply with individual Sections in Division 22, Plumbing and the following:

1. Scope:
   a. It is the intent of these documents to provide necessary information and adjustments to plumbing system required to meet code, and accommodate installation of new work.
   b. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas.
   c. Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages

caused by failure to exactly locate and preserve underground utilities. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.

2. Unless specifically indicated on Drawings, remove exposed, unused piping to behind finished surfaces (floor, walls, ceilings, etc.). Cap piping and patch surfaces to match surrounding finish.
3. Unless specifically indicated on Drawings, remove unused equipment, fixtures, fittings, rough-ins, and connectors. Removal is to be to a point behind finished surfaces (floors, walls, and ceilings).

3.13 ACCEPTANCE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Sections in Division 22, Plumbing and the following:
   1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
      a. Testing and Balancing Reports
      b. Cleaning
      c. Operation and Maintenance Manuals
      d. Training of Operating Personnel
      e. Record Drawings
      f. Warranty and Guaranty Certificates
      g. Start-up/Test Document and Commissioning Reports

3.14 FIELD QUALITY CONTROL

A. Confirm Field Quality Control requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

B. Tests:
   1. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in operation and maintenance manuals.
   2. During site evaluations by Architect or Engineer, provide appropriate personnel with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

3.15 LETTER OF CONFORMANCE

A. Provide Letter of Conformance, copies of manufacturers' warranties and extended warranties with a statement that plumbing items were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include Letter of Conformance, copies of manufacturers' warranties and extended warranties in Operation and Maintenance Manuals.

3.16 ELECTRICAL INTERLOCKS

A. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize plumbing equipment wiring diagrams to coordinate with electrical systems so that proper wiring of equipment involved is affected.

END OF SECTION

SECTION 22 05 19
PLUMBING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Water Hammer Arrestors (Shock Absorbers)

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements apply to this Section.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Water Hammer Arrestors (Shock Absorbers):
   1. Piston Type:
      a. PPP
      b. Sioux Chief

2.02 WATER HAMMER ARRESTORS (SHOCK ABSORBERS)

A. Piston-type, copper, brass or stainless steel with O-ring piston, pressure rated, tested and certified in accordance with PDI WH-201 or ASSE 1010.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. For plumbing devices requiring access from access panels (i.e. trap primers, water hammer arrestors and the like) submit location/size of all access panels to Architect for approval prior to purchase and installation of access panel. See Section 22 00 00, Plumbing Basic Requirements for additional requirements.

B. Provide instruments with scale ranges selected according to service with largest appropriate scale.

C. Install per manufacturer recommendations.

3.02 WATER HAMMER ARRESTORS (SHOCK ABSORBERS)

A. Install in upright position, in locations and of sizes in accordance with PDI WH-201 or ASSE 1010, and elsewhere as indicated.

B. Locate shock absorbers in supply pipe in accordance with recommendations of Plumbing and Drainage Institute PDI-WH201 or ASSE 1010. Install ahead of solenoid operated valves. Determine size of absorber by fixture unit value of fixture supplied, using PDI symbols to designate sizes. Provide access panel for each shock absorber.

C. Install per manufacturer recommendations.

END OF SECTION

SECTION 22 05 23
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Valves, General
   2. Ball Valves
   3. Thermostatic Point-of-Use Mixing Valves (ASSE 1070 Rated)

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. NSF 61, Annex G and/or NSF/ANSI 372 for potable water services. Valves must be 3rd-party certified.
   2. ISO 9001 Certified.
   3. IAPMO Certified for Low Lead.

C. Source Limitations for Valves: Obtain each type of valve from a single source and from a single manufacturer.

D. Model numbers indicated as Basis-of-Design indicate valve characteristics. All valves are to meet code Low Lead/Lead Free Standards.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations for Valves: Obtain each type of valve from a single source and from a single manufacturer.

B. Valves, General:
   1. Apollo
   2. Armstrong
   3. ASCO
   4. Caleffi
   5. Cla-Val
   6. Conbraco
   7. Crane
   8. Clow
   9. Griswold
   10. Hammond
   11. Hays

12. Jenkins
13. Josam
14. Kennedy
15. Milwaukee
16. Mueller
17. Nibco
18. Red-White Valve
19. Smith
20. Stockham
21. Tour Anderson
22. Wade
23. Watts
24. Wilkins
25. Zurn
26. Or approved equivalent.

C. Ball Valves:
1. See Valves General above.
2. NSF Valves:
a. Clow
b. Kennedy
c. Nibco
d. Or approved equivalent.

D. Thermostatic Point-of-Use Mixing Valves (ASSE 1070 Rated):
1. Caleffi
2. Lawler
3. Leonard
4. Or approved equivalent.

2.02 VALVES - GENERAL

A. General:
1. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.
2. Operators: Provide handwheels, fastened to valve stem, for valves other than quarter-turn. Provide lever handle for quarter-turn valves 6-inches and smaller. Provide gear operators for quarter-turn valves 8-inches and larger and plug valves installed over 5-feet above finished floor.
3. Valve Identification: Manufacturer's name (or trademark) and pressure rating clearly marked on valve body.

B. Valves in Insulated Piping: With 2-inch stem extension and following features:
1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation on valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after insulation is applied.

C. Valve-End Connections:
1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With thread according to ASME B1.20.1.

D. Valve Bypass and Drain Connections: MSS SP-45.

2.03 BALL VALVES

A. All ball valves on brazed piping are to be three-piece.

B. 2-1/2 Inches and Smaller: MSS SP-110, 400-600 PSI, two-piece full port ball configuration, bronze body, extended soldered ends for copper pipe and threaded ends for iron pipe, lead-free brass or stainless steel ball, lead-free brass stem, Teflon seat, extended steel handle. Apollo 77CLF 100 Series two-piece.

C. Full Port Ball Valve: 2- to 4-inch ductile iron, ASTM A536, micro finish steel chrome plated or stainless steel ball and stem. TFE seats, 600 PSI.

2.04 THERMOSTATIC POINT-OF-USE MIXING VALVES (ASSE 1070 RATED)

A. Thermostatic type with bronze body construction, corrosion resistant materials, union end stops, check inlets with strainers, 0-200 degree F dial thermometer and discharge shut-off valve. Mixing valves to meet ASSE 1070.

B. Maximum required delta temperature differential between hot water supply temperature and delivery temperature is 15 degrees F. Set valve outlet temperature per drawing requirements.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, grooves, and weld ends.
   3. Set ball valves open to minimize exposure of functional surfaces.
   4. Block check valves in either closed or open position.

B. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Inspect the shipping container before unpacking to look for damage that could have occurred during transport, and report it to the transportation company immediately. After visual inspection, remove the valve from the shipping container. Make sure the faces are free of any scratches and that there is not any obvious damage to the actuator assembly or valve body.

D. Make sure to note the valve's model number during the unpacking process. The model number will need to be provided when purchasing replacement parts.

E. Purge and clean all piping to be connected to valve.

F. Install per manufacturer's recommendations.

G. Determine that the valve and its plumbing piping is adequately supported when installed. If a valve is not adequately supported, this could prevent the valve from operating and sealing correctly. Be sure that all mating flanges are in line and parallel to minimize straining on joints and valve body.

H. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

I. Do not attempt to repair defective valves; replace with new valves.

J. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.

K. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve

drains with hose end adapter and cap on chain for each valve that must be installed with stem below horizontal plane. Ensure installation provides full stem movement.

L. Insulation: Where insulation is indicated, install extended stem valves, arranged in proper manner to receive insulation.

M. Mechanical Actuators: Install with chain operators where indicated. Extend chains to 5-feet above floor and hook to clips to clear aisle passage.

N. Stem Selection: Outside screw and yoke stems, except provide inside screw, non-rising stem where space prevents full opening of OS&Y valves.

O. Seats: Renewable seats, except where otherwise indicated.

P. When soldering, use paste flux that are approved by the manufacturer for use with lead free alloys.

Q. If valve applications are not indicated on Drawings, use the following:
   1. Shutoff Service: Ball valves.

R. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

S. Valves, except wafer/butterfly types, with the following end connections:
   1. For Copper Tubing, 2-inches and Smaller. Threaded ends except where solder-joint valve-end.
   2. For Steel Piping, 2-inches and Smaller: Threaded ends.

T. Valve Adjusting and Cleaning:
   1. Inspect valves for leaks. Adjust or replace packing to stop leaks. Replace valve if leak persists.
   2. Valve Identification. Tag valves per Section 22 05 53, Identification for Plumbing Piping and Equipment.

3.02 BALL VALVES

A. See General Installation Requirements above.

3.03 THERMOSTATIC POINT-OF-USE MIXING VALVES (ASSE 1070 RATED)

A. See General Installation Requirements above.

B. Install mixing valve per manufacturer's instruction manual.

END OF SECTION

SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Pipe Hangers and Supports for Plumbing Piping and Equipment
   2. Wall and Floor Sleeves
   3. Building Attachments
   4. Flashing
   5. Miscellaneous Metal and Materials

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. ASCE 7-16, Minimum Design Loads for Buildings and Other Structures.
   2. Hanger spacing installation and attachment to meet all manufacturer's requirements and MSS SP-58.
   3. Terminology: As defined in MSS SP-90 "Guidelines on Terminology for Pipe Hangers and Supports".
   4. Install piping per SMACNA's requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.07 PERFORMANCE REQUIREMENTS

A. General - Provide pipe and equipment hangers and supports in accordance with the following:
   1. When supports, anchorages, and seismic restraints for equipment, and supports, anchorages, and seismic restraints for piping are not shown on the Drawings, the contractor is responsible for their design.
   2. Connections to structural framing are not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

B. Engineered Support Systems:
   1. Support frames such as pipe racks or stanchions for piping and equipment which provide support from below.
   2. Equipment and piping support frame anchorage to supporting slab or structure.

C. Provide channel support systems, for piping to support multiple pipes capable of supporting the combined weight of supported systems, system contents and test water.

D. Provide heavy-duty steel trapezes for piping to support multiple pipes capable of supporting the combined weight of supported systems, system contents and test water.

E. Provide seismic restraint hangers and supports for piping and equipment.
F. Obtain approval from AHJ for seismic restraint hanger and support system to be installed for piping and equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Pipe Hangers and Supports for Plumbing Piping and Equipment:
1. Pipe Hangers/Supports:
a. B-Line Systems Inc.
b. Anvil International
c. HOLDRITE
d. Erico Co. Inc.
e. Snappitz Thermal Pipe Shield Manufacturing
f. Rilco Manufacturing Co. Inc.
g. Nelsen-Olson Inc.
h. Or approved equivalent.
2. Channel Support Systems:
a. B-Line Systems Inc.
b. Anvil International, Anvit-Strut
c. Erico Hanger Co. Inc.; O-Strut Div.
d. Unistrut Corp.
e. HOLDRITE EZ-Strut Systems
f. Or approved equivalent.
3. Thermal-Hanger Shield Inserts:
a. Erico Hanger Co. Inc.
b. Pipe Shields, Inc.
c. Rilco Manufacturing Co. Inc.
d. HOLDRITE Insulation Couplings
e. Or approved equivalent.
4. Pipe Alignment and Secondary Supports:
a. HOLDRITE
b. Starquick
c. Or approved equivalent.

B. Wall and Floor Sleeves:
1. Below Grade and High Water Table Areas:
a. Modular Link Sealing System at Pipe Sleeves:
1) Thunderline Corporation
2) Or approved equivalent.
2. Pre-Engineered Firestop Pipe Penetration Systems:
a. HOLDRITE HydroFlame
b. Proset
c. Or approved equivalent.

C. Building Attachments:
1. Anchor-It
2. Gunnebo Fastening Corp.
3. ITW Ramset / Red Head
4. Masterset Fastening Systems, Inc.
5. Or approved equivalent.

D. Flashing:

1. Fastenal
2. Or approved equivalent.

E. Miscellaneous Metal and Materials:
1. See Miscellaneous Metal and Materials article below.
2. Powder-Actuated Fastener Systems:
a. Gunnebo Fastening Corp.
b. Hilti, Inc.
c. ITW Ramset / Red Head
d. Masterset Fastening Systems, Inc.
e. Or approved equivalent.

2.02 PIPE HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

A. Horizontal Piping Hangers and Supports - Horizontal and Vertical Piping, and Hanger Rod Attachments:
1. Factory fabricated horizontal piping hangers and supports to suit piping systems in accordance manufacturer's published product information.
2. Use only one type by one manufacturer for each piping service.
3. Select size of hangers and supports to exactly fit pipe size for bare piping and to exactly fit around piping insulation with saddle or shield for insulated piping.
4. Provide copper-plated hangers and supports for uninsulated copper piping systems.
5. Provide padded pipe hangers, clamps and supports for thermoplastic piping system.
6. Install no hub cast iron pipe and fittings per CISPI 301-09 Installation Procedures for Hubless Cast Iron Pipe and Fittings for Sanitary and Storm Drain Waste and Vent Piping Applications. Brace hubless cast iron pipe and fittings 5-inch and larger with HOLDRITE No Hub Pipe Restraints or approved equivalent.

B. Pipe Hangers, Guides and Channel Systems:
1. Hanger Rods: Hanger rods continuously threaded or threaded ends only in concealed spaces and threaded ends only in exposed spaces; finish electro-galvanized or cadmium-plated in concealed spaces and prime painted in exposed spaces; sizes per MSS.
2. Hanger Rod Couplings: Malleable iron rod coupling with elongated center sight gap for visual inspection; to have same finish as hanger rods.
3. Pipe Rings for Hanger Rods: Pipe sizes 2-inch and smaller, MSS SP Type 6 or Type 10, or approved equivalent. Pipe sizes 2-1/2-inches and larger, clevis type hangers with adjustable nuts on rod. MSS SP Type 1. Pipe rings to have same finish as hanger rods.
4. Pipe Slides: Type 35 reinforced Teflon slide material (3/32-inch minimum thickness) bonded to steel; highly finished steel or stainless steel contact surfaces to resists corrosion; 60-80 PSI maximum active contact surface loading; steel parts 3/16-inch minimum thickness; attachment to pipe and framing by welding.
5. Pipe Guides:
a. Furnish and install pipe guides on continuous runs where pipe alignment must be maintained. Minimum two on each side of expansion joints, spaced per manufacturer's recommendations for pipe size. Fasten guides securely to pipe and structure. Any contact with chilled water pipe is not to permit heat to be transferred in sufficient quantity to cause condensation on any surface.
b. Furnish and install guides approximately 4 pipe diameters (first guide) and 14 diameters (second guide) away from each end of expansion joints. Guides

are not to be used as supports and are in addition to other pipe hangers and supports.

6. Channel Type Pipe Hanging System: Framing members No. 12 gauge formed steel channels, 1-5/8-inch square, conforming to ASTM A1011 GR33; one side of channel to have a continuous slot with in-turned lips; framing nut with grooves and spring 1/2-inch size, conforming to ASTM 675 GR60; screws conforming to ASTM A307; fittings conforming to ASTM A575; parts enamel painted or electro-galvanized.

C. Pipe Saddles and Shields:
1. Factory fabricated saddles or shields under piping hangers and supports for insulated piping.
2. Size saddles and shields for exact fit to mate with pipe insulation. 1/2 round, 18 gauge, minimum 12-inches in length (4-inch pipe and larger to be three times longer than pipe diameter).

D. Thermal-Hanger Shield Inserts: 100-PSI (690-kPa) minimum compressive strength insulation, encased in sheet metal shield.
1. Material for Cold Piping: Water-repellent-treated, ASTM C533, Type I calcium silicate with vapor barrier.
2. Material for Hot Piping: Water-repellent-treated, ASTM C533, Type I calcium silicate.
3. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
4. For Clevis or Band Hanger: Insert and shield to cover lower 180 degrees of pipe.
5. Insert Length: Extend 2-inches beyond sheet metal shield for piping operating below ambient air temperature.
6. Thermal Hanger Shield Inserts should be provided at the hanger points and guide locations on pipes requiring insulation. The Inserts should consist of Polyisocyanurate (urethane or phenolic insulation) encircling the entire circumference of the pipe with a 360 degree PVC (1.524 mm thick) with a living hinge and J lock and installed during the installation of the piping system.

E. Concrete Inserts:
1. Malleable iron body, hot dipped galvanized finish. Lateral adjustment. MSS Type 18.

F. Continuous Concrete Insert:
1. Steel construction, minimum 12 gauge. Electrogalvanized finish. Pipe clamps and insert nuts to match.

G. Beam Clamps:
1. MSS Type 19 and 23, wide throat, with retaining clip.
2. Universal Side Beam Clamp: MSS Type 20.

H. Below Ground:
1. Pipe Hangers: Adjustable Clevis type, Federal Specification WW-H-171 (Type 1), UL listed, stainless steel Type 316. MSS Type 1. If PVC piping to be used, provide Type 1 hanger, coated for PVC piping.
2. Rod: 5/8-inch stainless steel Type 316.
3. Eyebolt: Stainless steel Type 316.
4. Nuts and Washers: Stainless steel Type 316.

I. Hangers for Pipe Size 2-inches and Smaller:
1. Adjustable swivel ring hanger, UL listed, Type 6 or Type 10.

J. Hangers for Pipe Size 2-1/2-inches and Larger:

1. Adjustable clevis type, UL listed, Type 1.

K. Riser Clamps:
1. Steel, UL listed. MSS Type 8.

L. Plumbers Tape:
1. Not permitted as pipe hangers or pipe straps.

M. Pipe Alignment and Secondary Support Systems:
1. Secondary Pipe supports for general applications (Non-Acoustical).
a. Supports will be manufactured in compliance with IAPMO Product Standard PS 42-96. All products provided will be listed by IAPMO for secondary pipe support.
b. Supports may be used when sound and/or vibration transfer is not a concern.
2. Secondary pipe supports for sound and vibration attenuation (Acoustical).
a. Supports will be manufactured in compliance with IAPMO Product Standard PS 42-96. All products provided will be listed by IAPMO for secondary pipe support.
b. Acoustical pipe supports will be manufactured and installed in compliance with International Organization for Standardization (ISO) 3822-1 with current amendments.
c. Supports will be used when sound and/or vibration transfer is a concern. Locations where acoustical supports will be provided and include but are not limited to partition walls between living units, tenant spaces, retail units, mechanical rooms and lobbies.
d. Support Products:
1) Support to Wall Brace and Wall Stud Penetrations: HOLDRITE #261, #262, #263, and #264, or approved equivalent.
2) Pipe Wrap for Pipe Clamps and Channel-Mounted Pipe Clamps: HOLDRITE #270, or approved equivalent.
3) Pipe Wrap for Pipe Hangers: HOLDRITE #271, #272-2, and #272-4, or approved equivalent.
4) Drop-Ear Fitting Support: HOLDRITE #265, or approved equivalent.
5) Floor Riser Isolation Pads: HOLDRITE #275-T, or approved equivalent.
6) Floor Isolation Pads (General Applications): HOLDRITE #274, #275, #276, and #278, or approved equivalent.

2.03 WALL AND FLOOR SLEEVES

A. Below Grade and High Water Table Areas:
1. Modular Link Sealing System at Pipe Sleeves: Neoprene gasket links bolted together around an interior sleeve forming a watertight seal. Use a modular link sealing system at sleeves to continuously fill the annular space between the pipe and the wall opening. Provide Link-seal Type C unless otherwise noted. OS with S-316 stainless construction for continuous water/tank walls.
2. Sleeves through concrete foundation walls and floors. Ductile iron pipe. Class 50 or 51 pipe conforming to ANSI/AWWA C151/A21.51. Pipe sleeve will extend a minimum of 6-inches beyond outside perimeter of foundation. Final placement of sleeve will be confirmed with project's structural engineer. In areas with a high water table, provide AWWA C900, Class 235 plastic pipe in lieu of ductile iron pipe.

B. Pre-Engineered Firestop Pipe Penetration Systems: UL listed assemblies for maintaining fire rating of piping penetrations through fire-rated assemblies. Comply with ASTM E814.

C. Insulating Caulking: Eagle or Pitcher Super 66 high temperature cement.

D. Fabricated Accessories:
   1. Steel Pipe Sleeves: Fabricate from Schedule 40 black or galvanized steel pipe. Remove end burrs by grinding.
   2. Sheet Metal Pipe Sleeves: Fabricate from G-90 galvanized sheets closed with lock-seam joints. Provide following minimum gauges for sizes indicated:
      a. Sleeve Size 4-inches in Diameter and Smaller: 18 gauge.
      b. Sleeve Sizes 5-inches to 6-inches: 16 gauge.
      c. Sleeve Sizes 7-inches and Larger: 14 gauge.
      d. Fire-Rated Safing Material:
         1) Rockwool Insulation: Complying with FS-HH-I-558, Form A, Class IV, 6 lbs./cu.ft. density with melting point of 1985 degrees F and K value of 0.24 at 75 degrees F.
         2) Calcium Silicate Insulation: Noncombustible, complying with FS-HH-I-523, Type II, suitable for 100 degrees F to 1200 degrees F service with K value of 0.40 at 150 degrees F.

2.04 BUILDING ATTACHMENTS

A. General: Anchor supports to existing masonry, block and tile walls per anchoring system manufacturer's recommendations or as modified by project Structural Engineer. Provide anchor bolts suitable for cracked concrete.

B. Anchor Bolts:
   1. Anchor Bolts (Cast-In-Place): Steel bolts, ASTM A307. Nuts to conform to ASTM A194. Design values for shear and tension not more than 80 percent of the allowable listed loads.
   2. Anchor (Expansion) Bolts: Carbon steel to ASTM A307; nut to conform to ASTM A194; drilled-in type. Design values for shear and tension not more than 80 percent of the allowable listed loads.
   3. Anchor (Adhesive) Bolts: Consisting of two-part adhesive cartridge and zinc-plated Type A307 steel anchor bolt rod assembly with ASTM A194 nut.

C. Beam Clamps:
   1. MSS Type 19 and 23, wide throat, with retaining clip.
   2. Universal Side Beam Clamp: MSS Type 20.

D. Powder-Actuated Drive Pin Fasteners:
   1. Powder-Actuated Drive-Pin Fasteners: Powder actuated type, drive pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

E. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

F. Grout: ASTM C1107, Grade B, factory mixed and packaged, non-shrink and nonmetallic, dry, hydraulic-cement grout.
   1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
   2. Properties: Non-staining, noncorrosive, and non-gaseous.
   3. Design Mix: 5000-PSI (34.5-MPa), 28-day compressive strength.

2.05 FLASHING

A. Steel Flashing: 26 gauge galvanized steel.

B. Safes: 8 mil thick neoprene.

C. Caps: Steel, 22 gauge minimum, 16 gauge at fire-resistant structures.

D. Provide hot dipped galvanized components for items exposed to weather.

2.06 MISCELLANEOUS METAL AND MATERIALS

A. Miscellaneous Metal: Provide miscellaneous metal items specified hereunder, including materials, fabrication, fastenings and accessories required for finished installation, where indicated on Drawings or otherwise not shown on drawings, that are necessary for completion of the project. The Contractor is responsible for their design.
   1. Fabricate miscellaneous units to size, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

B. Structural Shapes: Where miscellaneous metal items are needed to be fabricated from structural steel shapes and plates, provide members constructed of steel conforming with requirements of ASTM A36 or approved equivalent.

C. Steel Pipe: Provide seamless steel pipe conforming to requirements of ASTM A53, Type S, Grade A, or Grade B. Weight and size required as specified.

D. Fasteners: Provide fasteners of types as required for assembly and installation of fabricated items; surface-applied fasteners are specified elsewhere.

E. Bolts: Low carbon steel externally and internally threaded fasteners conforming with requirements of ASTM A307; include necessary nuts and plain hardened washers. For structural steel elements supporting mechanical material or equipment from building structural members or connection thereto, use fasteners conforming to ASTM A325.

F. Miscellaneous Materials: Provide incidental accessory materials, tools, methods and equipment required for fabrication.

G. Provide hot dipped galvanized components for items exposed to weather.

H. Use straps, threshold rods and wire with sizes required by SMACNA to support piping.

I. Grout: ASTM C1107, Grade B, factory mixed and packaged, non-shrink and nonmetallic, dry, hydraulic-cement grout.
   1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
   2. Properties: Non-staining, noncorrosive, and non-gaseous.
   3. Design Mix: 5000-PSI (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Examination:
   1. Verify building materials to have hangers and attachments affixed in accordance with hangers to be used. Provide supporting calculations.

B. Preparation:
   1. Examine Drawings and coordinate for verification of exact locations of fire and smoke rated walls, partitions, floors and other assemblies. Indicate, by shading and labeling on Record Drawings such locations and label as "1-Hour Wall," "2-Hour Fire/Smoke Barrier," and the like. Determine proper locations for piping penetrations. Set sleeves in place in new floors, walls or roofs prior to concrete pour or grouting.

C. Install hangers, supports, anchors and sleeves after required building structural work has been completed in areas where the work is to be installed. Coordinate with project structural engineer proper placement of inserts, anchors and other building structural attachments.

3.02 PIPE HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

A. Hangers and Supports:

1. Comply with MSS SP-58. Pipe Hanger and Support Installation: Install hangers, supports, clamps, and attachments as required to properly support piping from building structure. For horizontally hung grooved-end piping, provide a minimum of 2 hangers per pipe section.
2. Pipe Ring Diameters:
   a. Uninsulated and Insulated Pipe, except where oversized pipe rings are specified: Ring inner diameter to suit pipe outer diameter.
   b. Insulated Piping Where Oversized Pipe Rings are Specified and Vibration Isolating Sleeves: Ring inner diameter to suit outer diameter of insulation or sleeve.
3. Oversize Pipe Rings: Provide oversize pipe rings of 2-inch and larger size.
4. Pipe Support Brackets: Support pipe with pipe slides.
5. Steel Backing in Walls: Provide steel backing in walls to support fixtures and piping hung from steel stud walls.
6. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.
   a. Field assemble and install according to manufacturer's written instructions.
7. Pipe Guides:
   a. Install on continuous runs where pipe alignment must be maintained. Provide a minimum of two on each side of expansion joints, spaced per manufacturer's recommendations for pipe size. Fasten guides to pipe structure. Any contact with chilled water pipe should not permit heat to be transferred in sufficient quantity to cause condensation on any surface.
   b. Install approximately 4 pipe diameters (first guide) and 14 diameters (second guide) away from each end of expansion joints. Do not use as supports. Provide in addition to other required pipe hangers and supports.
8. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field -fabricated, heavy-duty trapezes.
   a. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
   b. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1
9. Group parallel runs of horizontal piping to be supported together on trapeze-type hangers.
10. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe.
11. Do not support piping from other piping.
12. Fire protection piping will be supported independently of other piping.
13. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated.
14. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories.
15. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchor, and to

facilitate the action of expansion joints, expansion loops, expansion bends and similar units.

16. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
17. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping" is not exceeded.
18. Insulated Piping: (comply with the following)
    a. Attach clamps and spacers to piping.
        1) Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
        2) Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
        3) Do not exceed pipe stress limits according to ASME B31.9.
    b. Install MSS SP-58, Type 39 protection saddles, if insulation without a vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
        1) Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
    c. Install MSS SP-58, Type 40 protective shields on cold piping having a vapor barrier. Shields to span arc of 180 degrees.
        1) Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
    d. Shield Dimensions for Pipe, not less than the following:
        1) NPS 1/4 to NPS 3-1/2: 12-inches long and 0.048-inch thick.
        2) NPS 4: 12-inches long and 0.06-inch thick.
        3) NPS 5 and NPS 6: 18-inches long and 0.06-inch thick.
        4) NPS 8 to NPS 14: 24-inches long and 0.075-inch thick.
        5) NPS 16 to NPS 24: 24-inches long and 0.105-inch thick.
    e. Pipes NPS 8 and Larger: Include wood inserts.
    f. Insert Material: Length at least as long as protective shield.
    g. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.
19. Equipment Clearances: Do not route equipment or piping through electrical rooms, transformer vaults, elevator equipment rooms, IT rooms, MPOE rooms, or other electrical or electronic equipment spaces and enclosures and the like. Within equipment rooms, provide minimum 3-feet lateral clearance from all sides of electric switchgear panels. Do not route piping or equipment above any electric power or lighting panel, switchgear, or similar electric device. Coordinate with Electrical and coordinate exact equipment or pipe routing to provide proper clearance with such items.
20. Pipe supports and hanger spacing (pipe supported from structure or floor-supported) to meet the requirements of References and Standards Article in Part 1 above.

B. Vertical Piping:
    1. Support with U-clamps fastened to wall to hold piping away from wall unless otherwise approved.

2. Riser clamps to be directly under fitting or welded to pipe. Provide neoprene pads for all systems except natural gas.
3. Riser to be supported at each floor penetration.
4. Provide structural steel supports at the base of pipe risers. Size supports to carry forces exerted by piping system when in operation.

C. Adjusting and Painting:
1. Adjust hangers so as to distribute loads equally on attachments. Provide grout under supports to bring piping and equipment to proper level and elevations.
2. Prime paint ferrous nongalvanized hangers, accessories, and supplementary steel which are not factory painted.

3.03 WALL AND FLOOR SLEEVES

A. "Link-Seal" Pipe Sleeves: Install at slab on grade floor/below grade piping penetrations. Provide manufacturer's sleeve appropriate to seal type for pre-cast penetrations (except for DWV piping at slab on grade). Provide manufacturer's sleeve appropriate to seal type for pre-cast penetrations.

B. Fabricated Pipe Sleeves:
1. Provide either steel or sheet metal pipe sleeves accurately centered around pipe routes. Size such that piping and insulation, if any, will have free movement within the sleeve, including allowance for thermal expansion. Sleeve diameter to be determined by local seismic clearance requirement, and by waterproofing requirements.
2. Length: Equal to thickness of construction penetrated, except extend floor sleeves 1-inch above floor finish.
3. Provide temporary support of sleeves during placement in concrete and other work around sleeves. Provide temporary end closures to prevent concrete and other materials from entering pipe sleeves.
4. Seal each end airtight with a resilient nonhardening sealer, UL listed and fire rated per ASTM 814.

3.04 BUILDING ATTACHMENTS

A. Install within concrete slabs or attach to structural steel or wood. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints and at changes in direction of piping.

B. Attachment to Wood Structure: Provide MSS Type 34 for attachment to wooden beam or approved attachment for a wood structure.

C. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

D. Install concrete inserts before concrete is placed; fasten insert secure to forms. Where concrete with compressive strength less than 2500 PSI is indicated, install reinforcing bars through openings at top in inserts.

E. Install powder-actuated drive pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Test powder-actuated insert attachments with a minimum load of 100 pounds.

F. Bolting: Provide bored, drilled or reamed holes for bolting to miscellaneous structural metals, frames or for mounts or supports. Flame cut, punched or hand sawn holes will not be accepted.

G. Anchor Bolts:

1. Install anchor bolts for mechanical equipment and piping as required. Tightly fit and clamp base-supported equipment anchor bolts at equipment support points. Provide locknuts where equipment and piping are hung.
2. Anchor Bolts (Cast-In-Place): Embed anchor bolts in new cast-in-place concrete to anchor equipment. Install a pipe sleeve around the anchor bolt for adjustment of the top 1/3 of the bolt embedment; sizes and patterns to suit the installation conditions of the equipment to be anchored.

H. Pipe Anchors: Provide anchors to fasten piping which is subject to expansion and contraction, and adjacent to equipment to prevent loading high forces onto the equipment.

I. Escutcheon Plates: Install around horizontal and vertical piping at visible penetrations through walls, partitions, floors, or ceilings, including penetrations through closets, through below ceiling corridor wall, and through equipment room walls and floors.

J. Installation of metallic or plastic piping penetrations through non fire-rated walls and partitions and through smoke-rated walls and partitions:
1. Install fabricated pipe sleeve.
2. After installation of sleeve and piping, tightly pack entire annular void between piping or piping insulation and sleeve identification with specified material.
3. Seal each end airtight with a resilient nonhardening UL listed fire resistant ASTM 814 sealant.

K. Piping Penetrations Through Fire-Rated (1 to 3 hour) Assemblies:
1. Select and install pre-engineered pipe penetration system in accordance with the UL listing and manufacturer's recommendation.
2. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814. Use HOLDRITE HydroFlame or approved equivalent.

L. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories.

3.05 FLASHING

A. Flash and counter flash where piping passes through weather or waterproofed walls, floors and roofs.

B. Flash vent soil pipes with flashings per Division 01, General Requirements.

C. Flash floor drains over finished areas and roof drains, 10-inches clear on sides, minimum 36-inches by 36-inches sheet size. See Division 01, General Requirements. Fasten flashing to drain with clamping device.

D. Install built up fixtures (mop sinks, shower stalls, shower floors) with water sealing systems/membranes to meet Code and as prescribed by Division 01, General Requirements and Section 22 00 00, Plumbing Basic Requirements. Meet all Code testing requirements. Provide drainage devices with appropriate flanges, clamps, etc. to meet these installation requirements and ensure a water-tight installation.

3.06 MISCELLANEOUS METAL AND MATERIALS

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-

bolts, lag bolts, wood screws and other connectors as required. Avoid cutting concrete reinforcing when drilling for inserts. Reference structural drawings and reinforcing shop drawings and determine locations of stirrups prior to drilling into concrete.

C. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete masonry or similar construction.

D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

E. Setting Loose Plates: Clean concrete and masonry bearing surfaces of any bond reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

1. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

F. Fabrication:

1. General: Verify dimensions prior to fabrication. Form metal items to accurate sizes and configurations as indicated on Drawings and otherwise required for proper installation; make with lines straight and angles sharp, clean and true; drill, countersink, tap, and otherwise prepare items for connections with work of other trades, as required. Fabricate to detail of structural shapes, plates and bars; weld joints where practicable; provide bolts and other connection devices required. Include anchorages; clip angles, sleeves, anchor plates and similar devices. Hot dip galvanize after fabrication items installed in exterior locations. Set accurately in position as required and anchor securely to building construction. Construct items with joints formed for strength and rigidity, accurately machining for proper fit; where exposed to weather, form to exclude water.
2. Finishes:
   a. Ferrous Metal: After fabrication, but before erection, clean surfaces by mechanical or chemical methods to remove rust, scale, oil, corrosion, or other substances detrimental to bonding of subsequently applied protective coatings. For metal items exposed to weather or moisture, galvanize in manner to obtain G90 zinc coating in accordance with ASTM A123. Provide other non-galvanized ferrous metal with 1 coat of approved rust-resisting paint primer, in manner to obtain not less than 1.0 mil dry film thickness. Touch-up damaged areas with primer of same material before installation. Apply zinc coatings and paint primers uniformly and smoothly; leave ready for finish painting as specified elsewhere.
   b. Metal in contact with Concrete, Masonry and Other Dissimilar Materials:
      1) Where metal items are to be erected in contact with dissimilar materials, provide contact surfaces with coating of an approved zinc-chromate primer in manner to obtain not less than 1.0 mil dry film

thickness, in addition to other coatings specified in these specifications.

c. For Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

G. Metal Fabrication:

1. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.
2. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.
3. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of weld and methods used in correcting welding work, and with the following:
   a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   b. Obtain fusion without undercut or overlap.
   c. Remove welding flux immediately.
   d. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.
4. Provide hot dipped galvanized components for items exposed to weather.

END OF SECTION

SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Plastic Nameplates
   2. Tags
   3. Plastic Pipe Markers
   4. Detectable Underground Tape

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, submit Valve Schedule for each piping system, in tabular format using Microsoft Word or Excel software. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shutoff and similar special uses by special "flags" in margin of schedule. In addition to mounted copies, furnish extra copies for maintenance manuals. Provide schedules organized as follows:
   1. Equipment Type:
      a. Identification:
      b. Background:
         1) Size:
         2) Color:
      c. Lettering:
         1) Size:
         2) Color:

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification devices of types and sizes required.
   2. Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices unless otherwise indicated.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 22, Plumbing Sections. Where more than a single type is specified for application, provide single selection for each product category.

B. Plastic Nameplates:
   1. Brady Corporation
   2. Or approved equivalent.
C. Tags:
   1. Brady Corporation
   2. Brimar
   3. Champion America Inc.
   4. Craftmark
   5. Seton Identification Products
   6. Or approved equivalent.
D. Plastic Pipe Markers:
   1. Brady Corporation
   2. Brimar
   3. Champion America Inc.
   4. Craftmark
   5. Seton Identification Products
   6. Or approved equivalent.
E. Detectable Underground Tape:
   1. Brady Corporation
   2. Brimar
   3. Champion American Inc.
   4. Craftmark
   5. Seton Identification Products
   6. Or approved equivalent.

2.02 PLASTIC NAMEPLATES

A. Description: Engraving stock melamine plastic laminate 1/8-inch thick, engraved with engraver's standard letter style of the sizes and wording indicated.
   1. Letter Color: White.
   2. Letter Height: 1/2 inch.
   3. Background Color: Black.
   4. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.
   5. Access Panel Markers: Manufacturer's standard 1/16-inch thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve or devices/equipment. Include center hole to allow attachment.
   6. Signage for hot water outlets on 140 degree F hot water systems not protected by ASSE 1070 mixing valves; hose bibbs, janitor sinks, and fixtures used by trained personnel.
      a. Manufacturer's standard 1/8-inch thick engraved plastic laminate signage 4 by 4-inches.
      b. Letter Color: Red.
      c. Letter Height: 1/2 inch.
      d. Background Color: White.
      e. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2-inch diameter.

B. Metal Tags: Polished Brass with stamped letters; tag size minimum 1-1/2-inch diameter with smooth edges.

C. Valve designations to be coordinated with existing valve identifications to ensure no repetitive designations are utilized.

D. Chart/Schedules: Valve Schedule Frames. For each page of a valve schedule, provide glazed display frame with removable mounting as appropriate for wall construction upon which frame is to be mounted. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.

E. Valve Tag Fasteners: Solid brass chain (wire link or beaded type), or solid brass S-hooks.

F. Warning Tags: Preprinted or partially preprinted, accident-prevention tags; of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7-inches.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.
4. Color: Yellow background with black lettering.

2.04 PLASTIC PIPE MARKERS

A. Color: Conform to ASME A13.1 and ANSI Z535.1.

B. Plastic Pipe Markers (for external diameters of 6-inches and larger including insulation): Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers (for external diameters less than 6-inches including insulation): Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Minimum information indicating flow direction arrow and identification of fluid being conveyed.

2.05 DETECTABLE UNDERGROUND TAPE

A. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape with aluminum backing, minimum 6-inches wide by 4 mil thick, manufactured for direct burial service. Minimum information indicating flow direction arrow and identification of fluid being conveyed.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Lettering and Graphics:

1. General: Coordinate names, abbreviations and other designations used in plumbing identification work with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment.
2. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples: Chiller No. 3, Air Handling Unit No. 42, Standpipe F12, and the like).

B. Preparation: Degrease and clean surfaces to receive adhesive for identification materials.

C. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.
D. Install valve schedule at each mechanical room.
E. Access Doors: Provide markers on each access door and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions.

3.02 PLASTIC NAMEPLATES

A. Identify pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates riveted to equipment body.
B. Identify control panels and major control components outside panels with plastic nameplates riveted to equipment body.
C. Install plastic nameplates with corrosive-resistant mechanical fasteners.

3.03 TAGS

A. Small devices, such as in-line pumps, may be identified with tags. Use metal tags on piping 3/4-inch diameter and smaller.
B. Identify valves in main and branch piping with metal tags. Indicate valve function and the normally open or closed positions on the valve tag.
C. Coordinate with the facility maintenance personnel to ensure consistency with the existing tagging system.
D. Tag balancing valves with balanced GPM or CFM indicated after balancing is completed and accepted.
E. Install tags with corrosion resistant chain.

3.04 PLASTIC PIPE MARKERS

A. Install plastic pipe markers in accordance with manufacturer's instructions.
B. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
C. For exterior underground piping installations, install underground plastic pipe markers with tracer wire 6 to 8-inches below finished grade directly above buried pipe.
D. Identify piping, concealed or exposed, with plastic tape pipe markers. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20-feet (reduced to 10-feet in congested areas and mechanical equipment rooms) on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction. Locate near branches, valves, control devices, equipment connections, access doors, floor/wall penetrations.

3.05 DETECTABLE UNDERGROUND TAPE

A. For underground piping installations, Install underground plastic pipe markers with tracer wire 6-inches to 8-inches below finished grade, directly above buried pipe.

END OF SECTION

SECTION 22 07 00
PLUMBING INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Type 1, Glass Wool Pipe Insulation
   2. Type 2, Flexible Elastomeric Insulation
   3. Type 7, ADA Accessible Lavatory/Sink Insulation Kit
   4. Accessories
   5. Pipe Fitting Insulation Covers

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Piping insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Installer qualifications.
   2. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any) for each type of product indicated.
   3. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.
   4. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.
   5. Submit manufacturer's installation instructions.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements apply to this Section.

B. In addition, meet the following:
   1. Formaldehyde Free: Should be third-party certified with UL Environment Validation.
   2. Recycled Content: A minimum of 40 percent post-consumer recycled glass content certified and UL validated.
   3. Low Emitting Materials: For all thermal and acoustical applications of Glass Mineral Wool Insulation products, provide materials complying with the testing and products requirements of UL GREENGUARD Gold Certification.
   4. Installer to have minimum 5 years' experience in the business of installing insulation.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.07 FIRE HAZARD CLASSIFICATION

A. Maximum fire hazard classification of the composite insulation construction as installed to be not more than a Flame Spread Index (FSI) of 25 and Smoke Developed Index (SDI) of 50 as tested by current edition of ASTM E84 (NFPA 255) method.

B. Test pipe insulation in accordance with requirements of current edition of UL "Pipe and Equipment Coverings".

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Type 1, Glass Wool Pipe Insulation:
   1. Owens-Corning
   2. Johns Manville
   3. Or approved equivalent.

B. Type 2, Flexible Elastomeric Insulation:
   1. Insulation:
      a. Armacell LLC Armaflex
      b. K-Flex
      c. Or approved equivalent.
   2. Glue:
      a. Armacell LLC Armaflex Low VOC Adhesive
      b. K-Flex
      c. Or approved equivalent.
   3. Paint:
      a. Armacell LLC Armaflex
      b. K-Flex
      c. Or approved equivalent.

C. Type 7, ADA Accessible Lavatory/Sink Insulation Kit:
   1. IPS/Truebro
   2. McGuire/Pro-Wrap
   3. Plumberex/Pro-Extreme
   4. Brocar Trap Wrap

D. Accessories:
   1. ITW Insulation Systems
   2. Or approved equivalent.

E. Pipe Fitting Insulation Covers:
   1. Zeston Johns Manville
   2. ITW Insulation Systems
   3. Or approved equivalent.

2.02 TYPE 1, GLASS WOOL PIPE INSULATION

A. Glass Fiber: ASTM C547 Type I and IV; rigid molded, noncombustible.
   1. Thermal Conductivity Value: 0.27 BTU*in/(hr*sf*F) at 75 degrees F.
   2. Maximum Service Temperature: 850 degrees F to 1000 degrees F.
   3. Vapor Retarder Jacket: White Kraft paper reinforced with glass fiber and bonded to aluminum foil, with self-sealing longitudinal laps and butt strips or vapor barrier mastic.

2.03 TYPE 2, FLEXIBLE ELASTOMERIC INSULATION

A. Elastomeric Foam: ASTM C534; flexible, cellular elastomeric, molded or sheet.
   1. Thermal Conductivity Value: 0.25 BTU*in/(hr*sf*F) at 75 degrees F.
   2. Maximum Service Temperature of 220 degrees F.

3. Maximum Flame Spread: 25.
4. Maximum Smoke Developed: 50 (3/4-inch thick and below).
5. Connection: Waterproof vapor retarder adhesive as needed.
6. UV Protection: UV outdoor protective coating per manufacturer's requirements.

B. Glue: Contact adhesive specifically manufactured for cementing flexible elastomeric foam.

C. Paint: Nonhardening high elasticity type, specifically manufactured as a protective covering of flexible elastomeric foam insulation for prevention of degradation due to exposure to sunlight and weather.

2.04 TYPE 7, ADA ACCESSIBLE LAVATORY/SINK INSULATION KIT

A. P-traps, trap arms, tail pieces, hot water and cold water insulating guards meeting ASTM C1822. Molded closed cell insulation with vinyl cover and nylon fasteners, paintable. Provide accessories as required for complete installation covering all exposed waste piping, water piping, stops and supplies. Color white.

2.05 ACCESSORIES

A. Equipment Insulation Compounds: Provide adhesives, cement, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.

B. Provide staples, bands, wire, wire netting, tape corner angles, anchors, stud pins and metal covers as recommended by insulation manufacturer for applications indicated. Accessories, i.e., adhesives, mastics, cements and tape to have same flame and smoke component ratings as insulation materials with which they are used. Shipping cartons to bear a label indicating that flame and smoke ratings do not exceed those listed above. Provide permanent treatment of jackets or facings to impart flame and smoke safety. Provide non-water soluble treatments. Provide UV protection recommended by manufacturer for outdoor installation.

2.06 PIPE FITTING INSULATION COVERS

A. PVC Plastic Fitting Covers: Schuller Zeston 2000, Knauf Proto Fitting or approved equivalent. One-piece molded type fitting covers and jacketing material, gloss white. Connections: Tacks; pressure sensitive color matching vinyl tape.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION INFORMATION

A. Verification of Conditions:
1. Do not apply insulation until pressure testing and inspection of piping has been completed.
2. Examine areas and conditions under which insulation will be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Preparation: Clean and dry surfaces to be insulated.

C. Installation:
1. Insulation: Continuous through walls, floors, and partitions except where noted otherwise.
2. Piping and Equipment:
a. Install insulation over clean, dry surfaces with adjoining sections firmly butted together and covering surfaces. Fill voids and holes. Seal raw edges. Install insulation in a manner such that insulation may be split, removed, and reinstalled with vapor barrier tape on strainer caps and unions. Do not install insulation until piping has been leak tested and has passed such tests. Do not insulate manholes, equipment manufacturer's nameplates, handholes, and ASME stamps. Provide beveled edge at such insulation interruptions. Repair voids or tears.

D. Provide accessories as required. See Part 2 Article "Accessories" above.

E. Protection and Replacement: Protect installed insulation during construction. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

F. Labeling and Marking: Provide labels, arrows and color coding on piping. Attach labels and flow direction arrows to jacketing per Section 22 05 53, Identification for Plumbing Piping and Equipment.

G. Insulation Shields: Provide hangers and shields (18 gauge minimum) outside of insulation for cold piping (<60 degrees F). Hot water piping hangers may penetrate insulation to contact pipe directly. Provide 18-inch long, noncompressible insulation section at insulation shields for lines 1-1/2-inches and larger (hot and cold piping).

H. Piping Surfaces to be Insulated:

Item to be Insulated	System Insulation Type	Pipe Size	Insulation Thickness
Hot Water Piping Above Grade (105F to 140F)	1	Runouts =<1-1/4-inch (uncirculated branches located in partitions within conditioned spaces) Mains =<1-1/4-inch Mains >1-1/4-inch	1-inch 1-inch 1-1/2-inch
Cold Water Piping Above Grade	1	=<1-1/2-inch >1-1/2-inch	1/2-inch 1-inch
ADA Accessible Lavatory/Sink	7	All	As Listed

3.02 TYPE 1 , GLASS WOOL PIPE INSULATION

A. See General Installation Requirements above.

B. Install in accordance with manufacturer's instructions for below grade installation.

C. Lap seal insulation with waterproof adhesive. Do not use staples or other methods of attachment which would penetrate vapor barrier. Apply fitting covers with seated tacks and vapor barrier tape.

D. Apply insulation to pipe and seal with self-sealing lap. Use self-sealing butt strips to seal butt joints. Insulate fittings, valves and unions with single or multiple layers of insulation and cover to match pipe or use preformed PVC molded insulation covers.

3.03 TYPE 2, FLEXIBLE ELASTOMERIC INSULATION

A. See General Installation Requirements above.

B. Install in accordance with manufacturer's instructions for below grade installation.

C. Slip insulation on pipe prior to connection. Butt joints sealed with manufacturer's adhesive. Insulate fitting with miter-cut pieces. Cover insulation exposed to weather and undergrade with two coats of finish as recommended by manufacturer.

D. Flexible Elastomeric Tubing: Slip insulation over piping or if piping is already installed, it should be slit and snapped over piping. Joints and butt ends must be adhered with 520 adhesive.

3.04 TYPE 7, ADA ACCESSIBLE LAVATORY/SINK INSULATION KIT

A. See General Installation Requirements above.

B. Install in accordance with manufacturer's instructions.

C. Provide lavatory/sink insulation kit. Install on waste fittings, hot and cold water stops and supplies.

3.05 ACCESSORIES

A. See General Installation Requirements above.

B. Install in accordance with manufacturer's instructions.

C. Furnish and install accessories for all insulation types listed in this Section.

3.06 PIPE FITTING INSULATION COVERS

A. See General Installation Requirements above.

B. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 22 10 00
PLUMBING PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Sanitary, Drainage DWV Piping, Buried Within 5-feet of Building
   2. Sanitary, Drainage DWV Piping, Above Grade
   3. Hot and Cold Domestic Water Above Grade
   4. Primer Piping
   5. Piping Specialties
   6. Cleanouts

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. NSF 61, Annex G.
   2. Steel pipe to conform to ASTM and ANSI Standards as specified in this Section.
   3. Copper piping to conform to ASTM B88, B306 and B208 and the standards of Copper Development Association (CDA), and American Welding Society, (AWS).
   4. Cast Iron Piping to conform to standards of ASTM A-74, CISPI 301 and FM 1680.
   5. Manufacturer's Standards Society (MSS) for valving and support reference standard.
   6. American Water Works Association (AWWA) for Valving Assembly Standards.
   7. American Society of Sanitation Engineers (ASSE) for Valving Standards.
   8. American National Standards Institute (ANSI) for Piping Standards.
   9. NFPA Standard 51B - “Fire Prevention in Use of Cutting and Welding Processes”.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. See component manufacturers listed in individual articles below.
B. ADS
C. American-USA
D. Cerro
E. Charlotte
F. Clamp-All
G. Elkhart
H. Enfield

I. Gruvlok
J. Husky
K. Ideal
L. Mifab
M. Mission
N. Mueller
O. Nibco
P. Orion
Q. Sioux Chief
R. Spears
S. Tyler
T. Cleanouts:
    1. J.R. Smith
    2. Sioux Chief
    3. Wade
    4. Watts
    5. Zurn
U. Firestopping Penetrations in Fire Rated Wall Floor Assemblies:
    1. Hilti
    2. Proset
    3. Or approved equivalent.

2.02 GENERAL

A. Provide pipe, tube and fittings of the same type, fitting requirements, grade, class and the size and weight indicated or required for each service, as indicated in other Division 22, Plumbing Specifications. Where type, grade, or class is not indicated, provide proper selection as determined by installer for installation requirements, and comply with governing regulations and industry standards.
B. Manufactured materials delivered, new to the project site and stored in their original containers.
C. Product Marking: Furnish each item with legible markings indicating name brand and manufacturer, manufacturing process, heat number and markings as required per ASTM and UL/FM Standards.

2.03 SANITARY, DRAINAGE DWV PIPING, BURIED WITHIN 5-FEET OF BUILDING

A. Cast Iron Pipe: ASTM A888/CISPI 301 hubless.
    1. Fittings: Cast iron.
    2. Coupling Assembly:
        a. Heavy Duty: ASTM C1540, Clamp-All Hi-Torq 125, Husky SD 4000, Mifab QXHUB, Mission HeavyWeight couplings.
        b. Mechanical joint coupling for hubless pipe and fittings is to consist of an elastomeric sealing sleeve and a metallic shield that comply with CISPI 310, ASTM C or ASTM C 1540. The elastomeric sealing sleeve is to conform to ASTM C564 or CSA B602 and is to be provided with a center stop. Mechanical joint couplings are to be installed in accordance with the manufacturer's instructions.

2.04 SANITARY, DRAINAGE DWV PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A888/CISPI 301 hubless.
    1. Fittings: Cast iron.
    2. Coupling Assembly:

a. Standard Duty: ASTM C1277 or CISPI 310.

2.05 HOT AND COLD DOMESTIC WATER ABOVE GRADE

A. Copper Tube: 2-1/2-inches and smaller. ASTM B88 (ASTM B88M), Type L (B), Drawn.
   1. Fittings: ASME B16.18 copper.
   2. Joints: ASTM B32, alloy Sn95 solder.

B. Copper Tube: ASTM B88 (ASTM B88M), Type L (B) for 2-1/2-inches and smaller, Type K, Drawn.
   1. Fittings: Fittings are to be manufactured to copper tubing sizes, with grooves designed to accept grooved end couplings of the same manufacturer. Fittings are to be wrought copper, conforming to ASTM B75 alloy C12200 or ASTM B-152 alloy C11000 and ANSI B16.22.

2.06 PRIMER PIPING

A. Above Ground: Type L hard-drawn copper tubing with wrought sweat fittings and soldered joints.

B. Below Ground: Type L soft annealed copper tubing with wrought sweat fittings and brazed joints.

C. Below Ground: Cross-linked polyethylene (PEX) and engineered plastic fittings.

2.07 PIPING SPECIALTIES

A. Pipe Escutcheons:
   1. Provide pipe escutcheons as specified with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime zinc base paint finish for unoccupied areas.
   2. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide stainless steel, cast brass or sheet brass escutcheons, solid or split hinged.
   3. Pipe Escutcheons for Dry Areas: Provide stainless steel escutcheons, solid or split hinged.

B. Low Pressure Y-Type Pipeline Strainers:
   1. Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 125 percent of the working pressure of piping system with Type 304 stainless steel screens made with 1/16-inch perforations on 4-inch and smaller strainers, and 1/8-inch perforations on 6-inch and larger strainers.
   2. Threaded Ends, 2-inch and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with plus.
   3. Flanged Ends, 2-1/2-inch and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with hose bibb.

C. Air Vent with Valves:
   1. Install automatic air vents in all closed and open-loop water systems at high points and at any other point necessary to free system of air. Provide shut-off valve in riser to each automatic vent valve to facilitate servicing. Manual type vent may be used in lieu of automatic type, where specifically shown on the Drawings.
   2. Manufacturer: Hoffman #79.

D. Dielectric Waterways:

1. Provide standard products recommended by manufacturers in service indicated, which effectively isolate ferrous from non-ferrous piping (eliminating electrical conductance) to prevent galvanic action and stop corrosion.
2. Provide dielectric waterways or brass nipple fitting for transitions between dissimilar metal piping.

E. Unions:
1. Unions to comply with the following schedule:
   a. Black Steel, 2-inch and smaller: 150 PSI screwed malleable iron, ground joint, brass to iron seat.
   b. Black Steel, 2-1/2-inch and larger: 150 PSI cast iron screwed flanged, flat faced, full faced gasket.
   c. Soldered Copper or Brass Pipe, 2-inch and smaller: 150 PSI cast bronzed or copper, ground joint, non-ferrous seat with soldered ends.
   d. Screwed Copper or Brass Pipe, 2-inch and smaller: 150 PSI cast brass, ground joint, brass to brass seat, threaded ends.
   e. Flanged Copper or Brass Pipe, 2-1/2-inch and larger: Two 150 PSI cast bronze flanges.
   f. Manufacturer: EPCO, Mueller, Stanley G. Flagg, Watts, or approved equivalent.

F. Flexible Piping Connectors - Expansion Loops or Seismic Joints:
1. Provide flexible expansion loops of size and material noted on Drawings. Design flexible loops to impart no thrust loads on the anchors. The loop consists of two flexible sections of hose and braid, two 90 degree elbows, and a 180 degree return. Install loops in a neutral, precompressed, or pre-extended condition as required for the application. Provide drain plug for loops installed hanging down. Loops installed straight up may be fitted with an automatic air release valve to purge air from the high point of the loop. Loops installed in any position other than hanging down must have the 180 degree return supported.
2. Copper Pipe: Copper fittings, bronze hose and braid sweat solder ends, Metraloop Series MLS 8000.
3. Steel Pipe: Schedule 40 carbon steel fittings, stainless steel hose and braid.
4. Threaded Ends: Metraloop Series MLT 80000.
5. Flanged Ends: Metraloop Series MLF 80000.
6. Welded Ends: Metraloop Series MLW 80000.
7. Grooved Ends: Metraloop Series MLG 80000.
8. Provide expansion joints by Mason, Flexionics, or Shur Fit, for vertical and horizontal straight run hot water and domestic hot water recirculation piping exceeding 1,000-feet. Install per manufacturer's installation directions.

2.08 CLEANOUTS

A. Locate cleanouts as shown on Drawings and as required by local code. Cleanouts same size as pipe except that greater than 4-inches will not be required. Plastic components not allowed, except unless specifically noted.

B. Types:
1. Tile Floor Cleanouts: J. R. Smith 4020 with round heavy-duty nickel bronze top, taper thread, ABS plug and vandalproof screws.
2. Carpeted Floor Cleanout: J. R. Smith 4020-X with carpet clamping frame, round heavy-duty nickel bronze top, taper thread, ABS plug, carpet clamping device and vandalproof screws.

3. Concrete Floor Cleanout (General): J. R. Smith 4020 with round heavy-duty nickel bronze top, taper thread and ABS plug with vandalproof screws.
4. Wall Cleanout: J. R. Smith 4472-U, countersunk bronze taper thread plug, stainless steel shallow cover and vandalproof screws.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Underground Piping Systems:
1. Examination: Verify that excavations are to required grade, dry, and not over-excavated.
2. Perform necessary excavation and backfill required for installation of plumbing work. Repair piping or other work at no expense to Owner.
3. Water: Keep excavations free of standing water. Re-excavate and fill back excavations damaged or softened by water or frost to original level with sand, crushed rock or other approved material at no expense to Owner.
4. Tests: During progress of work for compacted fill, Owner reserves right to request compaction tests made under direction of testing laboratory.
5. Trench Excavation: Excavate trenches to necessary depth and width, removing rocks, unstable soil (muck, peat), roots and stumps. Excavation material is classified as "base fill" and "native." Base fill excavation material consisting of placed crushed rock may be used as backfill above "Pipe Zone." Remove and dispose off site native excavation material. Adequate width of trench for proper installation of piping or conduit.
6. Support Foundations:
   a. Foundations: Excavate trenches located in unstable ground areas below elevation required for installation of piping to depth which is determined by Architect as appropriate for conditions encountered. Place and compact approved foundation material in excavation up to "Bedding Zone." Dewatering, placement, compaction and disposal of excavated materials to conform to requirements contained in other Specification Sections or Drawings.
   b. Over-Excavations: Where trench excavation exceeds required depths, provide, place and compact suitable bedding material to proper grade or elevation at no additional cost to Owner.
   c. Foundation Material: Where native material has been removed, place and compact necessary foundation material to form base for replacement of required thickness of bedding material.

	Class A		**Class B**	
Material Passing	**Min.**	**Max.**	**Min.**	**Max.**
3/4-inch Square Opening	**27**	**47**	**0**	**1**

   d. Bedding Material: Full bed piping on sand, pea gravel, or 3/4-inch minus crushed rock. Place minimum 4-inch deep layer of sand, pea gravel, or crushed rock on leveled trench bottom for this purpose. Remove bedding to necessary depth for piping bells and couplings to maintain contact of pipe on bedding for its entire length. Provide additional bedding in excessively wet,

unstable, or solid rock trench bottom conditions as required to provide firm foundation.

7. Backfilling:
   a. Following installation and successful completion of required tests, backfill piping in lifts.
      1) In "Pipe Zone" place backfill material and compact in lifts not to exceed 6-inches in depth to height of 12-inches above top of pipe. Place backfill material to obtain contact with entire periphery of pipe, without disturbing or displacing pipe.
      2) Place and compact backfill above "Pipe Zone" in layers not to exceed 12-inches in depth.
   b. Backfill Material:
      1) Backfill Material in "Pipe Zone": 3/4-inch minus crushed rock, sand or pea gravel.
      2) Crushed rock, fill sand or other backfill material approved elsewhere in Specifications may be used above "Pipe Zone."
8. Compaction of Trench Backfill:
   a. Where compaction of trench backfill material is required, use one of following methods or combination thereof:
      1) Mechanical tamper,
      2) Vibratory compactor, or
      3) Other approved methods appropriate to conditions encountered.
   b. Architect to have right to change methods and limits to better accommodate field conditions. Compaction sufficient to attain 95 percent of maximum density at optimum moisture content unless noted otherwise on Drawings or elsewhere in Specifications. Water "puddling" or "washing" is prohibited.

B. General Installation:
1. Work performed by experienced journeyman plumbers. No exceptions.
2. Provide access panels for concealed valves, shock arrestors, trap primers and the like.
3. Install pipes and pipe fittings in accordance with recognized industry practices and manufacturer's recommendations.
4. Align piping accurately at connections, within 3/32-inch misalignment tolerance. Comply with ANSI B31 Code for Pressure Piping.
5. Locate piping runs, as indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details, and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, and other structural and permanent-enclosure elements of building. Limit clearance to 1/2-inch where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1-inch clearance outside insulation. Whenever possible in finished and occupied spaces, conceal piping from view by locating it in column enclosures, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as indicated.
   a. Do not run piping through transformer vaults, telephone, elevator, electrical or electronic equipment spaces or enclosures unless indicated on Drawings.

b. Concealed Piping Above Suspended Ceiling: Plan and coordinate to avoid interferences; install to maintain suspended ceiling heights shown on Architectural Drawings. Allow sufficient space above removable ceiling panels for panel removal. Locate piping so that valves are visible and accessible within 24-inches horizontally and vertically from point of access to the ceiling space. Provide plenum rated materials for ceiling spaces which are being used as plenums.

c. Exposed Work: Run pipes parallel to the closest wall unless otherwise shown on Drawings; maintain maximum headroom; avoid light fixtures.

d. Insulation Space Allowance: In piping work, allow space for pipe insulation and jackets. If interferences occur, move the piping to accommodate insulation thickness specified.

e. Pipe Lengths: Do not use short lengths or nipples at locations where a full length of pipe will fit.

f. Alignment Prior to Supporting and Anchoring: Place piping in proper alignment and position prior to connection to anchors, expansion loops, and equipment. Furnish jacking devices, temporary steel structural members, and assembled structures as necessary. Remove temporary equipment and structures supplied by contractor at completion; such items to remain Contractor property.

g. Valve and Equipment Connections: Piping not to place undue stress on flanged valves and equipment connections. Install mating flange faces true and parallel to each other and not requiring springing of piping for assembly. Pipe hangers and supports to carry the full weight of the pipe and fluid.

h. Piping Leaks: Correct immediately; use new materials; leak-sealing compounds or peening not permitted.

i. Pressure Ratings of Fittings, Valves, and Devices in Piping Systems: Pressure rating to be equal to, or greater than, the maximum working pressure of the system.

j. Equipment Vents and Drains: Provide for coils and vessels which contain water. Provide isolation valves and outlet valves at piping high and low points to permit venting and draining of the vessel without venting and draining connected piping. Provide hose connections and caps on drain lines.

k. Escutcheon Plates: Where exposed insulated and uninsulated piping passes through walls, floors or ceilings; provide spring clip type. Provide plates on both sides of wall or floor.

C. Testing:

1. General:

a. Provide temporary equipment for testing, including pumps, compressors, tanks, and gauges, as required. Test piping systems before insulation (if any) is installed and remove or disengage control devices before testing. Where necessary, test sections of each piping system independently, but do not use piping valves to isolate sections where test pressures exceed local valve operating pressure rating. Fill each section with water, compressed air, or nitrogen and pressurize for the indicated pressure and time.

b. Notify Architect and local Plumbing Inspector 2 days before tests.

c. Drainage, Waste and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, to permit system to be filled with water and

subjected to water pressure of minimum of 5 PSI head. System to hold water without water level drop greater than 1/2 pipe diameter of largest nominal pipe size within 24-hour period. Test system in sections if minimum head cannot be maintained in each section. 5 PSI head to be minimum pressure at highest joint.

d. Water Piping: Eliminate air from system. Fill and test at 125 PSIG or minimum 1-1/2 times static pressure at connection to serving utility main for period of two hours with no loss in pressure.

e. Send test results to Architect for review and approval and include in Operation and Maintenance Manual.

2. Testing of Pressurized Systems:

a. Test each pressurized piping system at 150 percent of operating pressure indicated, but not less than 125 PSIG test pressure.

b. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 2 percent of test pressure.

3. Test hot and cold domestic water piping systems upon completion of rough-in and before connection to fixtures at hydrostatic pressure of 125 PSIG.

D. Corrosive Soil Conditions:

1. Wrap steel, iron, copper or other metal piping materials/fittings with Protecto Wrap 200, 30 mils or greater. Maintain a 1/2-inch overlap and install per manufacturer's recommendations.

2. Provide epoxy coated cast iron pipe and fittings for drainage systems.

3. Obtain and review project soils report for verification of requirements concerning corrosive soils.

E. Protection:

1. Keep pipe openings closed by means of plugs or caps to prevent entrance of foreign matter. Protect piping, ductwork, fixtures, equipment and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore to its original condition or replace fixtures, equipment or apparatus damaged prior to final acceptance of work.

F. Firestopping Penetrations in Fire-Rated Wall/Floor Assemblies:

1. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet requirements of ASTM E814.

G. Cut piping squarely, free of rough edges and reamed to full bore. Insert piping fully into fittings.

H. Provide joints of type indicated in each piping system.

I. Thread pipe in accordance with ANSI/ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Remove excess cutting oil from piping prior to assembly. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed.

J. Sleeves:

1. Pipe Sleeves:

a. Layout work in advance of pouring concrete, furnish, and set sleeves necessary to complete work.

b. Floor Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Extend sleeve 1-inch above finished floor. Caulk pipes passing through floor with non-shrinking grout or approved caulking

compound (Except DWV Piping penetrating a concrete slab set on finish grade), provide "Link-Seal" sleeve sealing system for concrete/slab penetrations which are below grade. Caulk/seal piping passing through fire rated building assembly with UL rated assemblies. Provide fire-rated assemblies per local AHJ requirements

c. Wall Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Provide sleeve flush with finished face of wall. Caulk pipes passing through walls with non-shrinking caulking compound. Provide modular link sealing system for concrete penetrations which are below grade. Caulk/seal piping passing through fire-rated assemblies per local AHJ requirements.

d. Beam Sleeves: Coordinate with trades for locations of pipe sleeves in reinforced concrete and steel beams. Indicate penetrations on structural shop drawings. See Drawings and Specifications for specific sleeve location limitations. Plumbing Drawings are diagrammatic. Offset piping as required to meet these limitations. Pipe sleeve locations must be indicated on reinforced concrete and steel beam shop drawings. Field cutting of beams not allowed without written approval of structural engineer. No extra costs allowed for failure to coordinate beam penetrations prior to reinforced concrete and steel beam shop drawing submittal.

2. Installation of metallic or plastic piping penetrations through non fire-rated walls and partitions and through smoke-rated walls and partitions:
   a. Install fabricated pipe sleeve.
   b. After installation of sleeve and piping, tightly pack entire annular void between piping or piping insulation and sleeve identification.
   c. Seal each end airtight with a resilient nonhardening seal per code.
3. Piping penetrations through fire-rated (1 to 3 hour) assemblies:
   a. Select and install pre-engineered pipe penetration system in accordance with UL listing and manufacturer's recommendation.
   b. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet requirements of ASTM E84.

3.02 SANITARY, DRAINAGE DWV PIPING, BURIED WITHIN 5-FEET OF BUILDING

A. Excavation and Backfill:
   1. See General Requirements above.

B. Drainage, Waste and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, to permit system to be filled with water and subjected to water pressure of minimum of 5 PSI head. System to hold water without water level drop greater than 1/2 pipe diameter of largest nominal pipe size within 24-hour period. Test system in sections if minimum head cannot be maintained in each section. 5 PSI head to be minimum pressure at highest joint.

C. Corrosive Soil Conditions:
   1. Wrap steel, iron, copper or other metal piping materials/fittings with Protecto Wrap 200, 30 mils or greater. Maintain a 1/2-inch overlap and install per manufacturer's requirements.
   2. Provide epoxy coated cast iron pipe and fittings for drainage systems.

D. Cast-Iron Joints: Comply with coupling manufacturer's Cast Iron Soil Pipe Institute Standards and installation instructions.

E. Sanitary Drainage:

1. Grade piping at a uniform pitch of 2 percent unless otherwise noted on Drawings.
2. Drains:
   a. Install drains to suit finished floor. Install drains and components per manufacturer's instructions. Slope flooring to floor drain or sink a minimum of 1/2-inch below finished floor elevation.
   b. Install P-traps for hub drains, floor drains and floor sinks. P-traps to be of the same materials as soil and waste piping. Provide trap primer assembly for each drain.

3.03 SANITARY, DRAINAGE DWV PIPING, ABOVE GRADE

A. Drainage, Waste and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, to permit system to be filled with water and subjected to water pressure of minimum of 5 PSI head. System to hold water without water level drop greater than 1/2 pipe diameter of largest nominal pipe size within 24-hour period. Test system in sections if minimum head cannot be maintained in each section. 5 PSI head to be minimum pressure at highest joint.

B. Firestopping Penetrations in Fire-Rated Wall/Floor Assemblies:
   1. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet requirements of ASTM E814.

C. Cast-Iron Joints: Comply with coupling manufacturer's Cast Iron Soil Pipe Institute Standards and installation instructions.

D. Sanitary Drainage:
   1. Grade piping at a uniform pitch of 2 percent unless otherwise noted on Drawings.
   2. Indirect Waste or Drain Piping: Extend piping to discharge as shown on Drawings. Maintain minimum air gap. Provide traps on indirect waste or drain piping exceeding 60-inches.
   3. Fixture Carriers: Concealed fixture carriers for wall hung plumbing fixtures are specified in Section 22 40 00, Plumbing Fixtures.
   4. Drains:
      a. Install drains to suit finished floor. Install drains and components per manufacturer's instructions. Slope flooring to floor drain or sink a minimum of 1/2-inch below finished floor elevation.
      b. Install P-traps for floor drains. P-traps to be of the same materials as soil and waste piping. Provide trap primer assembly for each drain.
   5. Wall Access Panel: Secure to wall framing and install so that flange forms a close fitting joint with the finished wall surface.

3.04 HOT AND COLD DOMESTIC WATER ABOVE GRADE

A. Water Piping: Eliminate air from system. Fill and test at 125 PSIG or minimum 1-1/2 times static pressure at connection to serving utility main for period of two hours with no loss in pressure.

B. Testing of Pressurized Systems:
   1. Test each pressurized piping system at 150 percent of operating pressure indicated, but not less than 125 PSIG test pressure.
   2. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 2 percent of test pressure.

C. Test hot and cold domestic water piping systems upon completion of rough-in and before connection to fixtures at hydrostatic pressure of 125 PSIG.

D. Firestopping Penetrations in Fire-Rated Wall/Floor Assemblies:

1. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet requirements of ASTM E814.

E. Solder copper tube and fitting joints with lead free nickel/silver bearing solder meeting ASTM Std. B-32, in accordance with IAPMO Is 3-93, ASTM B-828 and Copper Development Association recommended procedures. Clean joints by other than chemical means prior to assembly. "Shock" cooling is prohibited. Fluxes to be water soluble for copper and brass potable water applications, and meeting CDA standard test method 1.0 and ASTM B813-91. Apply solder until a full fillet is present around the joint. Do not apply solder and flux in such excessive quantities as to run down interior of pipe. Lead solder or corrosion flux not to be present at the jobsite.

F. Braze copper tube and fitting socket with BCuP series filler metal without flux. Use listed brazing flux for joining of copper tube to brass or bronze fittings, meeting AWS FB3A or FB3C. "Shock" cooling is prohibited. A continuous fillet is to be visible around the completed joint. After cooling, thoroughly remove flux residue with warm water and a brush prior to testing. Do not use BCuP filler on copper alloys containing over 10 percent nickel. Cap or plug piping during construction to prevent entry of foreign material.

G. Domestic Water:

1. "Piping" to include pipes, fittings, nipples, valves and accessories connected thereto.
2. Run piping generally parallel to the axis of the building, arranged to conform to the building requirements and to suit the necessities of clearance for other mechanical ducts, flues, conduits and work of other trades, and as close to ceiling or other construction as practical, free of unnecessary traps or bends.
3. Grade water supply piping for complete drainage of the system. Install hose bibbs at low points.
4. Use unions for piping connections to equipment.
5. Provide sufficient elbows, swings and offsets to permit free expansion and contraction.
6. Use reducers or increasers. Use no bushings.
7. Ream or file each pipe to remove burrs. Inspect each length of pipe and each fitting for workmanship and clear passageways.
8. Cover, cap or otherwise protect open ends of piping during construction to prevent damage to threads or flanges and prevent entry of foreign matter. Disinfect and sterilize water supply piping as specified. Furnish written report on final water quality results.
9. Install exposed connections to equipment with special care, showing no tool marks or threads at fittings and piping. No bowed or bent piping permitted.
10. Make ferrous to non-ferrous connections with dielectric fittings.
11. Use extra heavy pipe for nipples, where unthreaded portion is less than 1-1/2-inches. Use no close nipples. Use only shoulder-type nipples.
12. Through-Wall Pipes: Type 'L' copper tubing for through-wall pipes which connect to exposed stops at wall surface. Anchor the pipes in the wall; attach pipe with U-bolts to steel back-up plates or steel angles anchored in the wall. Provide wrought copper elbow which securely anchors ears in wall at through-wall pipes.
13. Provide drain valves at base of risers and at low points on the system.
14. Backflow Preventers: Pipe relief to nearest drain. Slope at 2 percent.

H. Sterilization of Domestic Water System:

1. General: Upon completion of tests and necessary replacements, thoroughly flush and disinfect domestic water piping.
2. Method: After thoroughly flushing system with water to remove sediment, fill system with a solution containing 50 parts per million of chlorine for not less than 24 hours or 200 parts per million of chlorine for not less than 3 hours. After retention, drain, reflush and return system to service.
3. Certification: Provide copy of domestic water chlorination certificate in each operations and maintenance manual.
4. Provide water line disinfections performed by a licensed contractor with training in potable water line disinfections.

3.05 PRIMER PIPING

A. Excavation and Backfill:
   1. See General Requirements above.

B. Testing:
   1. See General Requirements above.

3.06 PIPING SPECIALTIES

A. Excavation and Backfill:
   1. See General Requirements above.

B. Drainage, Waste, and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, to permit system to be filled with water and subjected to water pressure of minimum of 5 PSI head. System to hold water without water level drop greater than 1/2 pipe diameter of largest nominal pipe size within 24-hour period. Test system in sections if minimum head cannot be maintained in each section. 5 PSI head to be minimum pressure at highest joint.

C. Corrosive Soil Conditions:
   1. Wrap steel, iron, copper or other metal piping materials/fittings with Protecto Wrap 200, 30 mils or greater. Maintain a 1/2-inch overlap and install per manufacturer's requirements.
   2. Provide epoxy coated cast iron pipe and fittings for drainage systems.

D. Cast-Iron Joints: Comply with coupling manufacturer's Cast Iron Soil Pipe Institute Standards and installation instructions.

3.07 CLEANOUTS

A. Install in aboveground piping and building drain piping as indicated, as required by code; at each change in direction of piping greater than 135 degrees; at minimum intervals of 100-feet; and at base of each vertical soil or waste stack. Install floor and wall cleanout covers for concealed piping. Select type to match adjacent building finish. Provide shop drawings to Architect to coordinate locations and types of cleanouts with Architect prior to installation.

END OF SECTION

SECTION 22 30 00
PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Water Heaters Tank-Less Electric

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Seismic anchor details and calculations signed and stamped by licensed Oregon structural engineer with equipment data.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. NSF 61, Annex G compliant.
   2. ISO 9001 Certified.
   3. IAPMO Low Lead Certification.

C. Products approved for installation by state authorizing agency, no exceptions.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Water Heaters Tank-Less Electric:
   1. Chronomite InstaFlow Micro Model M
   2. EEMax
   3. Stiebel Eltron
   4. Or approved equivalent.

2.02 GENERAL

A. Reference Drawings for capacities and specific model numbers.

2.03 WATER HEATERS TANK-LESS ELECTRIC

A. System: Domestic water.

B. Factory assembled packaged tank-less electric water heater utilizing microprocessor for temperature control. Heat water ways with high temperature coil electrical heating elements. 150 PSI working pressure. Cast aluminum or steel jacket with baked enamel finish. Pilot light to indicate when unit is operating. Prewire heaters ready for single electrical connection and bear UL label. Heater capable of operation within minimum and maximum operating flow rates and pressures of fixtures served and system operating pressure

PART 3 - EXECUTION

3.01 GENERAL

A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

C. Orients so controls and devices needing service and maintenance have adequate access.

D. Certificates: Submit appropriate Certificates of Shop Inspection and Data Report as required by provisions of ASME Boiler and Pressure Vessel Code.

E. Connect water piping to units with shutoff valves and unions.

F. Equipment Rigging: Heavy duty rigging eye bolts for Crosby Group swivel hoist rings installed over pump access covers for removal or maintenance.

G. Equipment Start-Up:

1. Start-up, test, and adjust equipment in accordance with manufacturer's start-up instructions. Check and calibrate controls.
2. Start-up performed by authorized manufacturer's representative or agent. Provide credentials of start-up personnel to Architect and Owner's Authorized Representative for approval.
3. Remove and replace filters when start-up testing is executed.
4. Manufacturer adjusts operating parameters of equipment to compensate to elevation of 500-feet above sea level.
5. Architect, Commissioning Agent, and Owner's Authorized Representative will be notified 10 days prior to start-up and will be present at start-ups.
6. Provide written report from manufacturer's representative on results of start-up within 48 hours.
7. Technical Training of maintenance staff includes two hours minimum per each piece of equipment.
8. Seismic Verification:
   a. Contractor will retain structural engineer who will submit stamped and signed anchoring and restraint details on plumbing equipment with submittal data in accordance with Division 22, Plumbing requirements.
   b. Contractor's Structural Engineer will test and verify in writing that seismic restraints have been installed in accordance with their details.

3.02 WATER HEATERS TANK-LESS ELECTRIC

A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

C. Orients so controls and devices needing service and maintenance have adequate access.

D. Certificates: Submit appropriate Certificates of Shop Inspection and Data Report as required by provisions of ASME Boiler and Pressure Vessel Code.

E. Connect water piping to units with shutoff valves and unions.

END OF SECTION

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. General Plumbing Fixtures:
      a. China Fixtures, White Only
      b. Faucet Fittings
      c. Stainless Steel Fixtures
      d. Thermostatic Mixing Valves
   2. Carriers
   3. Fixture Trim
   4. Flushometers - Water Closet
   5. Water Closet Seats
   6. Stainless Steel Drainage Fittings

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.
B. In addition, meet the following:
   1. Comply with lead free (less than or equal to 0.25 percent) products in drinking water systems.
   2. NSF 61, Annex G, Drinking Water System Components, Compliant.
   3. ISO 9001, Quality Management Standard Certified.
   4. IAPMO Low Lead Certification.
   5. Provide fixtures, faucets and accessories to meet barrier free requirements of the governing code with respect to plumbing fixtures provided for the physically handicapped.
   6. Items approved for use by State of Oregon.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. "Or approved equivalent" as defined in 22 00 00, Plumbing Basic Requirements. Substitution process requirements apply to approved equivalent products.
B. General Plumbing Fixtures: See Schedule on Drawings for type.
   1. China Fixtures - White Only:
      a. American Standard
      b. Kohler

c. Or approved equivalent.

2. Faucet Fittings:
   a. Public:
      1) Chicago
      2) Delta Commercial
      3) Moen Commercial
      4) Sloan
      5) Symmons
      6) T & S Brass
      7) Or approved equivalent.
3. Stainless Steel Fixtures:
   a. Elkay
   b. Haws
   c. Just
   d. Or approved equivalent.
4. Thermostatic Mixing Valves:
   a. Bradley
   b. Powers
   c. Symmons
   d. Holby
   e. Or approved equivalent.

C. Carriers:
   1. JR Smith
   2. Zurn
   3. Or approved equivalent.

D. Fixture Trim:
   1. McGuire
   2. Dearborn Brass
   3. Oatey
   4. Or approved equivalent.

E. Flushometers - Water Closet:
   1. Delaney
   2. Sloan
   3. Zurn
   4. Or approved equivalent.

F. Water Closet Seats:
   1. Bemis
   2. Or approved equivalent.

G. Stainless Steel Drainage Fittings:
   1. Blucher
   2. Josam
   3. JR Smith
   4. Kusel
   5. Zurn
   6. Or approved equivalent.

2.02 GENERAL PLUMBING FIXTURES

A. Review substitution request requirements in Division 01, General Requirements and 22 00 00, Plumbing General Requirements.

B. Reference Architectural Details for mounting height and location of fixtures.

C. Provide factory fabricated fixtures of type, style and material indicated on the plumbing fixture connection schedule shown on the Drawings. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by manufacturer, or required for complete installation. Where more than one type is indicated, selection is installer's option; but, fixtures of same type must be furnished by a single manufacturer. Where type is not otherwise indicated, provide fixtures complying with governing regulations.

D. Provide fixtures complete with fittings, supports, fastening devices, bolt caps, faucets, valves, traps, stops and appurtenances.

E. Plumbing Fixture Thermostatic Mixing Valves:

1. Lavatories provide ASSE 1070 compliant mixing valves or multiple lavatories served by a single ASSE 1070 compliant mixing valve.
2. Sinks serviced with a single ASSE 1070 mixing valve or multiple sinks served by a single ASSE 1070 mixing valve.
3. Commercial kitchen handsinks provide ASSE 1070 mixing valves.

2.03 CARRIERS

A. Wall Hung Water Closets:

1. Vertical: Zurn Z-1204-N4-X-50 or Z-1204-ND4-X-50 (JR Smith 230y-M54-M12 or 230DY-M54-M12). Adjustable vertical load siphon jet with 500 lb. capacity.
2. Horizontal: Zurn ZE-1203-N4-X-50 or ZE-1203-ND4-X-50 (JR Smith 220 R or L-Y-M54-M12 or 220DY-M54-M12). Adjustable horizontal siphon jet with 500 lb. load capacity.

B. Wall Hung Lavatory: Zurn Z-1231 (D). (JR Smith 700). Concealed arm or Plate type, 250 lb. capacity.

2.04 FIXTURE TRIM

A. Traps: Provide heavy duty commercial grade traps on fixtures except fixtures with integral traps. Exposed traps will be chromium plated cast brass or 17 gauge chromium plated brass tubing.

1. Sink: McGuire 8912CDF.
2. Lavatory: McGuire 8902CDF.

B. Supplies and Stops: Lead free heavy duty commercial grade, chrome plated with brass stems. Stops: T-handle or Loose Key type.

1. Lavatory: McGuire LFH2165LK.
2. Sink: McGuire LFH2167LK.
3. Water Closets: McGuire.

C. Lavatory Grid Strainer: McGuire 155A.

D. Sink Grid Strainer: McGuire 152N.

E. Sink Basket Strainer: McGuire 151.

F. Trim barrier-free wrap for P-traps and supplies by McGuire, Pro-Wrap, Plumberex or True-bro.

G. Escutcheons: McGuire wrought brass deep bell.

2.05 FLUSHOMETERS - WATER CLOSET

A. See Schedule on Drawings for types.

2.06 WATER CLOSET SEATS

A. See Schedule on Drawings for type.

2.07 STAINLESS STEEL DRAINAGE FITTINGS

A. Austenitic Stainless Steel of Material type (304/316) and gauge as listed in the plumbing fixture schedule.

PART 3 - EXECUTION

3.01 GENERAL PLUMBING FIXTURE INSTALLATION INFORMATION

A. Verification of Conditions:
   1. Examine rough-in work of water supply and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping and other unsatisfactory conditions for installation of plumbing fixtures.
   2. Examine walls, floors and cabinets for suitable conditions where fixtures are to be installed.
   3. Install plumbing fixtures level and plumb, in accordance with fixture manufacturer's written instructions, rough-in drawings and pertinent codes and regulations, design and referenced standards.
   4. Fasten plumbing fixtures securely to supports or building structure. Secure supplies behind or within wall construction to provide rigid installation.
   5. Install a stop valve in a readily accessible location in water connection to each fixture.
   6. Install escutcheons at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.
   7. Seal fixtures to walls and floors using silicone sealant Dow Corning No. 780 or approved equivalent. Match sealant color to fixture color.
   8. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning units, then retest.
   9. Inspect each unit for damage prior to installation. Replace damaged fixtures.
   10. Replace washers or cartridges of leaking or dripping faucets and stops.
   11. Clean fixtures, trim and strainers using manufacturer's recommended cleaning methods and materials.
   12. During construction, cover installed fixtures, drains, sinks and water coolers with cardboard and wrap with sheet plastic.
   13. Do not use lead flashing.

B. Owner Furnished Equipment:
   1. Rough-in and make final connections to Owner furnished equipment. Provide necessary items to complete installation.
   2. Comply with requirements of this Section and Drawings for installation procedures.

C. Adjusting and Cleaning: Clean plumbing fixtures, trim, and strainers of dirt and debris upon completion of installation. Adjust water pressure at faucets and flush valves to provide proper flow stream and specified GPM. Repair leaks at faucets and stops.

D. Extra Stock: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner.

E. Field Quality Control: Upon completion of installation of plumbing fixtures, test fixtures to demonstrate capability and compliance with Specifications. Correct or replace malfunctioning units at site, then retest to demonstrate compliance.

F. Protection: Protect fixtures and equipment from damage. Cover finished fixtures with cardboard and sheet plastic. Fixtures are not to be used during construction. Replace damaged items with new.

G. Signage: For fixtures that do not have ASSE 1070 mixing valve protection for hot water temperature, provide signage per Section 22 05 53, Identification for Plumbing Piping and Equipment.

3.02 CARRIERS INSTALLATION

A. Install components in accordance with manufacturer's instructions and approved product data submittals.

B. Set plumb, level and rigid.

C. Coordinate wall thickness so carrier has adequate depth to be concealed.

3.03 FIXTURE TRIM INSTALLATION

A. Install components in accordance with manufacturer's instructions and approved product data submittals.

B. Set plumb, level and rigid.

3.04 FLUSHOMETERS - WATER CLOSET INSTALLATION

A. Install components in accordance with manufacturer's instructions and approved product data submittals.

B. Set plumb, level and rigid.

3.05 WATER CLOSET SEAT INSTALLATION

A. Install components in accordance with manufacturer's instructions and approved product data submittals.

B. Set plumb, level and rigid.

3.06 STAINLESS STEEL DRAINAGE FITTINGS

A. Install components in accordance with manufacturers instructions and approved product data submittals.

B. Set plumb, level and flush to surrounding surfaces unless specifically noted otherwise.

C. As applicable install clamping devices-flanges to receive surface finish products (flooring, membranes etc.).

END OF SECTION

SECTION 23 00 00
HEATING, VENTILATING AND AIR CONDITIONING (HVAC) BASIC REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work included in 23 00 00, HVAC Basic Requirements applies to Division 23, HVAC work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of heating, ventilating and air conditioning systems for proposed project.

B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.

C. Definitions:

1. Provide: To furnish and install, complete and ready for intended use.
2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work provided.
4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent", substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted items.
5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and other reviewing entity whose approval is required to obtain systems acceptance.

1.02 RELATED SECTIONS

A. Contents of Section applies to Division 23, HVAC Contract Documents.

B. Related Work:

1. Additional conditions apply to this Division including, but not limited to:
   a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
   b. Drawings
   c. Addenda
   d. Owner/Architect Agreement
   e. Owner/Contractor Agreement
   f. Codes, Standards, Public Ordinances and Permits

1.03 REFERENCES AND STANDARDS

A. References and Standards per Division 01, General Requirements, individual Division 23, HVAC Sections and those listed in this Section.

B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:

1. State of Oregon:
   a. OAR - Oregon Administrative Rules
   b. 2021 OESC - Oregon Electrical Specialty Code

c. 2019 OFC - Oregon Fire Code
d. 2019 OMSC - Oregon Mechanical Specialty Code
e. 2021 OPSC - Oregon Plumbing Specialty Code
f. 2019 OSSC - Oregon Structural Specialty Code
g. 2021 OEESC - Oregon Energy Efficiency Specialty Code
h. 2011 Oregon Elevator Specialty Code

C. Reference standards and guidelines include but are not limited to the latest adopted editions from:
1. ABA - Architectural Barriers Act
2. ABMA - American Bearing Manufacturers Association
3. ADA - Americans with Disabilities Act
4. AHRI - Air-Conditioning Heating & Refrigeration Institute
5. AMCA - Air Movement and Control Association
6. ANSI - American National Standards Institute
7. ASCE - American Society of Civil Engineers
8. ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning Engineers
9. ASHRAE Guideline 0, The Commissioning Process
10. ASME - American Society of Mechanical Engineers
11. ASPE - American Society of Plumbing Engineers
12. ASSE - American Society of Sanitary Engineering
13. ASTM - ASTM International
14. AWWA - American Water Works Association
15. CFR - Code of Federal Regulations
16. CGA - Compressed Gas Association
17. CISPI - Cast Iron Soil Pipe Institute
18. EPA - Environmental Protection Agency
19. ETL - Electrical Testing Laboratories
20. FM - FM Global
21. GAMA - Gas Appliance Manufacturers Association
22. HI - Hydraulic Institute Standards
23. IAPMO - International Association of Plumbing & Mechanical Officials
24. IFGC - International Fuel Gas Code
25. ISO - International Organization for Standardization
26. MSS - Manufacturers Standardization Society
27. NEC - National Electric Code
28. NEMA - National Electrical Manufactures Association
29. NFPA - National Fire Protection Association
30. NFGC - National Fuel Gas Code
31. NRCA - National Roofing Contractors Association
32. NSF - National Sanitation Foundation
33. OSHA - Occupational Safety and Health Administration
34. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Inc.
35. TEMA - Tubular Exchanger Manufactures Association
36. TIMA - Thermal Insulation Manufactures Association
37. UL - Underwriters Laboratories, Inc.

D. See Division 23, HVAC individual Sections for additional references.

1.04 SUBMITTALS

A. See Division 01, General Requirements for Submittal Procedures as well as specific individual Division 23, HVAC Sections.

B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.

C. In addition:

1. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.
2. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail and be native/searchable PDF format. Scanned copies are not acceptable. For electronic format, provide one file per Specification Section containing one bookmarked PDF file with each bookmark corresponding to each product data section and additonal submittals as applicable per section. Arrange bookmarks in ascending order as listed in each Specification Section. Individual submittals sent in a piecemeal method will be returned without review or comment. All transmissions/submissions to be submitted to Architect. Deviations will be returned without review.
3. Product Data: Provide Manufacturer's descriptive literature for products specified in Division 23, HVAC Sections.
4. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.
   a. Label submittal to match numbering/references as shown in Contract Documents. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.
   b. Include technical data, installation instructions and dimensioned drawings for products, fixtures, equipment and devices installed, furnished or provided. Reference individual Division 23, HVAC Specification Sections for specific items required in product data submittal outside of these requirements.
   c. Provide pump curves, operation characteristics, capacities, ambient noise criteria, etc. for equipment.
   d. For vibration isolation of equipment, list make and model selected with operating load and deflection.
   e. See Division 23, HVAC individual Sections for additional submittal requirements outside of these requirements.
5. Maximum of two reviews of submittal package. Arrange for additional reviews and/or early review of long-lead items; Bear costs of these additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.

6. Resubmission Requirements: Make corrections or changes in submittals as required, and in consideration of Engineer's comments. Identify Engineer's comments and provide an individual response to each of the Engineer's comments. Cloud changes in the submittals and further identify changes which are in response to Engineer's comments.
7. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-16 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.
8. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required by Division 23, HVAC Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical submittals.
9. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.
10. Substitutions and Variation from Basis of Design:
    a. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.
    b. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties proposing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals". For any product marked "or approved equivalent", a substitution request must be submitted to Engineer for approval prior to bid.
11. Resubmission Requirements:
    a. Make any corrections or change in submittals when required. Provide submittals as specified. The Engineer will not be required to edit and/or interpret the Contractor's submittals. Indicate changes for the resubmittal in a cover letter with reference to page(s) changed and reference response to comment. Cloud changes in the submittals.
        1) Resubmit for review until review indicates no exception taken or make "corrections as noted".
        2) When submitting drawings for Engineer's re-review, clearly indicate changes on drawings and "cloud" any revisions. Submit a list describing each change.
12. Operation and Maintenance Manuals, Owner's Instructions:
    a. Submit, at one time, electronic files (native/searchable PDF format) of manufacturer's operation and maintenance instruction manuals and parts

lists for equipment or items requiring servicing. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.

1) Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.
2) Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, quantities, relevant to each piece of equipment: belts, motors, lubricants, and filters.
3) Include Warranty per Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Sections.
4) Include product certificates of warranties and guarantees.
5) Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub assemblies.
6) Include copy of startup and test reports specific to each piece of equipment.
7) Include copy of final air and water systems balancing log along with pump, fan and distribution system operating data.
8) Include commissioning reports.
9) Include copy of valve charts/schedules.
10) Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.

b. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 23 00 00, HVAC Basic Requirements Article titled "Demonstration".

c. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

13. Record Drawings:

a. Maintain at site at least one set of drawings for recording “As-constructed” conditions. Indicate on drawings changes to original documents by referencing revision document, and include buried elements, location of cleanouts, and location of concealed mechanical items. Include items changed by field orders, supplemental instructions, and constructed conditions.

b. Record Drawings are to include equipment and fixture/connection schedules, control dampers, fire smoke dampers, fire dampers, valves, bottom of pipe, duct and equipment elevations and dimensioned locations for all distribution

systems (hydronic and air). Invert elevations and dimensioned locations for underground systems below grade to 5-feet outside building that accurately reflect "as constructed or installed" for project.

c. At completion of project, input changes to original project Revit Model and make one set of black-line drawings created from Revit Model in version/release equal to contract drawings. Submit Revit Model and drawings upon substantial completion.

d. See Division 23, HVAC individual Sections for additional items to include in record drawings.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

B. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.

C. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., piping) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.

D. Manufacturer's Instructions: Follow manufacturers' written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.

E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.

F. Provide products that are UL listed.

G. Piping and duct insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.

H. ASME Compliance: ASME listed water heaters and boilers with an input of 200,000 BTUH and higher, hot water storage tanks which exceed 120 gallons, and hot water expansion tanks which are connected to ASME rated equipment or required by code or local jurisdiction.

I. Provide safety controls required by National Boiler Code (ASME CSD 1) for boilers and water heaters with an input of 400,000 BTUH and higher.

1.06 WARRANTY

A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Contracting and Procurement Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty under Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

1.07 COORDINATION DOCUMENTS

A. Prior to construction, coordinate installation and location of HVAC equipment, ductwork, grilles, diffusers, piping, equipment, fire sprinklers, plumbing, cable trays, lights, and electrical services with architectural and structural requirements, and other trades (including ceiling suspension, and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.

B. Advise Architect in event a conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.

C. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer, including but not limited to pumps, fans, valves, control devices, air handlers, vibration isolation devices, etc.

2.02 STANDARDS OF MATERIALS AND WORKMANSHIP

A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL or ETL listed and labeled or be approved by State, County, and City authorities prior to procurement and installation.

B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

C. Hazardous Materials:

1. Comply with local, State of Oregon, and Federal regulations relating to hazardous materals.
2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.
3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

PART 3 - EXECUTION

3.01 ACCESSIBILITY AND INSTALLATION

A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B. Install equipment having components requiring access (i.e., drain pans, drains, control operators, valves, motors and vibration isolation devices) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.

C. Install equipment and products complete as directed by manufacturer's installation instructions including all appurtenances recommended in manufacturer's installation instructions, at no additional charge to Owner. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing and coordination with other trades and disciplines.

D. Plenums:

1. Plenums: Materials within plenums shall be noncombustible or shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E 84 or UL 723. Immediately notify Architect/Engineer of any discrepancy.

E. Provide miscellaneous supports/metals required for installation of equipment, piping, and ductwork.

3.02 SEISMIC CONTROL

A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 23 HVAC Sections.

B. General:

1. Earthquake resistant designs for HVAC (Division 23) equipment and distribution, i.e. motors, ductwork, piping, equipment, etc. to conform to regulations of jurisdiction having authority.
2. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.
3. Provide stamped Shop Drawings from licensed Structural Engineer of seismic bracing and seismic movement assemblies for piping equipment and water heaters. Submit Shop Drawings along with equipment submittals.
4. Provide stamped Shop Drawings from licensed Structural Engineer of seismic flexible joints for piping and crossing building expansion or seismic joints. Submit Shop Drawings along with seismic bracing details.

C. Piping and Ductwork:

1. Per "Seismic Restraints Manual Guidelines for Mechanical Systems" latest edition published by SMACNA or local requirements.

D. Provide means to prohibit excessive motion of mechanical equipment during earthquake.

3.03 REVIEW AND OBSERVATION

A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:

1. Prior to covering walls.
2. Prior to ceiling cover/installation.
3. After major equipment is installed.
4. When main systems, or portions of, are being tested and ready for inspection by AHJ.

C. Final Punch:
   1. Prior to requesting a final punch visit from the Engineer, request from Engineer the Mechanical Precloseout Checklist, complete the checklist confirming completion of systems' installation, and return to Engineer. Request a final punch visit from the Engineer, upon Engineer's acceptance that the mechanical systems are ready for final punch.
   2. Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

3.04 CONTINUITY OF SERVICE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:
   1. During remodeling or addition to existing structures, while existing structure is occupied, current services to remain intact until new construction, facilities or equipment is installed.
   2. Prior to changing over to new service, verify that every item is thoroughly prepared. Install new piping and ductwork, and wiring to point of connection. Where existing systems are being utilized, clean existing distribution systems (ductwork, piping, fans, air handlers) prior to connecting new ductwork or piping.
   3. Coordinate transfer time to new service with Owner. If required, perform transfer during off peak hours. Once changeover is started, pursue to its completion to keep interference to a minimum.
      a. If overtime is necessary, there will be no allowance made by Owner for extra expense for such overtime or shift work.
   4. Organize work to minimize duration of power interruption.

3.05 CUTTING AND PATCHING

A. Confirm Cutting and Patching requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:
   1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
   2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftspeople of each respective trade in conformance with appropriate Division of Work.
   3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
   4. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, paving, and walks,

surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.

5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

3.06 EQUIPMENT SELECTION AND SERVICEABILITY

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

B. Maintain design intent where equipment other than as shown as Basis of Design in Contract Documents is provided. Where equipment requires ductwork or piping arrangement, controls/control diagrams, or sequencing different from that indicated in Contract Documents, provide at no additional cost to Owner.

3.07 DELIVERY, STORAGE AND HANDLING

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:

1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust. Insulation and lining that becomes wet from improper storage and handling to be replaced before installation. Products and/or materials that become damaged due to water, dirt, and/or dust as a result of improper storage to be replaced before installation.
2. Protect equipment and pipe to avoid damage. Close pipe openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.
3. Protect bright finished shafts, bearing housings and similar items until in service.

3.08 DEMONSTRATION

A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B. Upon completion of work and adjustment of equipment and test systems, demonstrate to Owner's Authorized Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

3.09 CLEANING

A. Confirm Cleaning requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

3.10 START UP

A. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

1. Do not place equipment in sustained operation prior to initial balancing of HVAC systems.

3.11 PAINTING

A. Confirm Painting requirements in Division 01, General Requirements and Division 09, Finishes. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:

1. Ferrous Metal: After completion of work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces in mechanical rooms, i.e., hangers, hanger rods, equipment stands, with one coat of black asphalt varnish for exterior or black enamel for interior, suitable for hot surfaces.
2. After acceptance by Authority Having Jurisdiction (AHJ), In a mechanical room, on roof or other exposed areas, machinery and equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
3. See individual equipment Specifications for other painting.
4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
5. Piping and Ductwork: Clean, primer coat and paint exposed piping and ductwork on roof or at other exterior locations with two coats paint suitable for metallic surfaces and exterior exposures. Color selected by Architect.
6. Covers: Covers such as manholes, cleanouts and the like will be furnished with finishes which resist corrosion and rust.

3.12 DEMOLITION

A. Confirm requirements in Division 01, General Requirements and Division 02, Existing Conditions. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:

1. Scope:
   a. It is the intent of these documents to provide necessary information and adjustments to the HVAC system required to meet code, and accommodate installation of new work.
   b. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas.
   c. Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to exactly locate and preserve utilities. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.
2. Unless specifically indicated on Drawings, remove exposed, unused ductwork and piping to behind finished surfaces (floor, walls, ceilings, etc.). Cap and patch surfaces to match surrounding finish.
3. Unless specifically indicated on Drawings, remove unused equipment, fixtures, fittings, rough-ins, and connectors. Removal is to be to a point behind finished surfaces (floors, walls, and ceilings).

3.13 ACCEPTANCE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:

1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
   a. Testing and Balancing Reports
   b. Cleaning
   c. Operation and Maintenance Manuals
   d. Training of Operating Personnel
   e. Record Drawings
   f. Warranty and Guaranty Certificates
   g. Start-up/Test Document
   h. Commissioning Reports

3.14 FIELD QUALITY CONTROL

A. Confirm Field Quality Control requirements in Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B. Tests:

1. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in Operation and Maintenance Manuals.
2. During site evaluations by Architect or Engineer, provide appropriate personnel with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

3.15 LETTER OF CONFORMANCE

A. Provide Letter of Conformance, copies of manufacturers' warranties and extended warranties with a statement that HVAC items were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include Letter of Conformance, copies of manufacturers' warranties and extended warranties in Operation and Maintenance Manuals.

3.16 ELECTRICAL INTERLOCKS

A. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize equipment wiring diagrams to coordinate with electrical systems so that proper wiring of equipment involved is affected.

3.17 TEMPORARY HEATING, COOLING AND HUMIDITY CONTROL

A. Provide temporary heating, cooling, controls, humidification and dehumidification as required to facilitate the construction of the project. Size and select temporary system based on the requirements of the various trades during construction. This includes, but is not limited to, drywall, case work, wood flooring and wood finishes that are subject to warping. Size and install system to prevent mold growth. Coordinate the location of the temporary system. The house system can be used. Develop a procedure for how the house system will be used including a sketch depicting the house system, how filtration will be used to prevent construction debris from entering the system and how often the filters will be changed, how the ductwork will be cleaned after use to ensure a clean system is turned over to the Owner and how the units are sized. Submit this procedure to the Mechanical Engineer for review. Follow National Air Duct Cleaners Association

(NADCA) duct cleaning procedures and guidelines. Warranties for the house system, if new, to commence when the Owner moves in if house system is used as the means to maintain the climate within the building during construction. Include this warranty requirement in the original bid or proposal amount. Coordinate and provide any temporary power, controls, ductwork, piping, plumbing anchorage, miscellaneous steel and structural supports required to support the temporary system. Installation of the system to comply with all applicable codes and be acceptable to the Authority Having Jurisdiction (AHJ).

END OF SECTION

SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING, DUCTWORK AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Hangers and Supports for HVAC Piping, Ductwork and Equipment
   2. Building Attachments
   3. Miscellaneous Metal and Materials

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. ASCE 7-16, Minimum Design Loads for Buildings and Other Structures.
   2. Terminology: As defined in MSS SP-90 "Guidelines on Terminology for Pipe Hangers and Supports".
   3. Install ductwork and piping per SMACNA's requirements.
   4. Hanger spacing installation and attachment to meet all manufacturer's requirements and MSS SP-58.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Welding:
      a. Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications".
   2. Welding for Hangers:
      a. Qualify procedures and personnel according to AWS D9.1, Sheet Metal Welding Code for duct joint and seam welding.
   3. Engineering Responsibility:
      a. Design and preparation of Shop Drawings and calculations for each multiple duct support equipment hangers/supports, roof structure or from structure above, and seismic restraint by a qualified Structural Professional Engineer.
         1) 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 hangers and supports that are similar to those indicated for this Project in material, design, and extent.
   4. Manufacturers regularly engaged in the manufacture of bolted metal framing support systems, whose products have been in satisfactory use in similar service for not less than 10 years.

5. Support systems to be supplied by a single manufacturer.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.07 PERFORMANCE REQUIREMENTS

A. Provide ductwork and equipment hangers and supports in accordance with the following:
   1. When supports, anchorages, and seismic restraints for equipment, and supports, anchorages, and seismic restraints for conduit, piping, and ductwork are not shown on the Drawings, the contractor is responsible for their design.
   2. Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

B. Engineered Support Systems:
   1. Equipment, ductwork and piping support frame anchorage to supporting slab or structure.

C. Provide seismic restraint hangers and supports for piping, ductwork and equipment.

D. Obtain approval from AHJ for seismic restraint hanger and support system to be installed for piping and equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Hangers and Supports for HVAC Piping, Ductwork and Equipment:
   1. Anvil International
   2. B-Line Systems, Incorporated
   3. Erico Company, Incorporated
   4. Nelson-Olsen Incorporated
   5. Rilco Manufacturing Company, Incorporated
   6. Snappitz Thermal Pipe Shield Manufacturing
   7. Unistrut Corporation

B. Building Attachments:
   1. Anchor-It
   2. Gunnebo Fastening Corporation
   3. Hilti Corporation
   4. ITW Ramset/Red Head
   5. Masterset Fastening Systems, Incorporated

2.02 HANGERS AND SUPPORTS FOR HVAC PIPING, DUCTWORK AND EQUIPMENT

A. Hanger Rods: Hanger rods continuously threaded or threaded ends only in concealed spaces and threaded ends only in exposed spaces; finish electro-galvanized or cadmium-plated in concealed spaces and prime painted in exposed spaces; sizes per MSS.

B. Hanger Rod Couplings: Anvil Figure 136, B-Line Figure B3220, or approved equivalent; malleable iron rod coupling with elongated center sight gap for visual inspection; to have same finish as hanger rods.

C. Channel Hanging System:
   1. Framing members No. 12 gauge formed steel channels, 1-5/8-inch square, conforming to ASTM A1011 Grade 33, one side of channel to have a continuous slot within turned lips; framing nut with grooves and spring 1/2-inch size, conforming to ASTM 675 GR60; screws conforming to ASTM A307; fittings conforming to ASTM A575; parts enamel painted or electro-galvanized.
   2. Concrete Inserts: Malleable iron body, hot dipped galvanized finish. Lateral adjustment. MSS Type 18.

2.03 BUILDING ATTACHMENTS

A. Beam Clamps:
   1. MSS Type 19 and 23, wide throat, with retaining clip.
   2. Universal Side Beam Clamp: MSS Type 20.

B. Powder-Actuated Drive Pin Fasteners: Powder actuated type, drive pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

C. Anchor Bolts:
   1. Anchor supports to existing masonry, block and tile walls per anchoring system manufacturer's recommendations or as modified by project structural engineer. Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
   2. Anchor (Expansion) Bolts: Carbon steel to ASTM A307; nut to conform to ASTM A194; drilled-in type. Design values for shear and tension not more than 80 percent of the allowable listed loads.
   3. Anchor (Adhesive) Bolts: Consisting of two-part adhesive cartridge and zinc-plated Type A307 steel anchor bolt rod assembly with ASTM A194 nut.

2.04 MISCELLANEOUS METAL AND MATERIALS

A. General:
   1. Provide miscellaneous supports and metal items, including materials, fabrication, fastenings and accessories required for finished installation, where indicated on drawings or otherwise not shown on drawings that are necessary for completion of the project. Contractor is responsible for their design.
   2. Fabricate miscellaneous units to size shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

B. Structural Shapes: Where miscellaneous metal items are needed to be fabricated from structural steel shapes and plates, provide members constructed of steel conforming with requirements of ASTM A36 or approved equivalent.

C. Steel Pipe: Provide seamless steel pipe conforming to requirements of ASTM A53, Type S, Grade A, or Grade B. Weight and size required as specified.

D. Fasteners: Provide fasteners of types as required for assembly and installation of fabricated items; surface-applied fasteners are specified elsewhere.

E. Bolts: Low carbon steel externally and internally threaded fasteners conforming with requirements of ASTM A307; include necessary nuts and plain hardened washers. For structural steel elements supporting mechanical material or equipment from building structural members or connection thereto, use fasteners conforming to ASTM A325.

F. Miscellaneous Materials: Provide incidental accessory materials, tools, methods, and equipment required for fabrication.

G. Provide hot dipped galvanized components for items exposed to weather. Cold galvanize field-welded joints and components. Use materials compatible with system being supported (i.e. aluminum for aluminum ductwork, stainless steel for stainless steel ductwork).

H. Use straps, threshold rods and wire with sizes required by SMACNA to support ductwork.

I. Grout:
   1. ASTM C1107, Grade B, factory mixed and packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.

2. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
3. Properties: Nonstaining, noncorrosive, and non gaseous.
4. Design Mix: 5000-PSI (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Verify building materials to have hangers and attachments affixed in accordance with hangers to be used. Provide supporting calculations.

B. Install hangers, supports, anchors and sleeves after required building structural work has been completed in areas where the work is to be installed. Coordinate proper placement of inserts, anchors and other building structural attachments.

C. Equipment Clearances: Do not route ductwork, equipment, or piping through electrical rooms, transformer vaults, elevator equipment rooms, IT rooms, MPOE rooms, or other electrical or electronic equipment spaces and enclosures and the like. Within equipment rooms, provide minimum 3-feet lateral clearance from all sides of electric switchgear panels. Do not route ductwork, equipment, or piping above any electric power or lighting panel, switchgear, or similar electric device. Coordinate with Electrical and coordinate exact ductwork, equipment or pipe routing to provide proper clearance with such items.

3.02 HANGERS AND SUPPORTS FOR HVAC PIPING, DUCTWORK AND EQUIPMENT

A. Hang rectangular sheet-metal ducts with a cross sectional area of less than 7 SF with galvanized strips of No. 16 USS gauge steel 1-inch wide, and larger ducts with steel angles and adjustable hanger rods similar to piping hangers. Support at a maximum of 8-feet on center.

B. Support horizontal ducts within 24-inches of each elbow and within 48-inches of each branch intersection.

C. Design hangers and supports to allow for expansion and contraction.

D. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

E. Install flexible ductwork per the more stringent of SMACNA HVAC Duct Construction Standards or the following:
1. Support horizontal duct runs at not more than 4 feet intervals.
2. Support vertical risers at not more than 6 feet intervals.
3. Limit sag between support hangers to 1/2-inch per foot of spacing support.
4. Supports shall be rigid and shall be not less than 1.5-inches wide at point of contact with the duct surface.
5. Duct bends shall be not less than 1.5 duct diameter bend radius.

F. Use double nuts and lock washers on threaded rod supports.

G. Anchor ducts securely to building in such a manner as to prevent transmission of vibration to structure. Do not connect duct hanger straps directly to roof deck. Do not support ducts from other ducts, piping or equipment.

H. Attach strap hangers installed flush with end of sheet-metal duct run to duct with sheet-metal screws.

I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Adjust hangers so as to distribute loads equally on attachments.

M. Prime paint ferrous nongalvanized hangers, accessories, and supplementary steel which are not factory painted.

3.03 BUILDING ATTACHMENTS

A. Factory fabricated attachments complying with MSS SP-58, selected to suit building substructure conditions and in accordance manufacturer's published product information.

B. Select size of building attachments to suit hanger rods.

C. Install building attachments within concrete slabs or attach to structural steel or wood. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping.

D. Attachment to Wood Structure: Anvil side beam bracket Figure 202 for attachment to wooden beam or approved attachment for a wood structure.

E. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Test powder-actuated insert attachments with a minimum load of 100 pounds.

F. Do not use powder-actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4-inches thick.

G. Bolting: Provide bored, drilled or reamed holes for bolting to miscellaneous structural metals, frames or for mounts or supports. Flame cut, punched or hand sawn holes will not be accepted.

H. Anchor Bolts:

1. Install anchor bolts for mechanical equipment, piping and ductwork as required. Tightly fit and clamp base-supported equipment anchor bolts at equipment support points. Provide locknuts where equipment, piping and ductwork are hung.

3.04 MISCELLANEOUS METAL AND MATERIALS

A. General: Verify dimensions prior to fabrication. Form metal items to accurate sizes and configurations as indicated on drawings and otherwise required for proper installation; make with lines straight and angles sharp, clean and true; drill, countersink, tap, and otherwise prepare items for connections with work of other trades, as required. Fabricate to detail of structural shapes, plates and bars; weld joints where practicable; provide bolts and other connection devices required. Include anchorages; clip angles, sleeves, anchor plates, and similar devices. Hot dipped galvanize after fabrication items installed in exterior locations. Set accurately in position as required and anchor securely to building construction. Construct items with joints formed for strength and rigidity, accurately machining for proper fit; where exposed to weather, form to exclude water.

B. Finishes:

1. Ferrous Metal: After fabrication, but before erection, clean surfaces by mechanical or chemical methods to remove rust, scale, oil, corrosion, or other substances detrimental to bonding of subsequently applied protective coatings. For metal items exposed to weather or moisture, galvanize in manner to obtain G90 zinc coating in accordance with ASTM A123. Provide other non-galvanized ferrous metal with 1 coat of approved rust-resisting paint primer, in manner to obtain not less than 1.0 mil dry film thickness. Touch-up damaged areas in primer with same material,

before installation. Apply zinc coatings and paint primers uniformly and smoothly; leave ready for finish painting as specified elsewhere.

2. Metal in Contact with Concrete, Masonry and Other Dissimilar Materials: Where metal items are to be erected in contact with dissimilar materials, provide contact surfaces with coating of an approved zinc-chromate primer in manner to obtain not less than 1.0 mil dry film thickness, in addition to other coatings specified in these specifications.
3. For Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required. Avoid cutting concrete reinforcing when drilling for inserts. Reference structural drawings and reinforcing shop drawings and determine locations of stirrups prior to drilling into concrete.

D. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

E. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

F. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.

G. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

H. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

I. Provide galvanized components for items exposed to weather.

END OF SECTION

SECTION 23 05 53
IDENTIFICATION FOR HVAC PIPING, DUCTWORK AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Plastic Nameplates
   2. Tags
   3. Ceiling Tags

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Schedules:
      a. For renovations or expansions of existing systems, coordinate with Owner to finalize equipment numbering and format.
   2. Submit schedule of identification type, including material, for each class of tagged item.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification devices of types and sizes required.
   2. Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices unless otherwise indicated.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 PLASTIC NAMEPLATES

A. Manufacturers:
   1. Brady Corporation
   2. Brimar
   3. Champion America
   4. Craftmark
   5. Seton

B. Description: Engraving stock melamine plastic laminate in the size and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color), punched for mechanical fastening except where adhesive mounting is necessary because of substrate. Provide 1/8-inch thick material.
   1. Letter Color: White.

2. Letter Height: 1/2-inch.
3. Background Color: Black.
4. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.
5. Access Panel Markers: Manufacturer's standard 1/16-inch thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve or devices/equipment. Include center hole to allow attachment.

2.02 TAGS

A. Manufacturers:
1. Brady Corporation
2. Brimar
3. Champion America
4. Craftmark
5. Seton

B. Metal Tags: Polished Brass with stamped letters; tag size minimum 2-inch diameter with smooth edges.

C. Tag Fasteners: Solid brass chain (wire link or beaded type), or solid brass S-hooks.

2.03 CEILING TAGS

A. Manufacturers:
1. Brady Corporation
2. Brimar
3. Champion America
4. Craftmark
5. Seton

B. Description: Steel with 3/4-inch diameter color coded head.

C. Color code as follows:
1. Yellow - HVAC equipment.
2. Red - Fire dampers/smoke dampers.
3. Blue - Heating/cooling valves.
4. Ceiling tile labels, machine generated, adhesive backed tape labels with black letters, clear tape.

PART 3 - EXECUTION

3.01 GENERAL - INSTALLATION

A. Identifyequipment with plastic nameplates riveted to equipment body.

B. Coordinate names, abbreviations and other designations used in mechanical identification work with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment.

C. Degrease and clean surfaces to receive adhesive for identification materials.

D. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

E. Coordinate with the facility maintenance personnel to ensure consistency with the existing tagging system.

F. Install all products in accordance with manufacturer's instructions.

G. Manual Balancing Dampers: Provide 12-inch long orange marker ribbon to end of balancing damper handle.

3.02 PLASTIC NAMEPLATES

A. Install plastic nameplates with corrosive-resistant mechanical fasteners.

3.03 TAGS

A. Use metal tags on piping 3/4-inch diameter and smaller.

B. Tag balancing valves and major dampers with balanced GPM or CFM indicated after balancing is completed and accepted.

C. Install tags with corrosion resistant chain.

3.04 CEILING TAGS

A. Provide ceiling tags to locate valves, dampers, and equipment above accessible ceilings. Locate in corner of ceiling tee grid closest to equipment.

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. General Requirements and Procedures
   2. Fundamental Air Systems Balancing Procedures
   3. Constant Volume Air Systems Balancing Procedures
   4. Pre-Balance Reporting
   5. Final Reports:
      a. Report Requirements
      b. General Report Data
      c. System Diagrams
      d. Air Handling Units
      e. Fans
      f. Diffusers/Registers/Grilles
      g. Instrument Calibration
   6. Additional Tests

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Quality-Assurance Submittals: Submit two copies of evidence that the Testing, Adjusting, and Balancing (TAB) Agent and Project's TAB team members meet the qualifications specified in the "Quality Assurance" Article below.
   2. Pre-Construction Phase Report:
      a. Provide a pre-construction phase TAB Plan at least two weeks prior to the commencement of TAB work. This report is to include:
         1) A complete set of report forms intended for use on the Project, with data filled in except for the field readings. Forms to be Project-specific.
         2) Marked up shop drawings identifying all HVAC equipment to be balanced, and associated outlets and terminal devices.
         3) Identification of the type, manufacturer, and model of the actual instruments to be used, and clear indication of which instrument will be used to take each type of reading. Calibration certifications to be included.
         4) A narrative of Project-specific and/or non-standard TAB procedures to be used, and the equipment or systems to which they apply.
   3. Contract Documents Examination Report: Within 45 days from the Contractor's Notice to Proceed, submit two copies of the Contract Documents review report as specified in Part 3 of this Section.

4. Strategies and Procedures Plan: Submit two copies of the TAB strategies and step-by-step procedures as specified in Part 3 of this Section. Include a complete set of report forms intended for use on this Project.
5. Specify reports required because of editing procedures in Part 3 of this Section.
6. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by the TAB Agent.
7. Sample Report Forms: Submit two sets of sample TAB report forms.
8. Test Instrument Calibration: Submit proof of calibration within the last 6 months.
9. Final Report.

1.05 QUALITY ASSURANCE

A. Quality Assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Balance Firm Qualifications:
   a. General:
      1) Procure services of independent TAB agency to balance, adjust and test water circulating and air moving equipment and air distribution or exhaust systems. Minimum experience: 5 years.
      2) Provide proof of testing agency having successfully completed at least five projects of similar size and scope.
   b. Testing and Balancing firm is certified by NEBB or AABC and has a NEBB Certified Professional (CP) or a AABC Test and Balancer Engineer (TBE) on staff.
   c. Industry Standards: Testing and Balancing will conform to NEBB or AABC, and American National Standards Institute (ANSI) as follows:
      1) NEBB: Comply with Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
      2) AABC: Comply with National Standards for Total System Balance.
   d. Test Observation: If requested, conduct tests in the presence of the Commissioning Authority, AHJ, Architect or the Architect's representative.
2. Code Compliance: Perform tests in the presence of the Authority Having Jurisdiction (AHJ) where required by the Authority Having Jurisdiction (AHJ).
3. Owner Witness: Perform tests in the presence of the Commissioning Authority, Architect, Architect's Representative, or Owner's representative.
4. Engineer Witness: The engineer or engineer's representative reserves the right to observe tests or selected tests to assure compliance with the specifications.
5. Simultaneous Testing: Test observations by the AHJ, the Owner's Authorized Representative and the engineer's representative need not occur simultaneously.
6. Do not perform TAB work until heating, ventilating, and air conditioning equipment has been completely installed and is operating continuously as required.
7. Conduct air testing and balancing with clean filters in place.
8. TAB Conference: Meet with the Commissioning Authority, Owner's and the Architect's representatives on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel. Provide 7 days advance notice of scheduled meeting time and location.
   a. Agenda Items: Include at least the following:
      1) Submittal distribution requirements.

2) Contract Documents examination report.
3) TAB plan.
4) Work schedule and Project site access requirements.
5) Coordination and cooperation of trades and subcontractors.
6) Coordination of documentation and communication flow.

9. Certification of TAB Reports: This certification includes the following:
   a. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
   b. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
10. TAB Reports: Use standard forms from NEBB or AABC.
11. Instrumentation Type, Quantity, and Accuracy: As described in NEBB or AABC.
12. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. TAB Agency provides warranty for a period of 90 days following submission of completed report, during which time, Owner may request a recheck of up to 10 percent of total number of terminals, or resetting of outlet, coil, or device listed in the final TAB report.
   2. Guarantee: Meet the requirements of the following programs:
      a. Provide a guarantee on NEBB or AABC forms stating that the agency will assist in completing the requirements of the Contract Documents if the TAB Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:
         1) The certified Agent has tested, adjusted, and balanced systems according to the Contract Documents.
         2) Systems are balanced to optimum performance capabilities within design and installation limits.

1.07 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

G. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

H. TAB: Testing, Adjusting, and Balancing.

I. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.
J. Test: A procedure to determine quantitative performance of a system or equipment.
K. Testing, Adjusting, and Balancing (TAB) Agent: The entity responsible for performing and reporting the TAB procedures.
L. AABC: Associated Air Balance Council.
M. NEBB: National Environmental Balancing Bureau.
N. AMCA: Air Movement and Control Association.
O. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.08 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.
B. Notice: Provide 7 days advance notice for each test. Include scheduled test dates and times.
C. Witness leakage and pressure tests carried out by Section 23 31 00, HVAC Ducts and Casings.
D. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS AND PROCEDURES

A. Project Conditions:
1. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire TAB period. Cooperate with the Owner during TAB operations to minimize conflicts with the Owner's operations.

B. General Requirements:
1. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and controls, coordinate scheduling and testing and inspection procedures with authorities having jurisdiction.
2. Perform TAB work with doors, closed windows, and ceilings installed etc., to obtain simulated or project operating conditions. Do not proceed until systems scheduled for TAB are clean and free from debris, dirt and discarded building materials.
3. Where Owner occupies building during the testing period, cooperate with Owner to minimize conflicts with Owner's operations.

C. Examination:
1. Examine Contract Documents to become familiar with project requirements and existing building record documents (if available) to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
a. Contract Documents are defined in the General and Supplementary Conditions of the Contract.
b. Verify that balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
2. Examine approved submittal data of HVAC systems and equipment.

3. Examine Project record documents described in Division 01, General Requirements.
4. Examine Architect's and Engineer's design data, including Basis of Design, HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
5. Examine equipment performance data, including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.
6. Coordinate requirements in system and equipment with this Section.
7. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.
8. Examine system and equipment test reports.
9. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
10. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
11. Examine equipment for installation and for properly operating safety interlocks and controls.
12. Report deficiencies discovered before and during performance of TAB procedures.

D. Preparation:
1. Prepare a TAB plan that includes strategies and step-by-step procedures.
2. Complete system readiness checks and prepare system readiness reports. Verify the following:
   a. Permanent electrical power wiring is complete.
   b. Automatic temperature-control systems are operational.
   c. Equipment and duct access doors are securely closed.
   d. Balance, smoke, and fire dampers are open.
   e. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
   f. Windows, doors and other portions of the building envelope can be closed so design conditions for system operations can be met.
3. Hold a pre-balancing meeting at least one week prior to starting TAB work.
   a. Attendance is required by installers whose work will be tested, adjusted, or balanced.
4. Provide instruments required for TAB operations. Make instruments available to Architect to facilitate spot checks during testing.

E. General TAB Procedures:

1. Perform TAB procedures on each system according to the procedures contained in NEBB or AABC and this Section.
2. Coordinate location of test probes prior to start of TAB procedures and make test probes available for Owner's tests after start of occupancy. Where required, cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.
3. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

F. Adjustment Tolerances:
1. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 5 percent of design for return and exhaust systems.
2. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

G. Recording and Adjusting:
1. Field Logs: Maintain written logs including:
   a. Running log of events and issues.
   b. Discrepancies, deficient or uncompleted work by others.
   c. Contract interpretation requests.
   d. Lists of completed tests.
2. Ensure recorded data represents actual measured or observed conditions.
3. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
4. Mark on drawings locations where traverse and other critical measurements were taken and cross reference location in final report.
5. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
6. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
7. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner's Authorized Representative, or Commissioning Agent.

3.02 FUNDAMENTAL AIR SYSTEMS BALANCING PROCEDURES

A. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

B. Examine terminal units, such as variable-air-volume boxes and mixing boxes, to verify that they are accessible and their controls are connected and functioning.

C. Prepare test reports for both fans and inlets and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross check the summation of required outlet volumes with required fan volumes.

D. Prepare schematic diagrams of systems' "as-built" duct layouts.

E. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

F. Check the airflow patterns from the outside-air louvers and dampers and the return-air and exhaust-air dampers, through the supply-fan discharge and mixing dampers.
G. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
H. Verify that motor starters are equipped with thermal protection, sized for the connected load.
I. Check dampers for proper position to achieve desired airflow path.
J. Check for airflow blockages.

3.03 CONSTANT VOLUME AIR SYSTEMS BALANCING PROCEDURES

A. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer. Adjust fans to deliver design airflow at the lowest possible speed.
   1. Measure fan static pressures to determine actual static pressure as follows:
      a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
      b. Measure static pressure directly at the fan outlet or through the flexible connection.
      c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
      d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
   2. Measure static pressure across each air-handling unit component under final balanced condition.
   3. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Recommend corrective action to align design and actual conditions.
   4. Do not make fan-speed adjustments that result in motor loading greater than full load amps. Do not increase fan speed beyond fan class rating. Modulate dampers and measure fan-motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.
   5. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.

3.04 PRE-BALANCE REPORTING

A. Pre-Construction Phase Report:
   1. Provide a pre-construction phase TAB Plan at least 2 weeks prior to the commencement of TAB work. This report is to include:
      a. A complete set of report forms intended for use on the Project, with all data filled in except for the field readings. Forms to be Project-specific.
      b. Marked up shop drawings identifying all HVAC equipment to be balanced, and associated outlets and terminal devices.
      c. Identification of the type, manufacturer, and model of actual instruments to be used, and clear indication of which instrument will be used to take each type of reading. Calibration certifications are to be included.
      d. A narrative of Project-specific and/or non-standard TAB procedures to be used, and the equipment or systems they apply to.
B. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing

devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

C. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced.

3.05 FINAL REPORTS

A. Report Requirements:
   1. General:
      a. Computer generated in PDF format and tabulated, divided, and bookmarked into sections by tested and balanced systems.
      b. Include a certification sheet in front of binder signed and sealed by the certified TAB engineer.
         1) Include a list of the instruments used for procedures, along with proof of calibration.
      c. Final Report Contents: In addition to the certified field report data, include the following:
         1) Fan Curves
         2) Manufacturers Test Data
         3) Field test reports prepared by system and equipment installers
         4) Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data

B. General Report Data:
   1. In addition to the form titles and entries, include the following data in the final report, as applicable:
      a. Title Page
      b. Name and Address of TAB Agent
      c. Project Name
      d. Project Location
      e. Architect's Name and Address
      f. Engineer's Name and Address
      g. Contractor's Name and Address
      h. Report Date
      i. Signature of TAB Agent who Certifies the Report
      j. Summary of Contents, Including the Following:
         1) Design versus Final Performance
         2) Notable Characteristics of Systems
         3) Description of System Operation Sequence if it varies from the Contract Documents
      k. Nomenclature Sheets for Each Item of Equipment
      l. Data for Terminal Units, including Manufacturer, Type Size, and Fittings
      m. Notes to explain why certain final data in the body of reports vary from design values.
      n. Test Conditions for Fans and Pump Performance Forms, Including the Following:
         1) Settings for Outside-, Return-, and Exhaust-air Dampers
         2) Conditions of Filters
         3) Fan Drive Settings, including Settings and Percentage of Maximum Pitch Diameter

4) Settings for Supply-air, Static-pressure Controller
5) Other System Operating Conditions that affect Performance

C. System Diagrams:
1. Include schematic layouts of air distribution systems. Present with single-line diagrams and include the following:
a. Quantities of Outside, Supply, Return, and Exhaust Airflows
b. Duct, Outlet, and Inlet Sizes
c. Terminal Units

D. Air Handling Units:
1. For air-handling units and fan coils, include the following:
a. Unit Data: Include the following:
1) Unit Identification
2) Location
3) Make and Type
4) Model Number and Unit Size
5) Manufacturer's Serial Number
6) Unit Arrangement and Class
7) Discharge Arrangement
8) Sheave Make, Size in inches, and Bore
9) Sheave Dimensions, Center-to-center and Amount of Adjustments in Inches
10) Number of Belts, Make, and Size
11) Number of Filters, Type, and Size
b. Motor Data: Include the following:
1) Make and Frame Type and Size
2) Horsepower and rpm
3) Volts, Phase, and Hertz
4) Full-load Amperage and Service Factor
5) Sheave Make, Size in Inches, and Bore
6) Sheave Dimensions, Center-to-center and Amount of Adjustments in Inches
c. Test Data: Include design and actual values for the following:
1) Total Airflow Rate in cfm (L/s)
2) Total System Static Pressure in Inches wg (Pa)
3) Fan rpm
4) Discharge Static Pressure in Inches wg (Pa)
5) Filter Static-pressure Differential in Inches wg (Pa)
6) Heating Coil Static-pressure Differential in Inches wg (Pa)
7) Return Airflow in cfm (L/s)
8) Return-air Damper Position

E. Fans:
1. Fan Test Reports: For supply, return, and exhaust fans, include the following:
a. Fan Data: Include the following:
1) System Identification
2) Location
3) Make and Type
4) Model Number and Size
5) Manufacturer's Serial Number
6) Arrangement and Class

b. Motor Data: Include the following:
1) Make and Frame Type and Size
2) Horsepower and rpm
3) Volts, Phase, and Hertz
4) Full-load Amperage and Service Factor
5) Number of Belts, Make, and Size

c. Test Data: Include design and actual values for the following:
1) Total Airflow Rate in cfm
2) Total System Static Pressure in Inches wg
3) Fan rpm
4) Discharge Static Pressure in Inches wg
5) Suction Static Pressure in Inches wg

F. Diffusers/Registers/Grilles:
1. For diffusers, registers and grilles, include the following:
a. Unit Data: Include the following:
1) System and Air-handling Unit Identification
2) Location and Zone
3) Test Apparatus Used
4) Area Served
5) Air-terminal-device Make
6) Air-terminal-device Number from System Diagram
7) Air-terminal-device Type and Model Number
8) Air-terminal-device Size
9) Air-terminal-device Effective Area in SF

b. Test Data: Include design and actual values for the following:
1) Airflow Rate in cfm
2) Air Velocity in fpm
3) Final Airflow Rate in cfm
4) Final Velocity in fpm
5) Space Temperature in Degrees F

G. Instrument Calibration:
1. For instrument calibration, include the following:
a. Report Data: Include the following:
1) Instrument Type and Make
2) Serial Number
3) Application
4) Dates of Use

b. Dates of Calibration

3.06 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

END OF SECTION

SECTION 23 07 00
HVAC INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Type A, Flexible Glass Wool Blanket
   2. Duct Insulation Accessories
   3. Duct Insulation Compounds

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Piping and duct insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Installer qualifications.
   2. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any) for each type of product indicated.
      a. Where indicated R-values/ratings cannot be achieved by a single layer of insulation, describe how performance requirements will be achieved.
   3. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.
   4. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.
   5. Submit manufacturer's installation instructions.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Formaldehyde Free: Should be third-party certified with UL Environment Validation.
   2. Recycled Content: A minimum of 40 percent post-consumer recycled glass content certified and UL validated.
   3. Low Emitting Materials: For all thermal and acoustical applications of Glass Mineral Wool Insulation products, provide materials complying with the testing and products requirements of UL GREENGUARD Gold Certification.
   4. Installer to have minimum 5 years' experience in the business of installing insulation.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.07 FIRE HAZARD CLASSIFICATION

A. Maximum fire hazard classification of the composite insulation construction as installed to be not more than a Flame Spread Index (FSI) of 25 and Smoke Developed Index (SDI) of 50 as tested by current edition of ASTM E84 (NFPA 255) method.

B. Test duct insulation in accordance with current edition of ASTM E84, UL 723, NFPA 255, NFPA 90A and NFPA 90B.

PART 2 - PRODUCTS

2.01 TYPE A, FLEXIBLE GLASS WOOL BLANKET

A. Acceptable Manufacturers:
   1. Certainteed
   2. Johns Manville
   3. Knauf
   4. Owens-Corning

B. ASTM C553, Type 1, Class B-2; flexible blanket.

C. 'K' Value: 0.27 BTU*in/(hr*sf*F) at 75 degrees F installed, maximum service temperature: 250 degrees F.

D. Density: 0.75 pounds per cubic foot.

E. DBDE-free. UL/E validated to be formaldehyde-free.

F. Vapor Barrier Jacket: FSK aluminum foil reinforced with glass wool yarn and laminated to fire resistant Kraft, secured with UL listed pressure sensitive tape or outward clinched expanded staples and vapor barrier mastic as needed.

2.02 DUCT INSULATION ACCESSORIES

A. Acceptable Manufacturers:
   1. Certainteed
   2. Johns Manville
   3. Owens-Corning

B. Staples, bands, wires, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.

2.03 DUCT INSULATION COMPOUNDS

A. Acceptable Manufacturers:
   1. Certainteed
   2. Johns Manville
   3. Owens-Corning

B. Cements, adhesives, coatings, sealers, protective finishes and similar accessories as recommended by insulation manufacturer for applications indicated. Comply with South Coast Air Quality Management District (SCAQMD) Rule #1168 in accordance with LLE EQ 4.1.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Verification of Conditions:
   1. Do not apply insulation until pressure testing and inspection of ducts has been completed.
   2. Examine areas and conditions under which duct insulation will be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Preparation: Clean and dry surfaces to be insulated.

C. Installation:
   1. Insulation: Continuous through walls, floors and partitions except where noted otherwise.

D. Protection and Replacement: Installed insulation during construction. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

E. Ductwork:
   1. Install insulation in conformance with manufacturer's recommendations to completely cover duct.
   2. Butt insulation joints firmly together and install jackets and tapes smoothly and securely.
   3. Apply duct insulation continuously through sleeves and prepared openings, except as otherwise specified. Apply vapor barrier materials to form complete unbroken vapor seal over insulation.
   4. Coat staples and seals with vapor barrier coating.
   5. Cover breaks in jacket materials with patches of same material as vapor barrier. Extend patches not less than 3-inches beyond break or penetration on all directions and secure with adhesive and staples. Seal staples and joints with vapor barrier coating.
   6. Fill jacket penetrations. i.e., hangers, thermometers and damper operating rods, and other voids in insulation with vapor barrier coating. Seal penetration with vapor barrier coating. Insulate hangers and supports for cold duct in un-conditioned spaces to extent to prevent condensation on surfaces.
   7. Seal and flash insulation terminations and pin punctures with reinforced vapor barrier coating.
   8. Do not conceal duct access doors with insulation. Install insulation terminations at access door in accordance with this Section.

F. Ductwork Surfaces to be Insulated: Climate Zone 4

Item to be Insulated	System Insulation Type	Duct Size	Minimum Installed R-Value
Supply ductwork inside building thermal envelope, where duct is not specified to be lined	A	All	R-4
Exhaust ducts within building thermal envelope between exterior and damper	A	All	R-16

   1. Note: Insulation R-value shown is a minimum. If state codes require higher R-value, then provide insulation per code requirements.

3.02 TYPE A, FLEXIBLE GLASS WOOL BLANKET

A. Install insulation in conformance with manufacturer's recommendations and requirements.

B. Duct Wrap: Cover air ducts per insulation table except ducts internally lined where internal duct lining is adequate to achieve adequate insulating values to meet local Energy Codes (indicate on shop drawings, locations where duct wrap is planned to be omitted and indicate internal duct lining insulating values to confirm they will meet the Energy Code). Wrap tightly with circumferential joints butted and longitudinal joints overlapped minimum of 2-inches. On ducts over 24-inches wide, additionally secure insulation with suitable mechanical fasteners at 18-inches on center. Circumferential and longitudinal joints

stapled with flare staples 6-inches on center and covered with 3-inch wide, foil reinforced tape.

3.03 DUCT INSULATION ACCESSORIES

A. Install insulation in conformance with manufacturer's recommendations and requirements.

3.04 DUCT INSULATION COMPOUNDS

A. Install insulation in conformance with manufacturer's recommendations and requirements.

END OF SECTION

SECTION 23 09 33
ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Relays and Contactors
   2. Transformers
   3. Wiring

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:
   1. Power wiring per Division 26, Electrical.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Operation and Maintenance Manual: Include record wiring drawings showing installed condition and operating changes made during start-up.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as outlined in Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Within 30 days prior to warranty expiration date, control supplier to visit job site and check calibration, operation, and adjustment of temperature, pressure and humidity sensors, valves, dampers, thermostats and other devices installed by control supplier. Make repair or replacement of defective control equipment as required at no charge to Owner.
   2. Submit letter to Architect certifying that this work has been completed.
   3. Attach copy of service report signed by Owner's Authorized Representative.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

2.02 RELAYS AND CONTACTORS

A. Provide relays and contactors where required to meet operating sequence where not internal to manufacturer's equipment.

B. Furnish relays or contactors with required coil voltage and contact amperage rating for use specified on Drawing and in manufacturer's equipment.

C. Mount relays in single control cabinet with hinge door and latch.

D. Control cabinet contains relays and numbered terminal strips for connection of relays and field wiring. Mount cabinet on painted plywood panel securely attached to wall framing. Mount time clock, transformer and motor contactors (if required) on plywood adjacent to control panel.

2.03 TRANSFORMERS

A. Transformers selected and sized for appropriate VAC capacity and installed and fused according to applicable codes. Provide wiring to nearest suitable power source as required.

2.04 WIRING

A. In accordance with Division 26, Electrical and applicable codes.

B. Provide line and low voltage wiring relating to control system. Includes wiring of contactors, relays, circuits, and incidental power wiring: operation power for time clock, power when run through stat/timeclock/relay, transformers.

PART 3 - EXECUTION

3.01 SEQUENCE OF OPERATION

A. Exhaust Fans:

1. Ceiling Exhaust Fans: Controlled from room lighting occupancy sensor. Provide delay-off relay and set to turn fan off 5-minutes after signal from occupancy sens.

3.02 INSTALLATION OF AUXILIARY CONTROL DEVICES

A. General:

1. Install sensors in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Ductwork, Joints and Fittings
   2. Insulated Flexible Duct
   3. Ductwork Joint Sealers and Sealants

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:
   1. Section 23 05 29, Hangers and Supports for HVAC Piping, Ductwork and Equipment.
   2. Section 23 05 93, Testing, Adjusting, and Balancing for HVAC.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Welding Certificates
   2. Field Quality Control Reports

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. NFPA Compliance:
      a. NFPA 90A Installation of Air Conditioning and Ventilating Systems.
      b. NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.
   2. Comply with SMACNA's HVAC Duct Construction Standards - Metal and Flexible for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Provide sheet metal materials free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.07 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select size and type of air-moving and distribution equipment and other air system components. Duct design is generally diagrammatic and is not meant to be scaled. Major changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

PART 2 - PRODUCTS

2.01 DUCTWORK, JOINTS, AND FITTINGS

A. Manufacturers:

1. Ductmate
2. Lindab Inc.
3. Nexus Inc.
4. SEMCO
5. United McGill Corporation
6. Ward Industries

B. Materials:
1. Galvanized Steel Ducts: Hot-dipped galvanized steel sheet, lock-forming quality, ASTM A 653/A 653M FS Type B, with G90/Z275 coating, minimum 26 gauge except where heavier material is specifed. Ducts to have mill phosphatized finish for surfaces exposed to view.

C. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
2. Deflection: Duct systems not-to-exceed deflection limits according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible.
3. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.

D. Formed-On Flanges: construct according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible, Figure 1-4, using corner, bolt, cleat, and gasket details.
1. Duct Size: Maximum 30-inches wide and up to 2-inch wg pressure class.
2. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.
3. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19-inches and larger and 0.0359-inch thick or less, with more than 10 SF of nonbraced panel area unless ducts are lined.

E. Round, Spiral Lock-Seam Ducts: Fabricate supply ducts of material specified in this Section according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible.
1. Ducts up to 20-inches in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.
2. Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.

F. 90-Degree Tees and laterals and Conical Tees: Fabricate to comply with SMACNA's HVAC Duct Construction Standards-Metal and Flexible, with metal thicknesses specified for longitudinal-seam straight ducts.

G. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.

H. Fabricate elbows using die-formed, gored, pleated, or mitered construction. Bend radius of die-formed, gored, and pleated elbows to be 1.5 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:
1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's HVAC Duct Construction Standards-Metal and flexible, unless otherwise indicated.
2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg (minus 500 to plus 500 Pa):

a. Ducts 3- to 36-inches in Diameter: 0.034-inch .

3. 90-Degree, Two-Piece, Mitered Elbows: Use only for supply systems or for material-handling Class A or B exhaust systems and only where space restrictions do not permit using radius elbows. Fabricate with single-thickness turning vanes.

4. Round Elbows:

a. 8-inches and Less in Diameter: Fabricate die-formed elbows for 45 and 90-degree elbows and pleated elbows for 30, 45, 60 and 90 degrees only. Fabricate nonstandard bend-angle configurations or non-standard diameter elbows with gored construction.

5. Not acceptable:

a. Corrugated or flexible metal duct.

b. Adjustable elbows.

2.02 INSULATED FLEXIBLE DUCT

A. Manufacturers:

1. ATCO
2. Flexmaster
3. J.P. Lamborn Co.
4. Hart and Cooley

B. Construction: Standard factory fabricated product. Inner wall: Impervious vinyl or chlorinated polyethylene, permanently bonded to a vinyl or zinc-coated spring steel helix.

C. Insulation: Fiberglass blanket insulation covered by an outer wall of vinyl or fiberglass-reinforced metalized vapor barrier.

D. Listing: UL 181 listed Class 1 flexible air duct material. Overall thermal transmission: No more than 0.25 BTU/in or hr/sq. degrees F at 75 degrees F differential, per ASTM C335.

E. Vapor transmission value no more than 0.10 perm, per ASTM E96.

F. Pressure Rating: 4-inch wg positive pressure and 1-inch wg negative pressure.

G. Performance Air Friction Correction Factor: 1.3 maximum at 95 percent extension. Working air velocity: Minimum 2000 FPM.

H. Flame Spread Rating: No more than 25.

I. Smoke Development Rating: No more than 50 as tested per ASTM E84.

J. Insertion Loss: Minimum attenuation of 29 DB for 10-foot straight length at 8-inch diameter at 500 Hz.

2.03 DUCTWORK JOINT SEALERS AND SEALANTS

A. Manufacturers:

1. Ductmate
2. Duro Dyne
3. Hardcast
4. United McGill Corporation
5. Vulkem
6. Foster
7. Childer

B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

C. Low Emitting Materials Requirement: Adhesives, sealants and sealant primers must comply with South Coast Air Quality Management District (SCAQMD) Rule #1168.

D. Type: Heavy mastic or liquid used alone or with fiber tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure and leakage class of ducts.

E. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E 84.

F. Water Based Sealant for Brush-On Application: Flexible, adhesive sealant, resistant to UV light, UL-181A, and UL-181-B listed, complying with NFPA requirements for Class 1 ducts. Min. 69 percent solids, nonflammable. Hardcast Versa-Grip 181; Childers CP-146; Foster 32-19 for SMACNA 1/2, 1, 2, 3, 4, 6, and 10-inch WG duct classes, and SMACNA Seal Class A, B, or C.

G. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C920, Type S, Grade NS, Class 25, Use O.

H. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

I. Polyurethane Sealant: General-purpose, exterior use, non-brittle sealant for gunned application. Vulkem 616 or equal.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. General: Use the following pressure seal, and leakage class(es) in design of ductwork specified in this section unless otherwise noted on Drawings.

SYSTEM	PRESSURE CLASS (Inches of Water)	SEAL CLASS	LEAKAGE CLASS ROUND DUCTS	LEAKAGE CLASS RECTANGULAR DUCTS
Low pressure (downstream of terminal unit)	+ 1-inch	A	3	6
Return and exhaust	0.5-inch more negative than return/exhaust fan pressure or -2-inch pressure class, whichever is more negative.	A	3	6

B. Ductwork Installation:

1. General: Install entire duct system in accordance with drawings, Specifications, and latest issues of local Mechanical Code, NFPA 90A, and SMACNA Duct Construction Manual. At Contractor's option, rectangular ductwork may be resized to maintain an equivalent air velocity and friction rate, while maintaining a maximum aspect ratio of 3. Remove markings and tagging from ductwork exterior surface in mechanical rooms and other locations where ductwork is exposed.
2. The duct layout shown on the Contract Drawings is diagrammatic in nature. Coordinate the ductwork routing and layout, and make alterations to the ductwork routing and layout to eliminate physical interferences. Where deviations in the ductwork routing as shown in the Contract Drawings are required, alterations may be made so as not to compromise the air flow, pressure drop, and sound characteristics of the duct fitting or duct run as shown on the Contract Drawings. In the event Architect determines that the installed ductwork is inconsistent with the above mentioned criteria, remove and replace at no additional cost to the Owner.
3. Install ducts with fewest possible joints.
4. Install fabricated fittings for changes in directions, size, shape, and for connections.

5. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12-inches, with a minimum of 3 screws in each coupling.
6. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.
7. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
8. Install ducts with a clearance of 1-inch, plus allowance for insulation thickness. Allow for easy removal of ceiling tile.
9. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.
10. Coordinate layout with suspended ceiling, air duct accessories, lighting layouts, and similar finish work.
11. Electrical and IT Equipment Spaces: route ducts to avoid passing through transformer vaults, electrical equipment spaces, IDF/MPOE rooms, and enclosures.
12. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2-inches.
13. Install ducts with hangers and braces designed to withstand, without damage to equipment, seismic force required by applicable building codes. Reference SMACNA's Seismic Restraint Manual: Guidelines for Mechanical Systems, Mason Seismic Restraint and Support Systems.
14. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's Duct Cleanliness for New Construction Advanced Level.
15. Paint interiors of metal ducts, that do not have duct liner, for 24-inches upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible duct material.
16. Install ductwork in the location and manner shown and detailed. Review deviations required by job conditions with Architect prior to any fabrication. Provide fittings for construction per SMACNA.
17. Install flexible ductwork to limit sag between support hangers to 1/2-inch per foot of spacing support.

C. Flanged Take-Offs:
1. Install at branch takeoffs to outlets using round or flex duct.
2. Flanged take-offs secured with minimum 8-inch screw spacing (three screws minimum).
3. Provide ductwork taps and branches off of main ducts at 45 degrees whether shown on Drawings or not (drawings are diagrammatic).

D. Cleaning:
1. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.
2. Grille and Exposed Duct Cleaning:
   a. After completion of ductwork installation, operate each fan system (excluding exhaust fans) for a minimum of 30 minutes prior to installation of ceiling grilles and diffusers. After grilles and diffusers are installed, clean out accumulation of particles from grilles and diffusers prior to acceptance.

b. Clean exterior surface of ducts exposed to public view of chalk, pencil and pen marks, labels, sizing tags, dirt, dust, etc., so that upon completion of installation, ducts are left in clean and unblemished manufactured conditions.

c. Exposed duct and grilles to remain free of dust entrained streaks due to leakage at joints and grille connections during warranty period. Clean leaks, seal and refinish to match existing if visible streaks develop.

3.02 DUCTWORK, JOINTS AND FITTINGS INSTALLATION

A. Duct Materials - Applied Locations:

1. General: Use the following materials in design of ductwork specified in this Section unless otherwise noted on the Drawings.

Location or Application	Material
Supply, Return, Transfer, and Exhaust - Low Pressure (downstream of terminal units)	Single Wall, Galvanized Steel

B. Ductwork Installation:

1. Fabricate radius elbows with centerline radius not less than 1-1/2 duct diameters.
2. Do not install duct size transition pitch angles which exceed 30 degrees for reductions in duct size in the direction of airflow, and 15 degrees for expansions in duct size in the direction of airflow.
3. Fabricate duct turns with the inside (smallest) radius at least equal to the duct width (supply ducts) and 1.5 times radius (return and exhaust ducts).

3.03 INSULATED FLEXIBLE DUCT INSTALLATION

A. Provide sheet metal plenum or rigid elbow and connect to diffusers and grilles with ductwork connections. Refer to Drawings for more information. Provide straight section of flexible duct with minimum length of 2-feet and maximum length of 5-feet and connect to sheet metal plenums and rigid elbows connected to diffusers and grilles, unless noted otherwise.

1. Provide round neck grilles/diffusers or square-to-round transitions. Flexible duct connections directly to diffuser and grilles is not allowed.
2. Flexible duct allowed in concealed spaces above lay-in ceilings only.

3.04 DUCTWORK JOINT SEALERS AND SEALANTS INSTALLATION

A. Joints and Seam Joint Sealing:

1. Seal duct seams and joints according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible, for duct pressure class indicated.
2. Seal transverse joints, longitudinal seams and duct wall penetrations including screw, fastener, pipe, rod, and wire.
3. Seal ducts before external insulation is applied.
4. Fasteners such as sheet-metal screws, machine screws or rivets to be cadmium plated.
5. Rectangular Ductwork: Where intermediate joint reinforcement is required for duct of negative pressure class, pre-drill stiffening flange and provide fastener maximum 8-inches on center. Where retaining flanges are welded to duct wall, paint welds with zinc coating.
6. Single Wall Round Ductwork: Joint to incorporate beaded slip collar with minimum #8 sheet metal screws 8-inches on center. Seal ductwork as specified in this Section.
7. Seal joints and seams. Apply sealant to make end connectors before insertion, and afterward to cover entire joint and sheet metal screws.

8. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
9. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities as well as Code required clearances.

END OF SECTION

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Sheet Metal Materials
   2. Dampers
   3. Duct Test Holes

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Manufacturer's catalog data and fabrication/installation drawings for each factory fabricated duct accessory. Include leakage, pressure drop and maximum back pressure data.
   2. Shop Drawings: Indicate air duct accessories.
   3. Manufacturer's installation instructions: Provide instructions for each factory fabricated duct accessory.
   4. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
      a. See Division 01, General Requirements, Product Requirements for additional provisions.
      b. Extra Fusible Links: One of each type and size.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this Section, with minimum five years of documented experience.
   2. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
   3. AMCA 500 - Test Methods for Louvers, Dampers and Shutters.
   4. AMCA 511 - Certified Ratings Program for Air Control Devices.
   5. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
   6. NFPA 101 - Life Safety Code.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M. Galvanizing: 1-1/4 ounces per square foot total both sides; ducts to have mill-phosphatized finish for surfaces exposed to view.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36-inches or less; 3/8-inch minimum diameter for lengths longer than 36-inches.

2.02 DAMPERS

A. Manufacturers:
   1. Air Balance
   2. Cesco
   3. Greenheck
   4. Nailor
   5. Ruskin

B. Basis-of-Design:
   1. Rectangular ductwork for velocities and pressures up to 1,500 fpm and 2.5-inch wg, respectively: Ruskin MD-35.
   2. Round ductwork for velocities and pressures up to 3,000 fpm and 4-inch wg, respectively: Ruskin CDSR-15.

C. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

D. Rectangular Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design with linkage concealed in frame and suitable for horizontal or vertical applications.
   1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum 16 gauge thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
      a. Roll-Formed Steel Blades: Galvanized sheet steel, 16 gauge thick for velocities up to 1,500 fpm, and 14 gauge thick for velocities up to 3,000 fpm.
      b. Blade Axles: Minimum 1/2-inch diameter, plated steel, hex shaped, mechanically attached to blade.
      c. Bearings: Molded synthetic sleeve, turning in extruded hole in frame.
      d. Tie Bars and Brackets: Galvanized steel.
      e. Mill galvanized.

E. Round Volume Dampers: Single-blade suitable for horizontal or vertical applications.
   1. Steel Frames: Galvanized, roll formed, minimum of 20 gauge thick with beads at each end.
   2. Blades: Minimum 14 gauge thick, galvanized sheet steel, round, single-piece.
   3. Blade Axles: Minimum 1/2-inch square, plated steel, mechanically attached to blade.
   4. Bearings: Molded synthetic sleeve, turning in hole in frame.

5. Finish: Mill galvanized.
6. Capacity:
   a. Closed Position: Maximum pressure of 4-inches wg.
   b. Open Position: Maximum air velocity of 3,000-feet per minute.
7. Leakage: Maximum 20 cfm at 4-inches wg.
8. Pressure Drop: Maximum 0.02-inch wg at 1,500-feet per minute through 20-inch diameter dampers.

F. Jackshaft: 1-inch diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.
2. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include 2-inch elevated platform for insulated duct mounting.

2.03 DUCT TEST HOLES

A. Manufacturers:
1. Ventlok

B. Temporary Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

PART 3 - EXECUTION

3.01 DUCT ACCESSORIES GENERAL INSTALLATION

A. Inspect areas to receive air duct accessories. Notify Engineer of conditions that would adversely affect the installation of the dampers. Do not proceed until conditions are corrected.

B. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts.

C. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

D. Do not compress or stretch damper frames into duct or opening.

E. Handle dampers using sleeve or frame. Do not lift dampers using blades, actuators, or jack shafts.

F. Adjust duct accessories for proper settings.

3.02 SHEET METAL MATERIALS INSTALLATION

A. Install bracing for multiple sections to support assembly weights and hold against system pressure. Install bracing as needed.

3.03 DAMPERS INSTALLATION

A. Where installing volume dampers in ducts with liner, avoid damage to and erosion of duct liner.

B. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts for air balancing. Install at a minimum of two duct widths from each branch takeoff. Provide balancing dampers for all air inlets and outlets.

C. Install dampers square and free from racking with blade running horizontally.

3.04 DUCT TEST HOLES INSTALLATION

A. Provide test holes at fan inlets and outlets where indicated and where required for air testing and balancing.

END OF SECTION

SECTION 23 34 00
HVAC FANS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Ceiling Exhaust Fans

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Certified fan performance curves with system operating conditions indicated.
   2. Certified fan sound-power ratings.
   3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   4. Material gauges and finishes, including color charts.
   5. Dampers, including housings, linkages, and operators.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Sound power levels as scheduled on Drawings. If not scheduled, within 5 percent of Basis of Design at design flow.
   2. Project Altitude: Base air ratings on sea-level conditions for project sites below 2,000 feet in elevation. Base air ratings on actual site elevations for project sites above 2,000 feet in elevation.
   3. Operating Limits: Classify according to AMCA 99.
   4. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   5. AMCA Compliance: Products are to comply with performance requirements and are to be licensed to use the AMCA-Certified Ratings Seal.
   6. NEMA Compliance: Motors and electrical accessories are to comply with NEMA standards.
   7. UL Standard: HVAC Fans are to comply with UL 705.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.08 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate installation of equipment supports.

1.09 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.01 CEILING EXHAUST FANS

A. Manufacturers:
   1. Greenheck
   2. Cook
   3. Broan
   4. Twin City
   5. Panasonic

B. Description: Centrifugal fan, direct drive, cabinet and exhaust grille. AMCA rated. Low sone model. Fan shrouds, motor, and fan wheel are to be removable for service.

C. Wheel: Centrifugal forward curved blades.

D. Housing: Acoustically insulated steel casing, factory standard finish, bottom access through grille, ducted outlet.

E. Drives: Direct drive.

F. Back draft damper.

G. Accessories:
   1. Disconnect plug.
   2. Louvered wall discharge with bird screen.

H. Motor: Integrally mounted with pre-lubricated sealed ball bearings. Engineered and rated to run continuously.
   1. Variable-Speed Controller: Where scheduled on Drawings, provide solid-state control to reduce speed from 100 percent to less than 50 percent.
   2. Disconnect Switch: Where not shown on Division 26, Electrical Drawings, provide nonfusible type, with thermal-overload protection mounted inside fan housing factory wired through an internal aluminum conduit.
   3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
   4. Electrically Commutated Motor (ECM) where indicated on Fan Schedule on Drawings.

I. Isolation: Rubber-in-shear vibration isolators.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install in accordance with manufacturer's instructions.

B. Install power ventilators level and plumb.

C. Support suspended units from structure threaded steel rods and vibration isolation device.

D. In seismic zones, restrain support units.

E. Install units with clearances for service and maintenance.

F. Provide backdraft dampers on discharge of exhaust fans and as indicated.

G. Duct installation and connection requirements are specified in other Division 23, HVAC Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors per Section 23 33 00, Air Duct Accessories.

H. Install ducts adjacent to power ventilators to allow service and maintenance.

I. Ground equipment.

J. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

K. Equipment Startup Checks:
   1. Verify that shipping, blocking, and bracing are removed.
   2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
   3. Verify that cleaning and adjusting are complete.
   4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.

L. Starting Procedures:
   1. Energize motor and adjust fan to indicated rpm.
   2. Measure and record voltage and amperage.

M. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

N. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

O. Shut unit down and reconnect automatic temperature-control operators.

P. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

Q. Adjust damper linkages for proper damper operation.

R. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.

S. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

T. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC fans. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.

3.02 CEILING EXHAUST FANS

A. Suspend units from structure; use steel wire or metal straps.

END OF SECTION

SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Grilles, Registers, Diffusers

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
   2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
   3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size and accessories furnished.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Air Distribution Diffuser, Register, and Grille Schedule lists Basis of Design, with any specialty accessories, construction, finish or other criteria noted on schedule. Submitted air distribution must match criteria of Basis of Design:
      a. Construction materials and appearance.
      b. Frame/installation method.
      c. Isothermal throw plus or minus 5 percent at design flows shown on drawings.
      d. Noise Criteria: NC value plus or minus 1 at design flows shown on drawings.
      e. Accessories: Equal to Basis of Design.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 23, HVAC sections, where more than a single type is specified for the application, provide single selection for each product category.

B. Grilles, Registers, Diffusers:
   1. Anemostat
   2. Carnes
   3. Environmental Air Products
   4. Krueger
   5. Metalaire

6. Nailor
7. Price Co.
8. Shoemaker
9. Titus
10. Tuttle & Bailey
11. Seiho
12. Or approved equivalent.

2.02 GRILLES, REGISTERS, DIFFUSERS

A. Diffuser, Register and Grille Schedule lists Basis of Design, with specialty accessories, construction, finish or other criteria noted on schedule. Submitted air distribution must match criteria of Basis of Design, including accessories and finish:
   1. Matching construction materials and appearance. Equal installation method/frame.
   2. Pressure drop equal to or less than Basis of Design at CFM on Drawings.
   3. Throw: Isothermal jet throw plus or minus 5 percent of Basis of Design at CFM listed on Drawings.
   4. Noise Criteria: Plus or minus 1 NC of Basis of Design at CFM listed on Drawings. If Basis of Design NC is below registered level, submitted must match. NC rating with 10 dB room factor or less.

B. Provide pattern controllers for linear supply air diffusers.

C. Coordinate mounting frames with ceiling construction type. Verify per reflected ceiling plans.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

A. Install in accordance with manufacturer's instructions. Provide seismic supports, clips, and bracing per local code. Coordinate installation of framing. Provide complete coverage of rough openings by integral device flanges or auxiliary frames. Where above ceiling location is unconditioned space, caulk rough openings; repair and re-paint locations where dust entrainment streaks develop due to unsealed openings.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Unless otherwise shown on drawings, for ceiling mounted air outlets with adjustable airflow pattern controllers mounted at a height of 12 feet or less, adjust the air outlets for horizontal air distribution, and adjust to vertical air distribution for ceiling height above 12 feet.

D. Exterior color of grilles per Architect. White finish if not otherwise scheduled or noted by Architect. Paint ductwork visible behind air outlets and inlets matte black.

E. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

3.02 GRILLES, REGISTERS AND DIFFUSERS INSTALLATION

A. Coordinate with Architectural Reflected Ceiling Plan(s). Reflected ceiling plans determine final locations.

B. Install diffusers to ductwork with air tight connection. 18-inch straight duct section or acoustic plenum at connection. Provide square to round adapters where required for connection to round ducts.

C. Linear Slot Diffusers:
   1. Coordinate connection plenum dimensions with linear slot final dimensions to conform with manufacturer's recommendations, or as indicated. Total and active

lengths as noted on drawings. Blank off unused sections. Coordinate frame type with Architect.

2. Paint surfaces visible behind air outlets and inlets, including blank-off sections, matte black unless otherwise called for on drawings.

END OF SECTION

SECTION 26 00 00
ELECTRICAL BASIC REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work included in 26 00 00, Electrical Basic Requirements applies to Division 26, Electrical work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of electrical systems for proposed project.

B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.

C. Definitions:

1. Provide: To furnish and install, complete and ready for intended use.
2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work furnished.
4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent", substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted items.
5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and other reviewing entity whose approval is required to obtain systems acceptance.

1.02 RELATED SECTIONS

A. Contents of Section applies to Division 26, Electrical Contract Documents.

B. Related Work:

1. Additional conditions apply to this Division including, but not limited to:
   a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
   b. Drawings
   c. Addenda
   d. Owner/Architect Agreement
   e. Owner/Contractor Agreement
   f. Codes, Standards, Public Ordinances and Permits

1.03 REFERENCES AND STANDARDS

A. References and Standards per Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, individual Division 26, Electrical Sections and those listed in this Section.

B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:

1. State of Oregon:
   a. OAR - Oregon Administrative Rules
   b. 2021 OESC - Oregon Electrical Specialty Code

c. 2019 OFC - Oregon Fire Code
d. 2019 OMSC - Oregon Mechanical Specialty Code
e. 2021 OPSC - Oregon Plumbing Specialty Code
f. 2019 OSSC - Oregon Structural Specialty Code
g. 2021 OEESC - Oregon Energy Efficiency Specialty Code
h. 2011 Oregon Elevator Specialty Code

C. Reference standards and guidelines include but are not limited to the latest adopted editions from:
1. ABA - Architectural Barriers Act
2. ADA - Americans with Disabilities Act
3. ANSI - American National Standards Institute
4. APWA - American Public Works Association
5. ASCE - American Society of Civil Engineers
6. ASHRAE Guideline 0, the Commissioning Process
7. ASTM - ASTM International
8. CFR - Code of Federal Regulations
9. EPA - Environmental Protection Agency
10. ETL - Electrical Testing Laboratories
11. FCC - Federal Communications Commission
12. FM - FM Global
13. IBC - International Building Code
14. IEC - International Electrotechnical Commission
15. IEEE - Institute of Electrical and Electronics Engineers
16. IES - Illuminating Engineering Society
17. ISO - International Organization for Standardization
18. MSS - Manufacturers Standardization Society
19. NEC - National Electric Code
20. NECA - National Electrical Contractors Association
21. NEMA - National Electrical Manufacturers Association
22. NETA - National Electrical Testing Association
23. NFPA - National Fire Protection Association
24. OSHA - Occupational Safety and Health Administration
25. UL - Underwriters Laboratories Inc.

D. See Division 26, Electrical individual Sections for additional references.

1.04 SUBMITTALS

A. See Division 01, General Requirements for Submittal Procedures as well as individual Division 26, Electrical Sections.

B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.

C. In addition:
1. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.
2. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail. For electronic format, provide one

file per division containing one bookmarked PDF file with each bookmark corresponding to each Specification Section. Arrange bookmarks in ascending order of Specification Section number. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. All transmissions/submissions to be submitted to Architect. Deviations will be returned without review.

a. Provide separate submittals for lighting control cutsheets, and for lighting control shop drawings.

3. Product Data: Provide manufacturer's descriptive literature for products specified in Division 26, Electrical Sections.
4. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.
   a. Label submittal to match numbering/references as shown in Contract Documents. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.
   b. Include technical data, installation instructions and dimensioned drawings for products, fixtures, equipment and devices installed, furnished or provided. Reference individual Division 26, Electrical specification Sections for specific items required in product data submittal outside of these requirements.
   c. See Division 26, Electrical individual Sections for additional submittal requirements outside of these requirements.
5. Maximum of two reviews of complete submittal package. Arrange for additional reviews and/or early review of long-lead items; Bear costs of these additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.
6. Resubmission Requirements: Make corrections or changes in submittals as required, and in consideration of Engineer’s comments. Identify Engineer’s comments and provide an individual response to each of the Engineer’s comments. Cloud changes in the submittals and further identify changes which are in response to Engineer’s comments.
7. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-16 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.
8. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 26, Electrical Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical submittals. Electric motors are supplied and installed by Division 23 unless otherwise specified. During shop drawing stage of the project, verify correct disconnect sizes, conductor sizes, etc., and bring any discrepancies to the attention of the Mechanical trade. Be

responsible for any modifications to electrical equipment or installations as a result of equipment incompatibility discovered after shop drawing review.

9. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.
10. Substitutions and Variation from Basis of Design:
    a. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.
    b. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals". For any product marked "or approved equivalent", a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.
11. Resubmission Requirements:
    a. Make any corrections or change in submittals when required. Provide submittals as specified. The Engineer will not be required to edit and/or interpret the Contractor's submittals. Indicate changes for the resubmittal in a cover letter with reference to page(s) changed and reference response to comment. Cloud changes in the submittals.
    b. Resubmit for review until review indicates no exception taken or "make corrections as noted".
12. Operation and Maintenance Manuals, Owner's Instructions:
    a. Submit, at one time, electronic files (PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
        1) Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.
        2) Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, quantities, relevant to each piece of equipment.
        3) Include Warranty per Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00,

Electrical Basic Requirements and individual Division 26, Electrical Sections.

4) Include product certificates of warranties and guarantees.
5) Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub assemblies.
6) Include commissioning reports.
7) Include copy of startup and test reports specific to each piece of equipment.
8) Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.

b. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 26 00 00, Electrical Basic Requirements, Demonstration.

c. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

13. Record Drawings:

a. Maintain at site at least one set of drawings for recording “As-constructed” conditions. Indicate on drawings changes to original documents by referencing revision document, and include buried elements, location of conduit, and location of concealed electrical items. Include items changed by field orders, supplemental instructions, and constructed conditions.

b. Record Drawings are to include equipment and fixture/connection schedules that accurately reflect "as constructed or installed" for project.

c. At completion of project, input changes to original project on Revit Model and make one set of black-line drawings created from Revit Model in version/release equal to contract drawings. Submit Revit Model and drawings upon substantial completion.

d. See Division 26, Electrical individual Sections for additional items to include in record drawings.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

B. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.

C. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e. distribution equipment, duct banks, light fixtures, etc.) and equipment proposed to assure

that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.

D. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.

E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.

F. Provide products that are UL listed.

1.06 WARRANTY

A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty under Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

1.07 COORDINATION DOCUMENTS

A. Prior to construction, coordinate installation and location of HVAC equipment, ductwork, grilles, diffusers, piping, plumbing equipment/fixtures, fire sprinklers, plumbing, lights, cable tray and electrical services with architectural and structural requirements, and other trades (including ceiling suspension and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.

B. Advise Architect in event a conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.

C. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer.

2.02 STANDARDS OF MATERIALS AND WORKMANSHIP

A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL or ETL listed and labeled or be approved by State, County, and City authorities prior to procurement and installation.

B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

C. Hazardous Materials:

1. Comply with local, State of Oregon, and Federal regulations relating to hazardous materials.
2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.

3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

PART 3 - EXECUTION

3.01 ACCESSIBILITY AND INSTALLATION

A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Install equipment requiring access (i.e., junction boxes, light fixtures, power supplies, motors, etc.) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in passageways, doorways, scuttles or crawlspaces which would impede or block the intended usage.

C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing, and coordination with other trades and disciplines.

D. Plenums:

1. In plenums, provide plenum rated materials that meet the requirements to be installed in plenums. Immediately notify Architect/Engineer of discrepancy.

E. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

F. Provide miscellaneous supports/metals required for installation of equipment and conduit.

3.02 SEISMIC CONTROL

A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 26 Electrical Sections.

B. General:

1. Earthquake resistant designs for Electrical (Division 26) equipment and distribution, i.e. power distribution equipment, generators, UPS, etc. to conform to regulations of jurisdiction having authority.
2. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.
3. Provide stamped shop drawings from licensed Structural Engineer of seismic bracing and seismic movement assemblies for conduit and equipment. Submit shop drawings along with equipment submittals.
4. Provide stamped shop drawings from licensed Structural Engineer of seismic flexible joints for conduit crossing building expansion or seismic joints. Submit shop drawings along with seismic bracing details.
5. Provide means to prohibit excessive motion of electrical equipment during earthquake.

3.03 REVIEW AND OBSERVATION

A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:
   1. Prior to covering walls.
   2. Prior to ceiling cover/installation.
   3. When main systems, or portions of, are being tested and ready for inspection by AHJ.

C. Final Punch:
   1. Prior to requesting a final punch visit from the Engineer, request from Engineer the Electrical Precloseout Checklist, complete the checklist confirming completion of systems' installation, and return to Engineer. Request a final punch visit from the Engineer, upon Engineer's acceptance that the electrical systems are ready for final punch.
   2. Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

3.04 CONTINUITY OF SERVICE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements, and Division 01, General Requirements. In the absence of specific requirements in Division 01, General Requirements, comply with individual Division 26, Electrical Sections and the following:
   1. During remodeling or addition to existing structure, while existing structure is occupied, present services to remain intact until new construction, facilities or equipment is installed.
   2. Prior to changing over to new service, verify that every item is thoroughly prepared. Install new wiring, and wiring to point of connection.
   3. Coordinate transfer time to new service with Owner. If required, perform transfer during off-peak hours. Once changeover is started, pursue to its completion to keep interference to a minimum.
      a. If overtime is necessary, there will be no allowance made by Owner for extra expense for such overtime or shift work.
   4. No interruption of services to any part of existing facilities will be permitted without express permission in each instance from Owner. Requests for outages must state specific dates, hours and maximum durations, with outages kept to these specific dates, hours and maximum durations. Obtain written permission from Owner for any interruption of power, lighting or signal circuits and systems.
      a. Organize work to minimize duration of power interruption.
      b. Coordinate utility service outages with utility company.

3.05 CUTTING AND PATCHING

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In the absence of specific requirements in Division 01, General Requirements, comply with individual Division 26, Electrical Sections and the following:
   1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of

proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).

2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftspeople of each respective trade in conformance with appropriate Division of Work.
3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
4. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, paving, and/or walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.
5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

3.06 EQUIPMENT SELECTION AND SERVICEABILITY

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

3.07 DELIVERY, STORAGE AND HANDLING

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:
1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust. Products and/or materials that become damaged due to water, dirt, and/or dust as a result of improper storage and handling to be replaced before installation.
2. Protect equipment to avoid damage. Close conduit openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.
3. Protect bus duct and similar items until in service.

3.08 DEMONSTRATION

A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, and individual Division 26, Electrical Sections.

B. Upon completion of work and adjustment of equipment, test systems and demonstrate to Owner's Authorized Representative, Architect, and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory

manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

3.09 CLEANING

A. Confirm Cleaning requirements in Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Upon completion of installation, thoroughly clean electrical equipment, removing dirt, debris, dust, temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

3.10 INSTALLATION

A. Confirm Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Install equipment and fixtures in accordance with manufacturers' installation instructions, plumb and level and firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.

C. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

D. Provide miscellaneous supports/metals required for installation of equipment.

3.11 PAINTING

A. Confirm requirements in Division 01, General Requirements and Division 09, Finishes. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:

1. Ferrous Metal: After completion of work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces (i.e., hangers, hanger rods, equipment stands, etc.) with one coat of black asphalt varnish for exterior or black enamel for interior, suitable for hot surfaces.
2. In Electrical Room, on roof or other exposed areas, equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
3. See individual equipment Specifications for other painting.
4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
5. Conduit: Clean, primer coat and paint interior/exterior conduit exposed in public areas with two coats paint suitable for metallic surfaces. Color selected by Architect.
6. Covers: Covers such as manholes, vaults and the like will be furnished with finishes which resist corrosion and rust.

3.12 DEMOLITION

A. Confirm requirements in Division 01, General Requirements and Division 02, Existing Conditions. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:

1. It is the intent of these documents to provide necessary information and adjustments to electrical system required to meet code, and accommodate installation of new work.
2. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas. Owner will cooperate

to best of their ability to assist in coordinated schedule, but will remain final authority as to time of work permitted.

3. Examination:
   a. Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to locate and preserve utilities. Replace damaged items with new material to match existing.
   b. Verify that abandoned wiring and equipment serve only abandoned facilities.
   c. Demolition drawings are based on casual field observation and existing record documents.
      1) Verify accuracy of information shown prior to bidding and provide such labor and material as is necessary to accomplish work.
      2) Verify location and number of electrical outlets, luminaires, panels, etc. in field.
   d. Report discrepancies to Architect before disturbing existing installation.
      1) Promptly notify Owner if utilities are found which are not shown on Drawings.
4. Execution:
   a. Remove existing luminaires, switches, receptacles, and other electrical equipment and devices and associated wiring from walls, ceilings, floors, and other surfaces scheduled for remodeling, relocation, or demolition unless shown as retained or relocated on Drawings.
   b. Provide temporary wiring and connections to maintain electrical continuity of existing systems during construction. Remove or relocate electrical boxes, conduit, wiring, equipment, and luminaires, as encountered in removed or remodeled areas in existing construction affected by this work.
   c. Remove and restore wiring which serves usable existing outlets clear of construction or demolition.
   d. If existing junction boxes will be made inaccessible, or if abandoned outlets serve as feed through boxes for other existing electrical equipment which is being retained, provide new conduit and wire to bypass inaccessible junction boxes and abandoned outlets.
   e. If existing conduits pass through partitions or ceiling which are being removed or remodeled, provide new conduit and wire to reroute clear of construction or demolition and maintain service to existing load.
   f. Extend circuiting and devices in existing walls to be furred out.
   g. Remove abandoned wiring to source of supply.
   h. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
   i. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
   j. Disconnect and remove abandoned panelboards and distribution equipment.
   k. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
   l. Existing lighting which is to remain, leave luminaires in proper working order.
   m. Repair adjacent construction and finishes damaged during demolition work.

n. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

3.13 ACCEPTANCE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:

1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
   a. Cleaning
   b. Operation and Maintenance Manuals
   c. Training of Operating Personnel
   d. Record Drawings
   e. Warranty and Guaranty Certificates
   f. Start-up/Test Document and Commissioning Reports

3.14 FIELD QUALITY CONTROL

A. Confirm Field Quality Control requirements in Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Tests:

1. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in operation and maintenance manuals.
2. During site evaluations by Architect or Engineer, provide appropriate personnel with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

3.15 LETTER OF CONFORMANCE

A. Provide Letter of Conformance, copies of manufacturers' warranties and extended warranties with a statement that Electrical items were installed in accordance with manufacturers' recommendations, UL listings and FM Global approvals. Include Letter of Conformance, copies of manufacturers' warranties and extended warranties in Operation and Maintenance Manuals.

3.16 SALVAGED EQUIPMENT AND RECYCLED MATERIAL

A. Salvage the following equipment not being reused and return to Owner:

1. Luminaires

B. Electrical equipment that cannot be salvaged for reuse, sell/give to recycling company. Recycle following excess, removed, or demolished electrical material:

1. Copper or aluminum conductors, buses, and motor/transformer windings.
2. Steel and aluminum from raceways, boxes, enclosures, and housings.
3. Acrylic and glass from luminaire lenses/refractors.

C. Provide separate on-site storage space for recycled and salvaged material. Clearly label space.

D. Confirm additional salvaged equipment and recycled materials in the Contract Documents.

END OF SECTION

SECTION 26 05 09
EQUIPMENT WIRING

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Equipment connections, whether furnished by Owner or other Divisions of the Contract.

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition:
   1. Verify mechanical and utilization equipment electrical characteristics with Drawings and equipment submittals prior to ordering equipment. Submit confirmation of this verification as a part of, or addendum to, the electrical product submittals.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements apply to this Section.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials and Equipment for Equipment Wiring: As specified in individual Sections.

2.02 GENERAL

A. Unless otherwise noted, the following voltage and phase characteristics apply to motors:
   1. 3/4 HP and Under: 120 volt, 1 phase.
   2. 1 HP and Less than 5 HP Loads: 480 volt, 3 phase.
   3. 5 HP and Over: 480 volt, 3 phase.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to submittal of product data for electrical distribution equipment, obtain and examine product data and shop drawings for equipment furnished by the Owner and by other trades on the project. Update the schedule of equipment electrical connections accordingly, noting proper ratings for overcurrent devices, fuses, safety disconnect switches, conduit and wiring, and the like. As a minimum, this requirement applies to equipment furnished by Owner and equipment furnished under the following divisions of work under this contract:
   1. Division 8, Openings
   2. Division 11, Equipment
   3. Division 21, Fire Suppression
   4. Division 22, Plumbing
   5. Division 23, HVAC, Heating, Ventilating and Air Conditioning

6. Division 28, Electronic Safety and Security

3.02 INSTALLATION

A. Do not install unrelated electrical equipment or wiring on mechanical equipment without prior approval of Architect.

B. Provide moisture tight equipment wiring and switches in ducts or plenums used for environmental air.

C. Connect motor and appliance/utilization equipment complete from panel to motor/equipment as required by code.

D. Install motor starters and controllers for equipment furnished by others.

E. Appliance/Utilization Equipment:

1. Provide appropriate cable and cord cap for final connection unless equipment is provided with same. Provide receptacle configured to receive cord cap.
2. Verify special purpose outlet NEMA configuration and ampere rating with equipment supplier prior to ordering wiring devices and coverplates.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Division 01, General Requirements.

3.04 SYSTEMS STARTUP

A. Provide field representative to prepare and start equipment.

1. Test and correct for proper rotation of polyphase motors.

B. Adjust for proper operation within manufacturer's published tolerances.

C. Demonstrate proper operation of equipment to Owner's Authorized Representative.

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Lugs and Pads
   2. Wires and Cables
   3. Splices
   4. Connectors

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Cable insulation test reports in project closeout documentation.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Lugs and Pads:
   1. Anderson
   2. Ilsco
   3. Panduit
   4. Thomas & Betts
   5. 3M
   6. Or approved equivalent.

B. Wires and Cables:
   1. General:
      a. General Cable
      b. Okonite
      c. Southwire
      d. Encore Wire
      e. Or approved equivalent.
   2. Metal Clad Cable - Type MC:
      a. Alflex
      b. AFC
      c. General Cable
      d. Southwire
      e. Encore Wire

f. Or approved equivalent.

C. Splices:
1. Branch Circuit Splices:
a. Ideal
b. 3M Scotchlok
c. Uraseal, Inc.
d. Or approved equivalent.

D. Connectors:
1. Anderson Power Products
2. Burndy
3. Ilsco
4. 3M
5. Thomas & Betts
6. Or approved equivalent.

2.02 LUGS AND PADS

A. Ampacity: Cross-sectional area of pad for multiple conductor terminations to match ampere rating of panelboard bus or equipment line terminals.

B. Copper Pads: Drilled and tapped for multiple conductor terminals.

C. Lugs: Compression type for use with stranded branch circuit or control conductors; mechanical type for use with solid branch and feeder circuit conductors.

2.03 WIRES AND CABLES

A. Building Wires:
1. Copper: Soft-drawn with conductivity of not less than 98 percent IACS at 20 degrees C (68 degrees F). 600 volt rated throughout. Conductors 12 AWG and larger, stranded. 12 AWG minimum conductor size. Minimum insulation rating of 90 degrees C. Insulation Type: THHN/THWN-2.

B. Phase color to be consistent at feeder terminations; A-B-C, top to bottom, left to right, front to back.

C. Color Code Conductors as Follows:

PHASE	208 VOLT WYE	480 VOLT
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Neutral	White	Gray or White w/colored strip
Ground	Green	Green

D. MC Cable:
1. Standard: High strength galvanized steel flexible armor. Full length minimum size No. 12 copper ground wire, copper dual rated THHN/THWN-2, full length tape marker phase/circuit identification on cable armor. Short circuit throat insulators, mechanical compression termination.

E. AC Cable (Armored Cable): Not allowed.

F. NMB Cable: Not allowed.

2.04 SPLICES

A. Branch Circuits: Twist on, high temperature, grounding type wing nuts.
1. Ideal Industries Wing-Nut Twist-On Connectors.
2. 3M Scotchlok Twist-On Wire Connectors.

2.05 CONNECTORS

A. Split bolt connectors not allowed.

B. Conductor Branch Circuits: Wire nuts with integral spring connectors for conductors 12 AWG through 8 AWG. Push-in type connectors where conductors are not required to be twisted together are not acceptable.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install per manufacturer instructions and OESC.

B. Field Quality Control:

1. Inspect and test in accordance with NETA Standard ATS, except Section 4.
2. Perform inspections and tests listed in NETA Standard ATS, Section 7.3.2.

3.02 LUGS AND PADS

A. Thoroughly clean surfaces to remove all dirt, oil, grease, or paint.

B. Use torque wrench to tighten per manufacturer's directions.

3.03 WIRES AND CABLES

A. General:

1. Do not install or handle thermoplastic insulated wire and cable in temperatures below -10 degrees C (14 degrees F). Do not handle thermoset insulated wire and cable in temperatures below -40 degrees C (-40 degrees F). All wire and cable must be acclimated to temperatures above freezing for no less than 24 hours prior to installation.
2. Install conductors in raceways having adequate, code size cross-sectional area for wires indicated.
3. Install conductors with care to avoid damage to insulation.
4. Do not apply greater tension on conductors than recommended by manufacturer during installation.
5. Use of pulling compounds is permitted. Clean residue from exposed conductors and raceway entrances after conductor installation. Do not use pulling compounds for installation of conductors connected to GFCI circuit breakers or GFCI receptacles.
6. Conductor Size and Quantity:
   a. Install no conductors smaller than 12 AWG unless otherwise shown.
   b. Provide required conductors for a fully operable system.
   c. Power Circuits: No. 12 AWG minimum, except as follows:
      1) No. 10 AWG for 15A, 120V circuits longer than 100-feet.
      2) No. 8 AWG for 15A, 120V circuits longer than 150-feet.
      3) No. 10 AWG for 20A, 120V circuits longer than 70-feet.
      4) No. 8 AWG for 20A, 120V circuits longer than 100-feet.
   d. When exact run lengths are determined for all branch circuits, and prior to installation of the conductors, ensure that the maximum voltage drop, based on 80 percent of the circuit protective device, does not exceed 3 percent. Increase wire size from #12AWG, if necessary, to ensure that the 3 percent voltage drop is not exceeded.
7. Provide dedicated neutrals (one neutral conductor for each phase conductor) in all 120V circuits.

B. Conductors in Cabinets:

1. Cable and tree wires in panels and cabinets for power and control. Use plastic ties in panels and cabinets.

2. Tie and bundle feeder conductors in wireways of panelboards.
3. Hold conductors away from sharp metal edges.

C. Homeruns:
1. Do not change intent of branch circuit homeruns without approval. Homeruns for 20A branch circuits may be combined to a maximum of six current carrying conductors including neutral conductors in homeruns. Apply derating factors as required per NEC. Increase conductor size as needed.
2. MC cable homeruns are not allowed.

D. Identify wire and cable under the provisions of Section 26 05 53, Identification for Electrical Systems. Identify each conductor with its panel and circuit number as indicated.

E. Exposed cable is not allowed.

F. All cable must be run parallel or perpendicular to building lines and hidden from view when possible. Where installed in tray each power cable is to be identified with Lamacoid nametag engraved with identification of equipment being fed. Tag to be fastened to cable using tie-wraps. Provide nametag at each floor level.

G. Do not install PVC jacketed cables in return air plenums, unless they are specially rated plenum cables.

H. Use of MC Cable is limited to the following conditions. Installations that do not comply with the following conditions are to be removed and replaced with no additional expense to the Owner.
1. 15 and 20 amp branch wiring where following conditions apply:
a. Where there is a suspended ceiling with accessible space above (example: suspended acoustic ceiling tile).

3.04 SPLICES

A. Make splices complete and promptly after wire installation. Provide single wire pigtails for luminaire and device connections. Wire nuts may be used for luminaire wire connections to single wire circuit conductor pigtails.

B. Make splices for No. 8 and larger wires with mechanically applied pressure type connectors. Make all taped joints with Scotch 33+ or equal, applied in half-lap layers without stretching to deform. Uraseal splice kits are also acceptable through 250 KCMIL.

C. Remove insulation with a stripping tool designed specifically for that purpose. A pocket knife is not an acceptable tool. Leave all conductors nick-free.

3.05 CONNECTORS

A. Install to assure a solid and safe connection.

B. Select hand twist connectors for wire size and install tightly on conductors.

C. Install compression connectors using methods and tools recommended by the manufacturer.

D. Do not install stranded conductors under screw terminals unless compression lugs are installed.

E. Do not connect wiring without UL listed connectors that are listed for the purposes.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Connectors and Accessories
   2. Grounding Conductor

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals not required for this Section.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Comply with the requirements of ANSI/NFPA 70.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Connectors and Accessories:
   1. Burndy Hyground Compression System
   2. Erico/Cadweld
   3. Amp Ampact Grounding System
   4. Pipe Grounding Clamp:
      a. Burndy GAR Series
      b. O Z Gedney
      c. Thomas & Betts
      d. Or approved equivalent.

B. Grounding Conductor
   1. General Cable
   2. Okonite
   3. Southwire
   4. Or approved equivalent

2.02 CONNECTORS AND ACCESSORIES

A. Grounding Connectors: Hydraulic compression tool applied connectors or exothermic welding process connectors or powder actuated compression tool applied connectors.

B. Pipe Grounding Clamp: Mechanical ground connector with cable parallel or perpendicular to pipe.

2.03 GROUNDING CONDUCTOR

A. Grounding Electrode Conductor: Soft-draw bare stranded copper for wire sizes larger than #10 AWG Bare. Solid copper for wire sizes #10 AWG and smaller.

B. Equipment Grounding Conductor: Green insulated, insulation type to match that of associated feeder or branch circuit wiring, size as indicated on drawings.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Verify site conditions prior to beginning work.

B. Separately Derived Systems: Ground each separately derived system per NEC Article 250.

C. Corrosion inhibitors: Apply a corrosion inhibitor to contact surfaces when making grounding and bonding connections. Use corrosion inhibitor appropriate for protecting a connection between metals used.

D. Inspect and test in accordance with NETA Standard ATS, Except Section 4.

E. Perform inspections and tests listed in NETA Standard AB, Section 7.13.

3.02 CONNECTORS AND ACCESSORIES INSTALLATION

A. Install per manufacturer's instructions.

3.03 GROUNDING CONDUCTOR INSTALLATION

A. Raceways:

1. Ground metallic raceway systems. Bond to ground terminal with code size jumper except where code size or larger equipment grounding conductor is included with circuit, use grounding bushing with lay-in lug.
2. Connect metal raceways, which terminate within an enclosure but without mechanical connection to enclosure, by grounding bushings and ground conductor to grounding bus.
3. Where equipment supply conductors are in flexible metallic conduit, install stranded copper equipment grounding conductor from outlet box to equipment frame.
4. Install equipment grounding conductor, code size minimum unless noted on drawings, in metallic and nonmetallic raceway systems.

B. Feeders and Branch Circuits:

1. Provide continuous green insulated copper equipment grounding conductors for feeders and branch circuits.
2. Where installed in a continuous solid metallic raceway system and larger sizes are not detailed, provide insulated equipment grounding conductors for feeders and branch circuits sized in accordance with the latest adopted edition of NEC Article 250, Table 250-122.

C. Bond boxes, cabinets, enclosures and panelboard equipment grounding conductors to enclosure with specified conductors and lugs. Install lugs only on thoroughly cleaned contact surfaces.

D. Motors, Equipment and Appliances: Install code size equipment grounding conductor to (motor) equipment frame or manufacturer's designated ground terminal.

E. Receptacles: Connect ground terminal of receptacle and associated outlet box to equipment grounding conductor. Self grounding nature of receptacle devices does not eliminate equipment grounding conductor bolted to outlet box.

END OF SECTION

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Anchors, Threaded Rod and Fasteners
   2. Support Channel, Hangers and Supports

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals not required for this Section.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Manufacturers regularly engaged in the manufacture of bolted metal framing support systems, whose products have been in satisfactory use in similar service for not less than 10 years.
   2. Support systems to be supplied by a single manufacturer.
   3. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support, trapeze, equipment hangers/supports, and seismic restraint by a qualified Structural Professional Engineer.
      a. 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 hangers and supports that are similar to those indicated for this Project in material, design, and extent.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.07 PERFORMANCE REQUIREMENTS

A. General: Provide conduit and equipment hangers and supports in accordance with the following:
   1. When supports, anchorages, and seismic restraints for equipment and supports, anchorages and seismic restraints for conduit, cable tray and equipment are not shown on the Drawings, the Contractor is responsible for their design.
   2. Connections to structural framing shall not introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

B. Engineered Support Systems: The following support systems to be designed, detailed, and bear the seal of a professional engineer registered in the State of Oregon.
   1. Support frames such as conduit racks or stanchions for conduit and equipment which provide support from below.
   2. Equipment and piping support frame anchorage to supporting slab or structure.

C. Provide channel support systems, for conduits to support multiple conduits capable of supporting combined weight of support systems and system contents.
D. Provide heavy-duty steel trapezes for piping to support multiple conduit capable of supporting combined weight of supported systems and system contents.
E. Provide seismic restraint hangers and supports for conduit and equipment.
F. Obtain approval from AHJ for seismic restraint hanger and support system to be installed for piping and equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Anchors, Threaded Rod and Fasteners:
   1. Anchor It
   2. Epcon System
   3. Hilti-Hit System
   4. Power Fast System
   5. Or approved equivalent.
B. Support Channel, Hangers and Supports:
   1. B-Line
   2. Kindorf
   3. Superstrut
   4. Unistrut
   5. Or approved equivalent.

2.02 ANCHORS, THREADED ROD AND FASTENERS

A. Anchors, Threaded Rod and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.
B. Concrete Inserts: Cast in concrete for support fasteners for loads up to 800 lbs.
C. Anchors and Fasteners:
   1. Do not use powder-actuated anchors.
   2. Concrete Structural Elements: Use precast inserts or expansion anchors.
   3. Steel Structural Elements: Use beam clamps, steel spring clips, steel ramset fasteners, or welded fasteners.
   4. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
   5. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
   6. Solid Masonry Walls: Use expansion anchors.
   7. Sheet Metal: Use sheet metal screws.
   8. Wood Elements: Use wood screws.
D. Fasteners: Provide fasteners of types as required for assembly and installation of fabricated items; surface-applied fasteners are specified elsewhere.
E. Bolts: Low carbon steel externally and internally threaded fasteners conforming with requirements of ASTM A307; include necessary nuts and plain hardened washers. For structural steel elements supporting mechanical material or equipment from building structural members or connection thereto, use fasteners conforming to ASTM A325.
F. Miscellaneous Materials: Provide incidental accessory materials, tools, methods, and equipment required for fabrication.

2.03 SUPPORT CHANNEL, HANGERS AND SUPPORTS

A. Hangers and Supports - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.

1. Channel Material: Carbon steel.
2. Coating: Hot dip galvanized.

B. Pipe Straps: Two-hole galvanized or malleable iron.

C. Luminaire Chain: 90 lb. test with steel hooks.

D. Miscellaneous Metal: Provide miscellaneous metal items specified hereunder, including materials, fabrication, fastenings and accessories required for finished installation, where indicated on Drawings or otherwise not shown on drawings that are necessary for completion of the project. The Contractor is responsible for their design.

1. Fabricate miscellaneous units to size shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

E. Structural Shapes: Where miscellaneous metal items are needed to be fabricated from structural steel shapes and plates, provide members constructed of steel conforming with requirements of ASTM A36 or approved equivalent.

F. Steel Pipe: Provide seamless steel pipe conforming to requirements of ASTM A53, Type S, Grade A, or Grade B. Weight and size required as specified.

G. Miscellaneous Materials: Provide incidental accessory materials, tools, methods, and equipment required for fabrication.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Fabrication - Miscellaneous Metals

1. General: Verify dimensions prior to fabrication. Form metal items to accurate sizes and configurations as indicated on Drawings and otherwise required for proper installation; make with lines straight and angles sharp, clean and true; drill, countersink, tap, and otherwise prepare items for connections with work of other trades, as required. Fabricate to detail of structural shapes, plates and bars; weld joints where practicable; provide bolts and other connection devices required. Include anchorages; clip angles, sleeves, anchor plates, and similar devices. Hot dipped galvanize after fabrication items installed in exterior locations. Set accurately in position as required and anchor securely to building construction. Construct items with joints formed for strength and rigidity, accurately machining for proper fit; where exposed to weather, form to exclude water.
2. Finishes:
   a. Ferrous Metal: After fabrication, but before erection, clean surfaces by mechanical or chemical methods to remove rust, scale, oil, corrosion, or other substances detrimental to bonding of subsequently applied protective coatings. For metal items exposed to weather or moisture, galvanize in manner to obtain G90 zinc coating in accordance with ASTM A123. Provide other non-galvanized ferrous metal with one coat of approved rust-resisting paint primer, in manner to obtain not less than 1.0 mil dry film thickness. Touch-up damaged areas in primer with same material, before installation. Apply zinc coatings and paint primers uniformly and smoothly; leave ready for finish painting as specified elsewhere.
   b. Metal in contact with Concrete, Masonry and Other Dissimilar Materials: Where metal items are to be erected in contact with dissimilar materials, provide contact surfaces with coating of an approved zinc-chromate primer in

manner to obtain not less than 1.0 mil dry film thickness, in addition to other coatings specified in these specifications.

c. For Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

3.02 ANCHORS, THREADED ROD AND FASTENERS INSTALLATION

A. Safety factor of 4 required for every fastening device or support for equipment installed. Supports to withstand four times the weight of equipment it supports.

B. Do not use other trade's fastening devices as supporting means for luminaires, equipment or materials.

C. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

D. Do not use supports or fastening devices to support other than one particular item.

E. Securely suspend junction boxes, pull boxes or other conduit terminating housings located above suspended ceiling from floor above or roof structure to prevent sagging and swaying.

F. Provide seismic bracing per OSSC requirements.

G. Install surface-mounted cabinets and panelboards with minimum of four anchors.

H. Use spring lock washers under fastener nuts for strut.

I. Cutting and Drilling

1. Do not drill or cut structural members without prior permission from Architect.

3.03 SUPPORT CHANNEL, HANGERS AND SUPPORTS INSTALLATION

A. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.

B. Safety factor of 4 required for every fastening device or support for equipment installed. Supports to withstand four times the weight of equipment it supports.

C. Verify mounting height of luminaires prior to installation when heights are not detailed.

D. Install vertical support members for equipment and luminaires, straight and parallel to building walls.

E. Install horizontal support members straight and parallel to ceilings or finished floor unless otherwise noted.

F. Provide independent supports to structural member for luminaires, materials, or equipment installed in or on ceiling, walls or in void spaces or over suspended ceilings.

G. Do not use other trade's fastening devices as supporting means for luminaires, equipment or materials.

H. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

I. Do not use supports or fastening devices to support other than one particular item.

J. Support conduits within 18-inches of outlets, boxes, panels, cabinets and deflections unless more stringently required by OESC.

K. Maximum distance between supports not to exceed 8 foot spacing unless otherwise required by OESC. 5-feet is a District Standard requirement.

L. Support flexible conduits and metal clad cable within 12-inches of outlets, boxes, panels, cabinets and deflections unless otherwise required by OESC.

M. Maximum distance between supports for flexible conduits and metal clad cable not to exceed 48-inches spacing unless otherwise required by OESC.

N. Maximum distance between supports for auxiliary gutters and wireways unless otherwise required by OESC is as follows:

1. Sheet metal auxiliary gutters and wireways - 4-feet apart horizontally and 10-feet vertically.

2. Non-metallic auxiliary gutters and wireways - 30-inches apart horizontally and 3-feet vertically.

O. Install strut hangers as instructed by strut manufacturer. Suspend strut hangers as instructed by strut manufacturer for the load, with a maximum spacing of 8-feet on center and within 2-feet of outlet box, cabinet, junction box or other channel raceway termination unless otherwise required by OESC.

P. Coordinate routing of conduit racks with materials and equipment installed by other trades. Where conduit racks are exposed to view, coordinate location and installation with Architect for optimal appearance.

Q. Securely suspend junction boxes, pull boxes or other conduit terminating housings located above suspended ceiling from floor above or roof structure to prevent sagging and swaying.

R. Provide seismic bracing per OSSC requirements.

S. Where service disconnects are mounted on building exterior, physically attach service disconnect to the building or structure served.

T. Install surface-mounted cabinets and panelboards with minimum of four anchors.

U. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

V. Wet and Damp Locations:

1. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1-inch off wall.

END OF SECTION

SECTION 26 05 33
RACEWAYS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Electrical Metallic Tubing (EMT)
   2. Flexible Metal Conduit (FMC)
   3. Liquidtight Flexible Metal Conduit (LFMC)

B. Provide a complete system of conduit and fittings, with associated couplings, connectors, and fittings, as shown on Drawings and described in these Specifications.

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:
   1. Section 26 05 29, Hangers and Supports for Electrical Systems and Equipment
   2. Section 26 05 34, Boxes

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.07 DEFINITIONS

A. Raceway system is defined as consisting of conduit, tubing, duct, and fittings including but not limited to connectors, couplings, offsets, elbows, bushings, expansion/deflection fittings, and other components and accessories. Complete electrical raceway installation before starting the installation of conductors and cables.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Electrical Metallic Tubing (EMT):
   1. Allied Tube & Conduit
   2. Beck Manufacturing WL
   3. Picoma
   4. Wheatland Tube Company
   5. Or approved equivalent.

B. Flexible Metal Conduit (FMC):
   1. AFC Cable Systems Inc.
   2. Electri-Flex Company
   3. International Metal Hose
   4. Or approved equivalent.

C. Liquidtight Flexible Metal Conduit (LFMC):
   1. AFC Cable Systems Inc.

2. Electri-Flex Company
3. International Metal Hose
4. Or approved equivalent.

2.02 ELECTRICAL METALLIC TUBING (EMT)

A. Description: UL 797, ANSI C80.3; steel galvanized tubing.
B. Fittings: NEMA FB 1; steel, set screw type.

2.03 FLEXIBLE METAL CONDUIT (FMC)

A. Description: UL 1, interlocked steel construction.
B. Fittings: NEMA FB 2.20.

2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: UL 360, inner core made from spiral wound strip of heavy gauge, hot dipped galvanized low carbon steel. 3/4-inch through 1-1/4-inch trade sizes to have a square lock core and contain an integral bonding strip of copper. 1-1/2-inch and larger to have fully interlocked core. Jacket material to be moisture, oil and sunlight resistant flexible PVC.
B. Fittings: NEMA FB 2.20.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Finished Surfaces: Schedule raceway installation to avoid conflict with installed wall and ceiling surfaces. If unavoidable, coordinate work and repairs with Architect.
B. Conduit Size:
1. Minimum Size: 3/4-inch for power and control, unless otherwise noted. 3/4-inch for communication/data, unless otherwise noted. 3/4-inch for signal systems, unless otherwise noted.
C. Provide two pull strings/tapes in empty conduits. Types:
1. Branch Circuits and Low Voltage: Greenlee Poly Line 431 or approved.
2. If fish tape is used for pulling line or low voltage wiring, fiberglass type to be used. Metal fish tapes will not be allowed.
3. Secure pull string/tape at each end.
4. Provide caps on ends of empty conduit to be used in future.
5. Label both ends of empty conduits with location of opposite end.
D. Elbow for Low Energy Signal Systems: Use long radius factory ells where linking sections of raceway for installation of signal cable.
E. Verify that field measurements are as shown on Drawings.
F. Plan locations of conduit runs in advance of the installation and coordinate with ductwork, plumbing, ceiling and wall construction in the same areas.
G. Locate penetrations and holes in advance where they are proposed in the structural sections such as footings, beams, and walls. Penetrations are acceptable only when the following occurs:
1. Where shown on the Structural Drawings.
2. As approved by the Structural Engineer prior to construction, and after submittal of drawing showing location, size, and position of each penetration.
H. Verify routing and termination locations of conduit prior to rough-in.
I. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.
J. Install raceways securely, in neat and workmanlike manner, as specified in NECA 1, Standard Practices for Good Workmanship in Electrical Construction.
K. Install steel conduit as specified in NECA 101, Standard for Installing Steel Conduits.
L. Inserts, anchors and sleeves.

1. Coordinate location of inserts and anchor bolts for electrical systems prior to concrete pour.
2. Coordinate location of sleeves with consideration for other building systems prior to concrete pour.

M. Conduit Supports:
1. Arrange supports to prevent misalignment during wiring installation.
2. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
3. Group related conduits; support using conduit rack. Construct rack using steel channel. Provide space on each for conduits.
4. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
5. Do not attach conduit to ceiling support wires.

N. Flexible metal conduit length not-to-exceed 6-feet, 3-feet in concealed walls. Provide sufficient slack to reduce the effect of vibration.

O. Install conduit seals at boundaries where ambient temperatures differ by 10 degrees F or more as shown on the drawings. Install seals on warm side of partition.

P. Seal raceways stubbing up into electrical equipment. Plug raceways with conductors with duct-seal. Cap spare raceways and plug PVC raceway products with plastic plugs as made by Underground Products, or equal, shaped to fit snugly into the stubup.

Q. Seal raceways penetrating an exterior building wall to prevent moisture and vermin from entering into the electrical equipment.

R. Use suitable caps on spare and empty conduits to protect installed conduit against entrance of dirt and moisture.

S. Only conduit servicing elevator equipment can be installed through elevator shafts or equipment rooms. These conduits may only enter the room and go directly to the equipment being supplied.

T. Keep 277/480 volt wiring independent of 120/208 volt wiring. Keep power wiring independent of communication system wiring.

U. Keep emergency system wiring independent of other wiring systems per NEC 700.

V. Arrange conduit to maintain headroom and present neat appearance.

W. Do not install conduits on surface of building exterior, along vapor barrier, across roof, on top of parapet walls, or across floors, unless otherwise noted on drawings.

X. Exposed conduits are permitted only in following areas:
1. Mechanical rooms, electrical rooms or spaces where walls, ceilings and floors will not be covered with finished material.
2. Existing walls that are concrete or block construction.
3. Where specifically noted on Drawings.
4. Route exposed conduit parallel and perpendicular to walls, tight to finished surfaces and neatly offset into boxes.

Y. Do not install conduits or other electrical equipment in obvious passages, doorways, scuttles or crawl spaces which would impede or block area passage's intended usage.

Z. Install continuous conduit and raceways for electrical power wiring and signal systems wiring.

AA. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

BB. Maintain adequate clearance between conduit and piping.

CC. Keep conduits a minimum of 12-inches away from steam or hot water radiant heating lines (at or above 104 degrees F) or 3-inches away from waste or water lines.

DD. Cut conduit square using saw or pipecutter; deburr cut ends.

EE. Bring conduit to shoulder of fittings; fasten securely.

FF. Use conduit hubs or sealing locknuts to fasten conduit to cast boxes in damp and wet locations.

GG. Install no more than the equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams.

HH. Use hydraulic one shot bender to fabricate elbows for bends in metal conduit larger than 2-inch size.

II. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

JJ. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control, and expansion joints.

KK. Conduit Terminations for Signal Systems: Provide a plastic bushing on the end of conduit used for signal system wiring.

LL. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07, Thermal and Moisture Protection.

MM. Route conduit through roof openings for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing installation and installer.

3.02 ELECTRICAL METALLIC TUBING (EMT) INSTALLATION

A. Dry Locations:

1. Concealed: EMT.
2. Exposed: EMT.

B. Dry, Protected: EMT.

3.03 FLEXIBLE METAL CONDUIT (FMC) INSTALLATION

A. Dry Locations: Motors, recessed luminaires and equipment connections subject to movement or vibration, use flexible metallic conduit.

B. Install 12-inch minimum slack loop on flexible metallic conduit.

3.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC) INSTALLATION

A. Use PVC coated liquidtight flexible metallic conduit for motors and equipment connections subject to movement or vibration and subjected to any of following conditions: Exterior location, moist or humid atmosphere, corrosive environments, water spray, oil, or grease.

B. Install 12-inch minimum slack loop on liquidtight flexible metallic conduit.

END OF SECTION

SECTION 26 05 34
BOXES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Outlet Boxes
   2. Pull and Junction Boxes

B. Provide electrical boxes and fittings for a complete installation. Include but not limited to outlet boxes, junction boxes, pull boxes, bushings, locknuts and other necessary components.

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:
   1. Section 26 05 33, Raceways
   2. Section 26 05 53, Identification for Electrical Systems

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Outlet Boxes:
   1. Hubbell
   2. Thomas & Betts
   3. Eaton/Crouse-Hinds
   4. Or approved equivalent.

B. Pull and Junction Boxes:
   1. Eaton/Crouse-Hinds
   2. Hoffman
   3. Or approved equivalent.

2.02 OUTLET BOXES

A. Luminaire Outlet: 4-inch octagonal box, 1-1/2-inches deep with 3/8-inch luminaire stud if required. Provide raised covers on bracket outlets and on ceiling outlets.

B. Device Outlet: Installation of one or two devices at common location, minimum 4-inches square, minimum 1-1/2-inches deep for non-USB type devices. Installation of one or two devices at common locations, minimum 4-inches square, minimum 2-inches deep for USB type devices. Single- or two-gang flush device raised covers.

C. Telecom Outlet: Provide 4-inches square, minimum 2-1/8-inch deep box with two-gang plaster ring.

D. Multiple Devices: Three or more devices at common location. Install one-piece gang boxes with one-piece device cover. Install one device per gang.
E. Masonry Boxes: Outlets in concrete.
F. Construction: For interior locations, provide galvanized steel outlet wiring boxes, of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices. All surface mounted outlet boxes are to be drawn. Welded boxes are not acceptable.
G. Accessories: Provide outlet box accessories for each installation, including mounting brackets, wallboard hangers, extension rings, luminaire studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations.
H. Noise Control: Provide acoustic putty pad to back side of each outlet box installed in acoustic rated walls.

2.03 PULL AND JUNCTION BOXES

A. Construction: Provide ANSI 61 gray polyester powder painted sheet steel junction and pull boxes, with screw-on covers; of type shape and size, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.
B. Location:
1. Provide junction boxes above accessible ceilings for drops into walls for receptacle outlets from overhead.
2. Provide junction boxes and pull boxes to facilitate installation of conductors and limiting accumulated angular sum of bends between boxes, cabinets and appliances to 270 degrees.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate locations of floor boxes and wall mounted wiring device boxes with architectural and structural floor plans prior to rough-in.
B. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1, Standard Practice of Good Workmanship in Electrical Construction.
C. Secure boxes rigidly to substrate upon which they are being mounted.
D. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NEC. Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.
E. Set wall mounted boxes at elevations to accommodate mounting heights specified in this Section.
F. Electrical boxes are shown on drawings in approximate locations unless dimensioned.
G. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07, Thermal and Moisture Protection.
H. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
I. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
J. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12-inches of box.
K. Box Color Coding and Marking: Reference Section 26 05 53, Identification for Electrical Systems.

L. Adjust boxes to be parallel with building lines. Boxes not plumb to building lines are not acceptable.
M. Install knockout closures in unused box openings.
N. Clean interior of boxes to remove dust, debris, and other material.
O. Clean exposed surfaces and restore finish.

3.02 OUTLET BOXES INSTALLATION

A. Mount outlet boxes, unless otherwise required by ADA, or noted on drawings, following distances above finished floor:
   1. Existing building standard heights take precedence.
   2. Control Switches:
      a. 48-inches to the top of outlet box.
      b. 4-inches above top of backsplash at countertops/workstations, not-to-exceed 44-inches above finished floor to the top of outlet box per ADA requirements.
   3. Receptacles: 15-inches to the bottom of outlet box.
   4. Telecom Outlets: 15-inches to the bottom of outlet box.
   5. Other Outlets: As indicated in other sections of specifications or as detailed on drawings.
B. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6-inches from ceiling access panel or from removable recessed luminaire.
C. Flush Outlets in Insulated Spaces: Maintain integrity of insulation and vapor barrier.
D. Coordinate electrical device locations and elevations (switches and receptacles) with architectural drawings to prevent mounting devices in mirrors, back splashes, and behind cabinets.
E. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
F. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices. Adjacent boxes not aligned vertically to be adjusted at no additional cost to Owner.
G. Use flush mounting outlet box in finished areas.
H. Do not install flush mounting box back-to-back in walls; provide minimum 6-inches separation. Provide minimum 24-inches in acoustic rated walls.
I. In acoustical walls, apply acoustic putty pad on outlet box prior to installation of acoustical blanket.
J. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
K. Use stamped steel bridges to fasten flush mounting outlet box between studs.
L. Use adjustable steel channel fasteners for hung ceiling outlet box.
M. Use gang box where more than one device is mounted together. Do not use sectional box.
N. Use gang box with plaster ring for single device outlets.
O. Adjust flush-mounting outlets to make front flush with finished wall material.

3.03 PULL AND JUNCTION BOXES INSTALLATION

A. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
B. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6-inches from ceiling access panel or from removable recessed luminaire.
C. Do not fasten boxes to ceiling support wires.
D. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

END OF SECTION

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Equipment Nameplates
   2. Device Labels
   3. Wire Markers

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals not required for this Section.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification devices of types and sizes required.
   2. Manufacturer's standard products of categories and types required for each application as referenced in other Division 26, Electrical Sections. Where more than a single type is specified for application, provide single selection for each product category.
   3. Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices unless otherwise indicated.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Equipment Nameplates:
   1. B & I Nameplates
   2. Intellicum
   3. JBR Associates
   4. Or approved equivalent.

B. Device Labels:
   1. Kroy
   2. Brady
   3. Or approved equivalent.

C. Wire Markers:
   1. Brady
   2. Panduit
   3. Sumitomo
   4. Or approved equivalent.

2.02 EQUIPMENT NAMEPLATES

A. Engraved phenolic plastic, laminate, minimum 1/16-inch thick in the size indicated, with beveled edge border matching letter color. Federal specification LP-387A. All upper case letters in engraver standard letter style of the size and wording indicated. Provide with 2-mil adhesive backing. Embossed tape style labels are not acceptable.

B. Color:
   1. Normal (Utility): White letters on black background.

C. Letter Size:
   1. Use 1/4-inch or 1/2-inch letters minimum for identifying panels, breakers, transformers, VFDs, disconnects, etc.
   2. Use 3/16-inch minimum for identifying source, voltage, current, phase, wire configurations, and short circuit current rating (SCCR).

D. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

E. The Architect, Engineer, Commissioning Agent and Owner reserve the right to make modifications to the nameplates as necessary.

F. Locations:
   1. Equipment including, but not limited to, motor controllers, disconnects, and VFDs.

2.03 DEVICE LABELS

A. Extra strength, laminated adhesive tape with 3/16-inch black letters on clear background. Embossed tape/punch tape style labels are not acceptable.

B. Receptacles: Indicate source panel and source circuits (e.g. xxx-xx).

C. Wall Switches/Control Device Stations:
   1. Where controls are provided for remote lighting or power outlets, or where controls in same location serve different purposes or areas, such as corridor and outside, provide device label indicating function of each control device.
   2. Label the function of control devices where two or more are mounted in same location and control function may be unclear.
   3. Wall switches with engraved buttons do not require labeling.

D. Junction Boxes: Label to show system identification, source circuit, or raceway origin. In finished areas, utilize device label. In unfinished areas or above ceilings, use of permanent ink marker is acceptable.

E. Panel and circuit designation written in permanent marker on the back of the plate and inside all back-boxes and junction boxes.

2.04 WIRE MARKERS

A. Description: Vinyl-cloth self-adhesive or tubing type wire markers.

B. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, junction boxes, and each load connection.

C. Power and Lighting Circuits: Branch circuit or feeder number as indicated on drawings and source panel.

D. Control Circuits: control wire number indicated on schematic and interconnection diagrams on drawings or shop drawings.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate designations used on Drawings with equipment nameplates and device labels.

B. Install nameplates and labels parallel to equipment lines.

C. Identify empty conduit and boxes with intended use.

D. Provide typewritten branch panel schedules with protective clear transparent covers accounting for every breaker installed. Use actual room designations assigned by name or number near completion of the work, and not the designations shown on drawings.

E. Where changes are made in existing panels, distribution boards, etc., provide new labeling and typewritten schedules to accurately reflect the changes.

3.02 EQUIPMENT NAMEPLATES

A. Degrease and clean surfaces to receive nameplates.

B. Secure equipment nameplates to equipment front using manufacturer adhesive backing, self-tapping stainless steel screws, rivets, or adhesives.

3.03 DEVICE LABELS

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Degrease and clean surfaces to receive labels. Fingers to be regularly cleaned of grease and debris to prevent fingerprints on labels. Labels installed dirty or with fingerprints to be replaced at no cost to Owner.

3.04 WIRE MARKERS

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Provide wire markers on each conductor for power, control, signalling and communications circuits.

END OF SECTION

SECTION 26 09 23
OCCUPANCY AND VACANCY SENSORS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Combined Occupancy Sensor/Wall Switches ("Sensor/Switches")

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Provide wiring diagrams indicating low voltage and line voltage wiring requirements.
   2. Provide, on reproducible architectural floor plan, a layout of sensors indicating their sensing distribution.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Use manufacturer's published testing and adjusting procedures to adjust sensors time delay, daylight sensitivity, and passive infrared sensitivity to satisfaction of the Owner.
   2. Prepare and complete report of test procedures and results. Submit these test procedures and results to Owner and Architect.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Combined Occupancy Sensor/Wall Switches ("Sensor/Switches"):
   1. Lutron
   2. Acuity Controls
   3. WattStopper
   4. Leviton
   5. Hubbell
   6. Cooper/Greengate
   7. Steinel
   8. Or approved equivalent.

B. Basis of Design: Occupancy/Vacancy sensor layout on Drawings are designed based on WattStopper product line. Approved manufacturers listed are allowed on condition of meeting the specified conditions including complete sensor coverage of the area controlled and switching of luminaires in the area controlled. Provide additional sensors and power switch packs as needed to provide the same level of functionality as shown on

Drawings or required in Specifications. Remove and replace electrical equipment installed not meeting these conditions at no cost to Owner.

2.02 GENERAL

A. Occupancy sensor designation indicates sensors automatically turn lights ON when the sensor detects the presence of a person and will automatically turn lights OFF when no presence is detected for a specified amount of time (automatic-on and automatic-off).

B. Vacancy sensor designation requires someone to manually turn the lights ON. The sensor will then automatically turn the lights OFF when no presence is detected for a specified amount of time (manual-on and automatic-off).

C. Provide occupancy sensors to sense presence of human activity within desired space and enable or disable on/off manual lighting control function provided by local switches.

D. Upon detection of human activity by detector, sensor initiates time delay to maintain lights on for present period of time. Field adjustable time delay setting from 30 seconds to 15 minutes.

E. Factory set sensors for maximum sensitivity.

F. LED lamp built into sensor indicates when occupant is detected.

G. Provide zero cross relay control with sensors and sensor/switched; relay contacts close and open with AC voltage signal is at zero.

H. Where line voltage sensors and sensor/switches are used, provide to match voltage of controlled circuit.

I. Line Voltage Sensors, Control Units, and Relays: UL listed.

2.03 COMBINED OCCUPANCY SENSOR/WALL SWITCHES ("SENSOR/SWITCHES")

A. Completely self-contained sensor system that fits into standard single gang box. Internal transformer power supply, latching dry contact relay switching mechanism compatible with LED drivers, compact fluorescent, and inductive loads. Triac and other harmonic generating devices are not allowed.

B. Passive infrared sensor technology includes advanced signal processing to reduce false triggers without increasing sensitivity. LED indicator blinks when occupant sensed.

C. Rated to switch loads: 1000 watts at 120-volt; 1200 watts at 277 volt. Zero-crossing technology switches lighting off when AC voltage is at zero, minimizes contact wear.

D. Adjustable high-end and low-end trim setting.

E. Provide adjustable daylight feature that holds lighting "off" when desired footcandle level is present.

F. Provide integral off override switch with no leakage current to load or ground.

G. Vandal-resistant lens.

H. Includes neutral wire to meet NEC.

I. Finish: White.

J. Alerts for impending shut-off: light flash, audible, both or none.

K. Standard Sensor/Switch:

1. Programmable to operate as an occupancy sensor (automatic-on and automatic-off) or a vacancy sensor (manual-on and automatic-off). Factory set to manual on/auto off.
2. 180 degree sensor range; Coverage: 180-square feet for desktop activity.

L. Passive Infrared Sensor/1-10V Dimmer:

1. Integral 0-10V dimming control with separate dim/bright controls allows for full range dimming of LED lighting levels from 0 to 100 percent. Press and hold to dim is not acceptable. Separate manual button for override 'off' control.
2. 180 degree sensor range; Coverage: 180-square feet for desktop activity.

M. Sensor/Slide Dimmer:
   1. Line voltage dimmer allows for adjustment of lighting levels from 100 percent to 10 percent; compatible with two-wire line voltage 100 percent to 10 percent electronic dimming ballasts. Separate manual button for override 'off' control.
   2. 180 degree sensor range; Coverage: 300-square feet for desktop activity.
N. Passive Infrared Wall Switch Vacancy-Only Sensors:
   1. Operates only as a vacancy sensor (manual-on and automatic-off).
   2. Adjustable sensitivity (high, low presets).
O. Dual Technology Wall Switch Vacancy-Only Sensors:
   1. Operates only as a vacancy sensor (manual-on and automatic-off).
   2. Adjustable sensitivity (high, medium, low, and off presets) individually for passive infrared and ultrasonic sensing.
P. Passive Infrared Wall Dimmer Vacancy-Only Sensors:
   1. Operates only as a vacancy sensor (manual-on and automatic-off).
Q. Passive Infrared 0-10 V Wall Dimmer Vacancy-Only Sensors:
   1. Operates only as a vacancy sensor (manual-on and automatic-off).
R. Dual Technology 0-10V Wall Dimmer Vacancy Sensors:
   1. Operates only as a vacancy sensor (manual-on and automatic-off).

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install occupancy/vacancy sensors as directed by manufacturer's instructions. Complete connections to control circuits, occupancy sensors, power supply pack and low voltage wiring.
B. Provide power packs for sensor to control number of circuits and/or switch legs within its area of coverage.
C. Field adjust each sensor to maximize its coverage of room space.
D. Relocate sensors with ultrasonic technology to avoid being closer to HVAC diffusers and power packs than recommended by manufacturer.
E. Field set time delay for each device as noted below:
   1. Restrooms: 15 minutes.
   2. Time Switches: 2-hours.
F. Coordinate HVAC control requirements with controls contractor prior to installation.
G. Lighting System Testing and Commissioning:
   1. Test lighting controls to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in accordance with Drawings and Specifications. Provide functional testing of sequences of operation to ensure operation in accordance with Drawings and Specifications. Provide complete report of test procedures and results to engineer and insert approved copy into project closeout documents.
   2. Testing includes:
      a. Occupant Sensing Automatic Controls.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: Provision of materials, installation and testing of:
   1. Wall Switches
   2. Receptacles
   3. Finish Plates
   4. Wall Dimmers
   5. Surface Covers

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Wall switches
   2. Receptacles
   3. Wall Plates
   4. Dimmers
   5. In-Use Cover

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Wall Switches:
   1. Toggle Type:
      a. Cooper AH1201
      b. Hubbell HBL1221
      c. Leviton 1221
      d. Legrand P&S PS20AC1
      e. Or approved equivalent.

B. Receptacles:
   1. Commercial Grade:
      a. 20 Amp:
         1) Cooper 5362
         2) Hubbell 5362
         3) Bryant CBRS20
         4) Leviton 5362S
         5) Legrand P&S 5362

6) Or approved equivalent.

2. Ground Fault Circuit Interrupter (GFCI) Receptacle - 20 Amp:
   a. Cooper WRSGF20W
   b. Hubbell GFR5362SGW
   c. Legrand P&S 2097TRWR
   d. Or approved equivalent.

C. Finish Plates:
1. Bryant
2. Cooper
3. Hubbell
4. Leviton
5. Legrand P&S
6. Or approved equivalent.

D. Wall Dimmers:
1. Lutron Maestro Series
2. Or approved equivalent.

E. Surface Covers:
1. Aluminum with Gasket, Blanks, Single Gang:
   a. Bell 240-ALF
   b. Carlon
   c. Or approved equivalent.
2. 2-Gang:
   a. Bell 236-ALF
   b. Carlon
   c. Or approved equivalent.

F. Provide lighting switches and receptacles of common manufacturer and appearance.

2.02 WALL SWITCHES

A. Characteristics: Toggle type, quiet acting, 20 amp, 120/277 volt, UL listed for motor loads up to 80 percent of rated amperage, extra heavy duty.

B. Finish: White.

2.03 RECEPTACLES

A. Duplex Receptacles Characteristics: Straight parallel blade, 125 volt, 2 pole, 3 wire grounding.
1. Commercial Grade: Riveted. Back and side wired. Brass ground contact on steel strap. Nylon face and nylon base. 20 amp.

B. Ground Fault Circuit Interrupter (GFCI) Receptacle: Feed through type, back-and-side wired, tamper-resistant, weather resistant self-testing, 20 amp, 125VAC.

C. Special Purpose Receptacles: Reference Drawings for NEMA Standard Specification.

D. Finish:
1. Same exposed finish as switches.
2. All automatically controlled, nonlocking type, 125 volt, 15 amp and 20 amp rated receptacles to be permanently marked by the manufacturer with the "universal power" symbol and the word "controlled."

2.04 FINISH PLATES

A. Finish Plates: Commercial grade thermoplastic with same finish as devices, white finish.

B. Provide telephone/signal device plates; activated outlets to have coverplates to match modular jack.

2.05 WALL DIMMERS

A. Provide wall dimmers compatible with type of load controlled (i.e. line voltage, low voltage, 2-wire, 3-wire, 0-10v). Finish to match wall switches. Size dimmers to accept connected load. Do not cut fins. Where dimmers are ganged together, provide a single multi gang coverplate.

B. LED indicator dots show by what percentage controlled lighting is dimmed. Programmable settings for maximum and minimum trim settings, and rate of change in lighting levels.

2.06 SURFACE COVERS

A. Material: Galvanized steel, drawn, 1/2-inch raised industrial type with openings appropriate for devices installed on surface receptacles.

B. Cast Box and Extension Adaptors: Aluminum with gasket, blanks single gang or 2-gang.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. See Architectural elevations for location and mounting height of wiring devices. Review Architectural elevations prior to rough-in and contact Architect immediately if conflicts are found between Architectural and Electrical Drawings. Do not rough-in devices until conflicts are resolved.

B. Install wiring devices and finish plates plumb with building lines, equipment cabinets and adjacent devices. Devices not plumb will be fixed at no additional cost to Owner.

C. Orientation:

1. Install wiring devices with long dimension oriented vertically at centerline height shown on drawings or as specified.
2. Vertical Alignment: When more than one device is shown on drawings in close proximity to each other, but at different elevations, align devices on a common vertical center line for best appearance. Verify with Architect.
3. Horizontal Alignment: When more than one device is shown on drawings in close proximity to each other with same elevation, align devices on a common horizontal center line for best appearance. Verify with Architect.

D. Provide labeling per Section 26 05 53, Identification for Electrical Systems.

E. Test wiring devices to ensure electrical continuity of grounding connections, and after energizing circuitry, to demonstrate compliance with requirements. Test receptacles for line to neutral, line to ground and neutral to ground faults. Correct any defective wiring.

3.02 WALL SWITCHES INSTALLATION

A. At time of substantial completion, replace those items which have been damaged.

3.03 RECEPTACLES INSTALLATION

A. Upon installation, adhere to proper and cautious use of convenience receptacles. At time of substantial completion, replace those items which have been damaged, including those burned and scored by faulty receptacles or cord caps.

B. In the following outlet locations, regardless of whether shown as GFCI on Drawings, either provide a GFCI duplex receptacle, or use a GFCI breaker where code would require a GFCI outlet to have a remote test switch:

1. Bathrooms.
2. Where receptacles are installed within 6-feet, 0-inches from edge of sinks.

C. GFCI Receptacles: One GFCI receptacle may not be used to provide GFCI protection to downstream duplex receptacles on the same branch circuit.

3.04 FINISH PLATES INSTALLATION

A. Do not install items until finish painting is complete. Replace scratched and paint splattered finish plates and wiring devices.

3.05 WALL DIMMERS INSTALLATION

A. Install per manufacturer's recommendations and wiring diagrams.

3.06 SURFACE COVERS INSTALLATION

A. Do not install items until finish painting is complete. Replace scratched and paint splattered finish plates and wiring devices.

END OF SECTION

SECTION 26 28 00
OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Fuses
   2. Molded Case Circuit Breakers

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Product data and instantaneous let-through current curves and average melting time current curves for fuses supplied to project.
   2. Product data and time/current trip curves for circuit breakers supplied to project.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements apply to this Section.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Fuses:
   1. Bussmann
   2. Ferraz-Shawmut
   3. Littelfuse
   4. McGraw-Edison
   5. Or approved equivalent.

B. Molded Case Circuit Breakers:
   1. Eaton Electrical
   2. ABB/General Electric
   3. Siemens
   4. Schneider Electric/Square D
   5. Or approved equivalent.

2.02 FUSES

A. Characteristics:
   1. Dual element, time delay, current limiting, nonrenewable type, rejection feature.
   2. Combination Loads: UL Class RK1, RK5, or J, 1/10 to 600 amp. UL Class L, above 600 amps.
   3. Motor Loads: UL Class RK5, 1/10 to 600 amp.
   4. Fuse pullers for complete range of fuses.

2.03 MOLDED CASE CIRCUIT BREAKERS

A. 1-, 2- or 3-pole bolt-on, single handle common trip, 600VAC or 250VAC as indicated on Drawings.

B. Overcenter toggle-type mechanism, quick-make, quick-break action. Trip indication is by handle position.

C. Calibrate for operation in 40 degrees C ambient temperature.

D. 15 to 150 Amp Breakers: Permanent trip unit containing individual thermal and magnetic trip elements in each pole.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Coordination:

1. Obtain and review the submitted product data for equipment furnished by the Owner, and furnished under other Divisions of this contract, particularly under Divisions 22 and 23.
2. Confirm the equipment nameplate maximum overcurrent protection (MOCP) and make accommodations and adjustments to overcurrent protective devices as necessary to coordinate with the nameplate rating.

B. Install all items in accordance with manufacturers written instructions.

3.02 FUSES INSTALLATION

A. Fuses: For each class and ampere rating of fuse installed, provide the following quantities of spares for quantity of fuses installed:

1. 0 to 24: Provide 6 spare.
2. 25 to 48: Provide 9 spare.
3. 49 and Above: Provide 12 spare.

3.03 MOLDED CASE CIRCUIT BREAKERS INSTALLATION

A. Provide testing of ground fault interrupting breakers.

B. Provide circuit breakers, as specified and on Drawings, for installation in panelboards, individual enclosures or combination motor starters.

C. Provide ground fault interrupter circuit breakers for equipment in damp or wet locations.

D. Provide device on handle to lock breaker in "ON" position for breakers feeding time switches, night lights and similar circuits required to be continuously energized.

E. Shunt Trip Circuit Breakers: Provide wiring to remote trip switch/contacts as indicated on Drawings.

F. Provide multi-pole branch circuit breakers for multiwire branch circuits for simultaneous disconnection of circuits.

END OF SECTION

SECTION 26 51 00
LIGHTING

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Luminaires
   2. LED Drivers
   3. Lamps

B. Provide wiring for complete and operating lighting system.

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. NECA 500 - Commercial Lighting.
   2. UL 8750 - Light Emitting Diode (LED) equipment for use in lighting products.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Submit product data for:
      a. LED Luminaires: Electrical ratings, dimensions, mounting, material, clearances, terminations, wiring, connection diagram, LM-79 photometric data, LM-80 lumen depreciation data.
      b. LED Drivers
      c. Lamps
   2. Submittal Cutsheets: Highlight, circle or otherwise graphically indicate which option(s) are being selected for the products submitted. Cutsheets that are not edited to indicate which products and options are submitted for this project or that list only catalog numbers to identify submitted options are not acceptable.
   3. Specified manufacturers are approved to submit bid. However, inclusion does not relieve manufacturer from supplying product as described.
   4. Provide the following operating and maintenance instructions as required by Section 26 00 00, Electrical Basic Requirements:
      a. Luminaires
      b. LED Drivers
      c. Lamps

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Provide luminaires acceptable to code authority for application and location installed.
   2. Comply with applicable ANSI standards.
   3. Comply with applicable NEMA standards.

4. Provide luminaires and lampholders that comply with UL standards and have been listed and labeled for location and use indicated by a testing agency acceptable by the AHJ (e.g., UL, ETL, and the like).
5. Comply with OESC as applicable to installation and construction of luminaires.
6. Comply with fallout and retention requirements of OSSC for diffusers, baffles, and louvers.
7. Provide LED luminaires from the same manufacturer and manufacturing LED source batch for similar applications (e.g., all LED downlights from a single manufacturer and batch, all linear LED products from single manufacturer and batch).

1.06 WARRANTY

A. Warranty as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. LED Luminaire Manufacturer's Warranty: Not less than 5 years for luminaire based on date of substantial completion. Includes normal cost of labor to replace luminaire. Replacement luminaire will match physical dimensions, physical appearance, chromaticity, lumen output and photometric characteristics of original installed equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Luminaires:

1. Reference description and manufacturers in Luminaire Schedule on Drawings.
2. Or approved equivalent.

B. LED Drivers:

1. Indoor Drivers:
   a. eldoLED Series
   b. Advance/Philips
   c. Osram Sylvania
   d. Or approved equivalent.

C. Lamps:

1. LED (Light Emitting Diode) Lamps:
   a. Nichia
   b. Cree
   c. Osram Sylvania
   d. GE Lumination
   e. Or approved equivalent.
2. Unless specific manufacturer not shown on this list is indicated in the Luminaire Schedule.
3. Special types as indicated in Luminaire Schedule.
4. Or approved equivalent.

2.02 LUMINAIRES

A. Luminaires: Reference description and manufacturers in Luminaire Schedule on Drawings.

B. Where recessed luminaires are installed in cavities intended to be insulated, provide IC rated luminaires or other code approved installation.

C. UL label luminaires installed under canopies, roof or open porches, and similar damp or wet locations, as suitable for damp or wet location.

D. Recessed Luminaires: Frame compatible with ceiling material installed at particular luminaire location. Provide proper factory trim and frame for luminaire to fit location and ceiling material. Verify with Architectural Reflected Ceiling Plan prior to submittals.

E. Finishes:
   1. Manufacturer's standard finish (unless otherwise indicated) over corrosion resistant primer.
   2. Interior Light Reflecting Finishes: White or specular finish with not less than 85 percent reflectance.

F. Light Transmitting Components:
   1. Plastic diffusers, molded or extruded of 100 percent virgin acrylic.
   2. Prismatic acrylic, extruded, flat diffusers, 0.125-inch overall thickness, unless otherwise noted.

G. LED Luminaires:
   1. UL listing of luminaire includes drivers, transformers, enclosures, rated wire, communications devices and accessories needed for a complete and functional system.
   2. LM-79: Testing and measurement of absolute photometry, chromaticity (CCT) and luminaire power. Report provided by DOE certified independent testing laboratory. CCT as specified in Luminaire Schedule.
   3. Standards: ANSI C78.377, LM-79 and LM-82 compliant for performance characteristics, photometry, colorimetry, efficacy and thermal characteristics.
   4. LM-80 + TM-21: Testing and measurement, and statistical prediction of LED lamp life. Report provided by DOE certified independent testing laboratory.
   5. LEDs in one module/luminaire: Supplied from same batch/bin and fall within 3-step MacAdam Ellipse, or as described in Luminaire Schedule, whichever is the more stringent requirement.
   6. Provide luminaires with integral LED thermal management system (heat sinking).
   7. Luminaires to be equipped with an LED driver that accepts 120V through 277V, 50Hz to 60Hz (universal). Component-to-component wiring within the luminaire will carry no more than 80 percent of rated current and be listed by UL for use at 600VAC at 302 degrees F/150 degrees C or higher. Plug disconnects to be listed by UL for use at 600VAC, 15A or higher.
   8. Provide luminaires with individual LED arrays/modules and drivers that are accessible and replaceable from exposed side of the luminaire.

2.03 LED DRIVERS

A. General:
   1. Performance: Meet dimming range called out in Luminaire Schedule, free from perceived flicker or visible stroboscopic flicker, smooth and continuous change in level (no visible steps in transitions), natural square law response to control input, and stable when input voltage conditions fluctuate over what is typically experienced in a commercial environment. Demonstration of this compliance to dimming performance will be necessary for substitutions or prior approval.
   2. Ten-year expected life while operating at maximum case temperature and 90 percent non-condensing relative humidity.
   3. Minimum efficiency of 85 percent, power factor greater than or equal to 0.90, compliance with reduction of hazardous substances (RoHS). Rated for operating temperature range of area in which driver is installed.
   4. Limit inrush current to minimize breaker tripping.

a. Base specification: NEMA 410 standard for inrush current for electronic drivers.
b. Preferred Specification: Meet or exceed 30 milliamp-squared-seconds at 277VAC for up to 50 watts of load and 75 amps at 240 microseconds at 277VAC for 100 watts of load.

5. Withstand up to a 1,000 volt surge without impairment of performance as defined by ANSI C62.41 Category A.
6. No visible change in light output with a variation of plus/minus 10 percent line voltage input.
7. Total Harmonic Distortion less than 10 percent and meet ANSI C82.11 maximum allowable THD requirements at full output. THD at no point in the dimming curve allows imbalance current to exceed full output THD.
8. Support automatic adaptation, allowing for future luminaire upgrades and enhancements and deliver improved performance:
   a. Adjustment of forward LED voltage, supporting 3V through 55V.
   b. Adjustment of LED current from 150mA to 1.4A at the 100 percent control input point in increments of 1mA.
   c. Adjustment for operating hours to maintain constant lumens (within 5 percent) over the 50,000 hour design life of the system, and deliver up to 20 percent energy savings early in the life cycle.
9. Operate for a (+/- 10 percent) supply voltage of 120V through 277VAC at 60Hz.
10. UL Recognized under the component program and modular for simple field replacement. Drivers that are not UL Recognized or not suited for field replacement will not be considered.
11. Ability to provide no light output when the analog control signal drops below 0.3 V, or the DALI/DMX digital signal calls for light to be extinguished and consume 0.5 watts or less in this standby. Control dead band between 0.3V and 0.65V included to allow for voltage variation of incoming signal without causing noticeable variation in luminaire to luminaire output.

B. Light Quality:
1. Over the entire range of available drive currents, driver to provide step-free, continuous dimming to black from 100 percent to 0.1 percent and 0 percent relative light output, or 100 percent to 1 percent light output and step to 0 percent where indicated. Driver to respond similarly when raising from 0 percent to 100 percent.
   a. Driver must be capable of 20 bit dimming resolution for white light LED drivers or 15 bit resolution for RGBW LED drivers.
2. Driver must be capable of configuring a linear or logarithmic dimming curve, allowing fine grained resolution at low light levels.
3. Drivers to track evenly across multiple luminaires at all light levels, and must have an input signal to output light level that allows smooth adjustment over the entire dimming range.
4. Driver and luminaire electronics to deliver illumination that is free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10). At all points within the dimming range from 100 percent to 0.1 percent luminaire will have:
   a. LED dimming driver to provide continuous step-free, flicker free dimming similar to incandescent source.
   b. Base specification: Based on IEEE PAR1789, minimum output frequency should be greater than 1250 Hz.

c. Preferred specification: Flicker index to be equal to incandescent, less than 1 percent at all frequencies below 1000 Hz.

C. Control Input:

1. Provide control protocol to match lighting control system specified for use with luminaire.
2. 4-Wire (0-10V DC Voltage Controlled) Dimming Drivers:
   a. Meet IEC 60929 Annex E for General White Lighting LED drivers.
   b. Connect to devices compatible with 0 to 10V Analog Control Protocol, Class 2, capable of sinking 0.6 ma per driver at a low end of 0.3V. Limit the number of drivers on each 0-10V control output based on voltage drop and control capacity.
   c. Meet ESTA E1.3 for RGBW LED drivers.

2.04 LAMPS

A. Provide lamps for luminaires.

B. Provide lamp catalogued for specified luminaire type.

C. Incandescent Lamps: Not allowed unless noted in Luminaire Schedule.

D. LED (Light Emitting Diode):

1. LED manufacturer will include, but not be limited to, light source, luminaire, power supply and control interface with added components as needed for complete and functioning system.
   a. Comply with ANSI chromaticity standard for classifications of color temperature. See Luminaire Schedule for specified LED lamp color and color temperature. UL or ETL listed and labeled.
   b. Luminaire testing per IESNA LM-79 and LM-80 procedures.
   c. Lamp life for white LEDs: 50,000 plus hours with lamp failure occurring when LED produces 70 percent of initial rated lumens.
   d. Lamp life for color LEDs: 30,000 plus hours with lamp failure occurring when LED produces 50 percent of its initial rated lumens.
   e. LED Drivers: Reverse polarity protection, open circuit protection, require no minimum load. Minimum 80 percent efficiency. Class A noise rating.
   f. Dimming: LED system capable of full and continuous dimming.
   g. Correlated Color Temperature (CCT): See Luminaire Schedule for selection of color temperature for each luminaire. Ranges given below reflect maximum allowable tolerances for color temperature range for each nominal CCT.
      1) Nominal CCT:
         (a) 2700 K (2725 ± 145)
         (b) 3000 K (3045 ± 175)
         (c) 3500 K (3465 ± 245)
         (d) 4000 K (3985 ± 275)
   h. Color Rendering Index (CRI) to be greater than or equal to 80.
2. Special types as indicated in Luminaire Schedule.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install per manufacturer's written installation instructions and requirements.

B. Install luminaires securely, in neat and workmanlike manner.

C. Install luminaires of types indicated where shown and at indicated heights in accordance with manufacturer's written instructions and with recognized industry practices to ensure that luminaires comply with requirements and serve intended purposes.

D. Wiring:
   1. Recessed luminaires to be installed using flexible metallic conduit or MC Cable as allowed by Section 26 05 19 with luminaire conductors spliced to branch circuit conductors in nearby accessible junction box over ceiling. Junction box fastened to building structural member within 6-feet of luminaire.
   2. Luminaires for lift out and removal from ceiling pattern without disconnecting conductors or defacing ceiling materials.
   3. Flexible connections where permitted to exposed luminaires; neat and straight, without excess slack, attached to support device.
   4. Install junction box, flexible conduit and high temperature insulated conductors for through wiring of recessed luminaires.

E. Relamp luminaires which have failed lamps at substantial completion.

F. Replace LED drivers deemed as excessively noisy by Architect, Engineer, or Owner.

G. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

H. Support luminaires larger than 2- by 4-foot size independent of ceiling framing.

I. Locate recessed ceiling luminaires as indicated on architectural reflected ceiling plan.

J. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

K. Exposed Grid Ceilings:
   1. Support surface mounted luminaires in grid ceiling directly from building structure.
   2. Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires.
   3. Fasten surface mounted luminaires to ceiling grid members using bolts, screws, rivets, or suitable clips.

L. Install recessed luminaires to permit removal from below.

M. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

N. Install clips to secure recessed grid-supported luminaires in place.

O. Install wall mounted luminaires, emergency lighting units, and exit signs at height as indicated on Architectural Drawings.

P. Install accessories furnished with each luminaire.

Q. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

R. Bond products and metal accessories to branch circuit equipment grounding conductor.

S. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.

T. Where manufactured wiring assemblies are used, ensure that wiring assembly manufacturer sends components to appropriate luminaire manufacturer for respective installation of proper components.

U. Coordination:
   1. Coordination of Conditions: Coordinate ceiling construction, recessing depth and other construction details prior to ordering luminaires for shipment. Refer cases of uncertain applicability to Architect for resolution prior to release of luminaires for shipment. Where luminaires supplied do not match ceiling construction, replace luminaires at no cost to Owner.

2. Electrical drawings are schematic, identifying quantity and type of luminaires used and their approximate location, but are not to be used for dimensional purposes. Reference architectural drawings for exact locations, including mounting heights.
3. Provide lighting indicated on Drawings with luminaire of the type designated and appropriate for location.
4. Provide LED luminaires with driver compatible to lighting control system as shown in drawings and as specified.
5. Where remote drivers are required, ensure adequate accessibility to driver. Upsize conductors between luminaire and driver to accommodate voltage drop.

V. Field Quality Control:
1. Perform field inspection in accordance with Division 01, General Requirements.
2. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

W. Cleaning:
1. Clean electrical parts to remove conductive and deleterious materials.
2. Remove dirt and debris from enclosures.
3. Clean paint splatters, dirt, dust, fingerprints, and debris from luminaires.
4. Clean photometric control surfaces as recommended by manufacturer.
5. Clean finishes and touch up damaged finishes per by manufacturer's instructions.

X. Demonstrate luminaire operation for minimum of two hours.

3.02 LUMINAIRES

A. Install per manufacturer's written installation instructions and requirements.

B. Align, mount and level luminaires uniformly. Use ball hangers for suspended stem mounted luminaires.

C. Avoid interference with and provide clearance from equipment. Where indicated locations for luminaires conflict with locations for equipment, change locations for luminaire by minimum distance necessary as directed by Architect.

D. Suspended Luminaires: Mounting heights indicate clearances between bottom of luminaire and finished floors.

E. Interior Luminaire Supports:
1. Support Luminaires: Anchor supports to structural slab or to structural members within a partition, or above a suspended ceiling.
2. Maintain luminaire positions after cleaning and relamping.
3. Support luminaires without causing ceiling or partition to deflect.
4. Provide mounting supports for recessed and pendant mounted luminaires as required by IBC.

F. Adjusting:
1. Aim and adjust luminaires as indicated.
2. Focus and adjust floodlights, spotlights and other adjustable luminaires, with Architect, at such time of day or night as required.
3. Align luminaires that are not straight and parallel/perpendicular to structure.
4. Position exit sign directional arrows as indicated.

3.03 LED DRIVERS

A. Install lamps per manufacturer's installation instructions and requirements.

B. Where driver is remote mounted, size wiring based on type of driver, driver distance from luminaire, and voltage/power level, and manufacturer's installation instructions.

C. Protect 0-10V input from line voltage mis-connection, and so it will be immune and the output unresponsive to induced AC voltage on the control leads.

END OF SECTION

SECTION 28 00 01
ELECTRONIC SAFETY BASIC REQUIREMENTS

PART 1 - GENERAL

1.01 DESIGN-BUILD SUMMARY

A. Work included in 28 00 01 applies to Division 28, Electronic Safety work to provide materials, labor, tools, permits and incidentals to make electronic safety systems ready for Owner's use for proposed project.

1.02 DESIGN-BUILD INSTRUCTIONS

A. This document is issued to give Bidders a basis for preparing a proposal to design and install a complete Electronic Safety system for this project.

B. Alternates to this Document may be offered as a separate proposal.

1.03 DESIGN-BUILD APPROACH

A. Use this Specification for design/engineering requirements, workmanship and materials or construction. Utilize design-build concept throughout construction phase of project.

B. Investigate and be apprised of applicable codes, rules, and regulations as enforced by AHJ.

C. Visit the Site of the proposed construction. Verify and inspect the existing site to determine conditions that affect this work.

1.04 DESIGN-BUILD CRITERIA

A. Related Work Specified Elsewhere: Contents of Section apply to Division 28, Electronic Safety Specifications. Requirements of Section are a minimum for Division 28, Electronic Safety Sections, unless otherwise stated in each Section, in which case that Section's requirements take precedence.

B. Reference Basis of Design narrative document.

C. Fire Alarm Design Criteria: Refer to Section 28 31 00, Fire Detection and Alarm, for fire alarm system design criteria.

D. Fire Alarm Equipment: Refer to Section 28 31 00, Fire Detection and Alarm, for fire alarm equipment requirements.

1.05 SECTION INCLUDES

A. Work included in 28 00 01, Electronic Safety Basic Requirements applies to Division 28, Electronic Safety work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of electronic safety systems for proposed project.

B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.

C. Definitions:

1. Provide: To furnish and install, complete and ready for intended use.
2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
3. Install: Includes unloading, unpacking, assembling, erecting, installing, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work furnished.
4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent," substitution requests must be submitted to Engineer for consideration,

in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted items.

5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities having jurisdiction, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and other reviewing entity whose approval is required to obtain systems acceptance.

1.06 RELATED SECTIONS

A. Contents of Section apply to Division 28, Electronic Safety Contract Documents.

B. Related Work:

1. Additional conditions apply to this Division including, but not limited to:
   a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
   b. Drawings
   c. Addenda
   d. Owner/Architect Agreement
   e. Owner/Contractor Agreement
   f. Codes, Standards, Public Ordinances and Permits

C. Contents of Division 26, Electrical apply to this Section.

1.07 REFERENCES AND STANDARDS

A. References and Standards per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, individual Division 28, Electronic Safety Sections and those listed in this Section.

B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:

1. State of Oregon:
   a. OAR - Oregon Administrative Rules
   b. 2021 OESC - Oregon Electrical Specialty Code
   c. 2019 OFC - Oregon Fire Code
   d. 2019 OMSC - Oregon Mechanical Specialty Code
   e. 2021 OPSC - Oregon Plumbing Specialty Code
   f. 2019 OSSC - Oregon Structural Specialty Code
   g. 2021 OEESC - Oregon Energy Efficiency Specialty Code
   h. 2011 Oregon Elevator Specialty Code

C. Reference standards and guidelines include but are not limited to the latest adopted editions from:

1. ABA - Architectural Barriers Act
2. ADA - Americans with Disabilities Act
3. ANSI - American National Standards Institute
4. ASCE - American Society of Civil Engineers
5. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers
6. ASHRAE Guideline 0, the Commissioning Process
7. ASME - American Society of Mechanical Engineers
8. ASTM - ASTM International
9. CFR - Code of Federal Regulations
10. EPA - Environmental Protection Agency
11. ETL - Electrical Testing Laboratories
12. FM - FM Global

13. ISO - International Organization for Standardization
14. NEC - National Electric Code
15. NEMA - National Electrical Manufacturers Association
16. NFPA - National Fire Protection Association
17. OSHA - Occupational Safety and Health Administration
18. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association
19. UL - Underwriters Laboratories Inc.

D. See Division 28, Electronic Safety individual Sections for additional references.

1.08 SUBMITTALS

A. See Division 01, General Requirements for Submittal Procedures.

B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.

C. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.

D. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail. For electronic format, provide one file per division containing one bookmarked PDF file with each bookmark corresponding to each Specification Section. Arrange bookmarks in ascending order of Specification Section number. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. Copy Architect on all transmissions/submissions.

E. Product Data: Provide manufacturer's descriptive literature for products specified in Division 28, Electronic Safety Sections.

F. Identify/mark each submittal in detail. Note what difference, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the specifications and drawings.

1. Label submittal to match numbering/references as shown in Contract Documents. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.
2. Include technical data, installation instructions and dimensioned drawings for products, equipment and devices installed, furnished or provided. Reference individual Division 28, Electronic Safety specification Sections for specific items required in product data submittal outside of these requirements.
3. See Division 28, Electronic Safety individual Sections for additional submittal requirements outside of these requirements.

G. Maximum of two reviews of complete submittal package. Arrange for additional reviews and/or early review of long-lead items; bear costs of additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.

H. Resubmission Requirements: Make corrections or changes in submittals as required, and in consideration of Engineer’s comments. Identify Engineer’s comments and provide an

individual response to each of the Engineer's comments. Cloud changes in the submittals and further identify changes which are in response to Engineer's comments.

I. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-16 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.

J. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 28, Electronic Safety Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical and Division 28, Electronic Safety submittals.

K. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.

L. Substitutions and Variation from Basis of Design:
   1. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.
   2. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor are required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals." For any product marked "or approved equivalent," a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.
   3. Where manufacturer equipment or model numbers are indicated with no exceptions, substitutions will be rejected.

M. Shop Drawings:
   1. Provide coordinated shop drawings which include physical characteristics of all systems, device layout plans, and control wiring diagrams. Reference individual Division 28, Electronic Safety specification Sections for additional requirements for shop drawings outside of these requirements.
   2. Provide Shop Drawings indicating access panel locations, size and elevation for approval prior to installation.

N. Samples: Provide samples when requested by individual Sections.

O. Resubmission Requirements:
   1. Make any corrections or change in submittals when required by Architect/Engineer review comments. Provide submittals as specified. The engineer will not be required to edit and/or interpret the Contractor's submittals. Indicate changes for the resubmittal in a cover letter with reference to page(s) changed and reference response to comment. Cloud changes in the submittals.
   2. Resubmit for review until review indicates no exception taken or "make corrections noted."

3. When submitting drawings for Engineers re-review, clearly indicate changes on drawings and "cloud" any revisions. Submit a list describing each change.

P. Operation and Maintenance Manuals, Owner's Instructions:
1. Reference individual Division 28, Electronic Safety Specification Sections for additional requirements for operations and maintenance manuals.
2. Submit, at one time, electronic files (PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
   a. Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.
   b. Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes and quantities relevant to each piece of equipment.
   c. Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub-assemblies.
   d. Include Warranty per Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 28 00 01, Electronic Safety Basic Requirements and individual Sections.
   e. Include product certificates of warranties and guarantees.
   f. Include copy of start-up and test reports specific to each piece of equipment.
   g. Include commissioning reports.
   h. Engineer will return incomplete documentation without review.
   i. Engineer will provide one set of review comments in Submittal Review format. Arrange for additional reviews; Bear costs for additional reviews at Engineer's hourly rates.
3. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 28 00 01, Electronic Safety Basic Requirements Article titled "Demonstration."
4. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

Q. Record Drawings:
1. Maintain at site at least one set of drawings for recording “as-constructed” conditions. Indicate on drawings changes to original documents by referencing revision document, and include buried elements and location of concealed items. Include items changed by addenda, field orders, supplemental instructions, and constructed conditions.
2. Record Drawings are to include equipment locations, calculations, and schedules that accurately reflect "as constructed or installed" for project.
3. At completion of project, input changes to original project on CAD Drawings and make one set of black-line drawings created from CAD Files in version/release

equal to contract drawings. Submit CAD Files and drawings upon substantial completion.

4. See Division 28, Electronic Safety individual Sections for additional items to include in Record Drawings.

1.09 QUALITY ASSURANCE

A. Regulatory Requirements: Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

B. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.

C. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (e.g. cable tray, panels, etc.) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.

D. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.

E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.

F. Provide products that are UL listed.

1.10 WARRANTY

A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 28 00 01, Electronic Safety Basic Requirements and individual Division 28, Electronic Safety Sections.

B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty under Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

1.11 COORDINATION DOCUMENTS

A. Prior to construction, prepare and submit coordinated layout drawings (composite drawings), to coordinate installation and location of ductwork, grilles, diffusers, piping, fire sprinklers, plumbing, lights, and electrical services. Composite Drawings show services on single sheet. Key Drawings to structural column identification system. Prior to completion of Drawings, coordinate proposed installation with architectural and structural requirements, and other trades (including plumbing, HVAC, fire protection, electrical, ceiling suspension, and ceiling tile systems, etc.), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.

B. Prepare Drawings as follows:
   1. Drawings in CAD Format. CAD format release equal to design documents. Drawings to be same sheet size and scale as Contract Drawings and indicate location, size and elevation above finished floor of equipment and distribution systems.
   2. Review and revise, as necessary, section cuts in Contract Drawings after verification of field conditions.
   3. Indicate fittings, hangers, access panels, and elevation of bottom of cable tray above finished floor.
   4. Drawings to indicate proposed ceiling grid and lighting layout as shown on electrical drawings and architectural reflected ceiling drawings and HVAC equipment, ductwork.
   5. Incorporate Addenda items and change orders.
   6. Provide additional coordination as requested by other trades.

C. Advise Architect in event conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.

D. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Articles, fixtures, and equipment of a kind to be standard product of one manufacture, including but not limited to panels, devices and equipment unless otherwise specified in individual Division 28, Electronic Safety Sections.

2.02 STANDARDS OF MATERIALS AND WORKMANSHIP

A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL, ETL, or FM listed and labeled or be approved by State, County, and City authorities prior to procurement and installation.

B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

C. Hazardous Materials:
   1. Comply with local, State of Oregon, and Federal regulations relating to hazardous materials.
   2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.
   3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

PART 3 - EXECUTION

3.01 ACCESSIBILITY AND INSTALLATION

A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 28 00 01, Electronic Safety Basic Requirements and individual Division 28, Electronic Safety Sections.

B. Install equipment having components requiring access (i.e., devices, equipment, electrical boxes, panels, etc.) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in

obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.

C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing and coordination with other trades and disciplines.

D. Earthwork:
   1. Confirm Earthwork requirements in Contract Documents. In absence of specific requirements, comply with individual Division 28, Electronic Safety Sections and the following:
      a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with related earthwork divisions. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.
      b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.
      c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.

E. Firestopping:
   1. Confirm Firestopping requirements in Division 07, Thermal and Moisture Protection.
   2. In absence of specific requirements, comply with individual Division 28, Electronic Safety Sections and coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around conduit, raceway and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

F. Plenums: In plenums, provide plenum rated materials that meet the requirements to be installed in plenums.

3.02 SEISMIC CONTROL

A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 28 Electronic Safety Sections.

B. Earthquake resistant designs for Electronic Safety (Division 28) systems and equipment to conform to regulations of jurisdiction having authority.

C. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.

D. Provide means to prohibit excessive motion of safety equipment during earthquake.

3.03 REVIEW AND OBSERVATION

A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 28 00 01,

Electronic Safety Basic Requirements and individual Division 28, Electronic Safety Sections.

B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:
   1. Underground conduit and wire installation prior to backfilling.
   2. Prior to covering walls when electronic safety systems installation is started.
   3. Prior to ceiling cover/installation.
   4. When main systems, or portions of, are being tested and ready for inspection by AHJ.

C. Final Punch: Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

3.04 CONTINUITY OF SERVICE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements in Division 01, General Requirements, comply with individual Division 28, Electronic Safety Sections and the following:
   1. During remodeling or addition to existing structures, while existing structure is occupied, current services to remain intact until new construction, facilities or equipment is installed.
   2. Prior to changing over to new system, verify that every item is thoroughly prepared. Install new wiring to point of connection.
   3. Coordinate transfer time to new service with Owner. If required, perform transfer during off peak hours. Once changeover is started, pursue to its completion to keep interference to a minimum. If overtime is necessary, there will be no allowance made by Owner for extra expense for such overtime or shift work.
   4. Organize work to minimize duration of power interruption.

3.05 CUTTING AND PATCHING

A. Confirm Cutting and Patching Requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 28, Electronic Safety Sections and the following:
   1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
   2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftsmen of each respective trade in conformance with appropriate Division of Work.
   3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
   4. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are

removed as part of this project. Where alterations disturb lawns, paving, and walks, repair, refinish and leave in condition matching existing prior to commencement of work.

5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

3.06 EQUIPMENT SELECTION AND SERVICEABILITY

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

3.07 DELIVERY, STORAGE AND HANDLING

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with the individual Division 28, Electronic Safety Sections and the following:

1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust.
2. Protect equipment and pipe to avoid damage. Close conduit openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.
3. Protect devices, panels and similar items until in service.
4. Products and/or materials that become damaged due to water, dirt and/or dust as a result of improper storage to be replaced before installation.

3.08 DEMONSTRATION

A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 28 00 01, Electronic Safety Basic Requirements and individual Division 28, Electronic Safety Sections.

B. Upon completion of work and adjustment of equipment, test systems, demonstrate to Owner's Authorized Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Staff as specified in Division 01, General Requirements, Section 28 00 01, Electronic Safety Basic Requirements and individual Division 28, Electronic Safety Sections.

C. Manufacturer's Field Services: Furnish services of a qualified factory certified instructor at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

3.09 CLEANING

A. Confirm cleaning requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 28 00 01, Electronic Safety Basic Requirements and individual Division 28 Sections.

B. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

3.10 INSTALLATION

A. Confirm Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 28 00 01, Electronic Safety Basic Requirements and individual Division 28, Electronic Safety Sections.

B. Install equipment in accordance with manufacturer's installation instructions, plumb and level and firmly anchored to building structure. Maintain manufacturer's recommended clearances.

C. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

D. Provide miscellaneous supports required for installation of equipment, conduit and wiring.

3.11 PAINTING

A. Confirm Painting requirements in Division 01, General Requirements and Division 09, Finishes. In absence of specific requirements, comply with individual Division 28, Electronic Safety Sections and the following:

1. Ferrous Metal: After completion of work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces, i.e. hangers, hanger rods, equipment stands, with one coat of black asphalt varnish for exterior or black enamel for interior, suitable for hot surfaces.
2. In electrical and mechanical room, on roof or other exposed areas, equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
3. See individual equipment Specifications for other painting.
4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
5. Conduit: Clean, primer coat and paint interior conduit exposed in finished areas with two coats paint suitable for metallic surfaces. Color selected by Architect.

3.12 DEMOLITION

A. Confirm requirements in Division 01, General Requirements and Division 02, Existing Conditions. In the absence of specific requirements, comply with individual Division 28, Electronic Safety Sections and the following:

1. Scope:
   a. It is the intent of these documents to provide necessary information and adjustments to electronic safety system required to meet code, and accommodate installation of new work.
   b. Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to exactly locate and preserve underground utilities. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.
   c. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access, access to different areas. Owner will cooperate to best of their ability to assist in coordinated schedule, but will remain final authority as to time of work permitted.
2. Examination:
   a. Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to locate and preserve utilities. Replace damaged items with new material to match existing.
   b. Verify that abandoned wiring and equipment serve only abandoned facilities.
   c. Demolition drawings are based on casual field observation and existing record documents.

1) Verify accuracy of information shown prior to bidding and provide such labor and material as is necessary to accomplish work.
2) Verify location and number of electronic safety system devices, panels, etc. in field.

d. Report discrepancies to Architect before disturbing existing installation.

3. Promptly notify Owner if systems are found which are not shown on Drawings.
4. Execution:
   a. Remove existing electronic safety equipment, devices and associated wiring from walls, ceilings, floors, and other surfaces scheduled for remodeling, relocation, or demolition unless shown as retained or relocated on Drawings.
   b. Provide temporary wiring and connections to maintain electrical continuity of existing systems during construction. Remove or relocate electrical boxes, conduit, wiring and equipment as encountered in removed or remodeled areas in existing construction affected by this work.
   c. Remove and restore wiring which serves usable existing outlets clear of construction or demolition.
   d. If existing junction boxes will be made inaccessible, or if abandoned outlets serve as feed through boxes for other existing electrical equipment which is being retained, provide new conduit and wire to bypass abandoned outlets.
   e. If existing conduits pass through partitions or ceiling which are being removed or remodeled, provide new conduit and wire to reroute clear of construction or demolition and maintain service to existing load.
   f. Extend circuiting and devices in existing walls to be furred out.
   g. Remove abandoned wiring to source of supply.
   h. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
   i. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
   j. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
   k. Existing electronic safety system components are indicated on demolition plans. Verify exact location and number of existing devices and components in field. Only partial existing systems shown. Locations of items shown on Drawings as existing are partially based on Record and other Drawings which may contain errors. Verify accuracy of information shown prior to bidding and provide such labor and material as is necessary to accomplish intent of Contract Documents.
   l. Remove abandoned wiring to leave site clean.
   m. If existing electrical equipment contains PCBs (Polychlorinated Biphenyl), replace with new non-PCB equipment. Dispose of material containing PCBs as required by federal and local regulations.
   n. Repair adjacent construction and finishes damaged during demolition work.
   o. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
5. Existing Fire Alarm System: Maintain existing system in service during construction. Disable system only to make switchovers and connections.
   a. Notify Owner before partially or completely disabling system.
   b. Notify local fire service.

c. Make notifications at least five working days in advance.
d. Make temporary connections to maintain service in areas adjacent to work area.

3.13 ACCEPTANCE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 28, Electronic Safety Sections and the following:
1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
a. Cleaning
b. Operation and Maintenance Manuals
c. Training of Operating Personnel
d. Record Drawings
e. Warranty and Guaranty Certificates
f. Start-up/test Documents and Commissioning Reports

3.14 FIELD QUALITY CONTROL

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 28, Electronic Safety Sections and the following:
1. Tests:
a. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in Closeout Documents.
b. During site evaluations by Architect or Engineer, provide appropriate personnel with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

3.15 LETTER OF CONFORMANCE

A. Provide Letter of Conformance, copies of manufacturers' warranties and extended warranties with a statement in letter that electronic safety systems were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include Letter of Conformance, copies of manufacturers' warranties and extended warranties in operating and maintenance manuals.

END OF SECTION

SECTION 28 31 00
FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
1. Fire Alarm Control Panel
2. Notification Appliance Circuit Panels
3. Fire Alarm Transmitters
4. Fire Alarm Annunciators
5. Manual Pull Stations
6. Fixed Temperature Heat Detectors
7. Rate-of-Rise and Fixed Temperature Heat Detectors
8. Photoelectric Type Detectors
9. Duct-Mounted Smoke Detectors
10. Relay Modules
11. Control Modules
12. Input Modules
13. Fault Isolation Modules
14. Combination Horn/Strobes
15. Strobes
16. Horns
17. Weatherproof/Surface Backboxes
18. Protective Guards
19. Circuit Conductors
20. Surge Protection
21. Batteries
22. Locks and Keys
23. Document Storage Cabinet
24. Instruction Charts
25. Framed Floor Map

B. Scope:
1. Provide a new fire alarm system.
2. Provide a new fire alarm transmitter communication system.

C. In addition, provide design for the following as required in these Contract Documents:
1. Fire Alarm System
2. Fire Alarm Transmitter Communication System

D. System Design:
1. Design Criteria:
a. These are Contractor designed systems. Contact AHJ prior to bid to verify systems' requirements. Design systems in compliance with code as interpreted by the AHJ.
b. Fire Alarm Sequence of Operation: Activation of manual fire alarm box, automatic fire detector, or fire extinguishing system causes system to enter “alarm” mode including the following operations:
1) Local English language annunciation of device location, address and condition and audible and visual alarm signal at control panel and remote annunciators.

2) Manual "acknowledge" function at control panel and remote annunciators to silence audible alarm signal, visual signal remains displayed until initiating alarm is cleared.
3) Transmit “alarm” signal to off-premises equipment, i.e., to local fire department or Owner's selected vendor. Provide necessary connections to transmitter.
4) Activate fire alarm notification appliances.
5) Activate Emergency Control Functions as required by code.
(a) Transmit signal to fire/smoke dampers.
(b) Transmit signal to initiate shutdown of air handling equipment.
(c) Transmit signal to release fire doors.
(d) Transmit signals to elevator control equipment to initiate elevator recall and shunt trip.

c. Supervisory Sequence of Operation: Fire sprinkler tamper or supervisory pressure switch activation, or duct-mounted smoke detector activation causes system to enter "supervisory" mode including the following operations:
1) Local English language annunciation of device location, address and condition and audible and visual supervisory signal at control panel and remote annunciators.
2) Manual "acknowledge" function at control panel and remote annunciators to silence audible supervisory signal, visual signal remains displayed until initiating supervisory is cleared.
3) Transmit "supervisory" signal to off-premises equipment.
4) Transmit signal to fire/smoke dampers (duct detector only).
5) Transmit signal to initiate shutdown of air handling equipment (duct detector only).

d. Trouble Sequence of Operation: System trouble, including single ground or open of supervised circuit, or power or system failure, causes system to enter "trouble" mode including the following operations:
1) Local English language annunciation of device location, address and condition and audible and visual trouble signal at control panel and remote annunciators.
2) Manual "acknowledge" function at control panel and remote annunciators to silence audible trouble signal, visual signal remains displayed until initiating trouble is cleared.
3) Transmit "trouble" signal to off-premises equipment.

2. Design of Fire Alarm Transmitter Communication System:
a. Provide design of the fire alarm transmitter communication system as required by code.

1.02 RELATED SECTIONS

A. Contents of Division 28, Electronic Safety and Division 01, General Requirements apply to this Section.
B. Division 26, Electrical requirements apply to this section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Division 28, Electronic Safety and Division 01, General Requirements.
B. In addition, meet the following:

1. NFPA 72, National Fire Alarm and Signaling Code, adopted edition.
2. NFPA 70, National Electrical Code, adopted edition.

1.04 SUBMITTALS

A. Submittals as required by Division 28, Electronic Safety and Division 01, General Requirements.

B. Shop Drawings:
1. Submit shop drawings which include documentation required per NFPA 72; Shop Drawings.
2. In addition, provide the following:
a. Provide system designer NICET certification number or Engineer's signature and seal on shop drawings.
b. Identification of system designer and evidence of qualification or certification of designer as required by AHJ.

C. Operation and Maintenance Manuals:
1. Provide manuals containing the documentation required in NFPA 72; Completion Documentation.
2. In addition, provide the following:
a. One year warranty agreement including parts and labor. Warranty period begins upon date of substantial completion.
b. Instruction chart.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Division 28, Electronic Safety and Division 01, General Requirements.

B. In addition, meet City of Beaverton, Oregon requirements, ordinances and amendments.

C. Designer Qualifications: NICET III or IV or Fire Protection Engineer.

D. Installer Certifications: NICET II minimum.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Division 28, Electronic Safety and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Fire Alarm Control Panel:
1. Autocall
2. EST
3. Farenhyt
4. Gamewell-FCI
5. Notifier
6. Potter
7. Siemens
8. Silent Knight
9. Simplex
10. Or approved equivalent.

B. Notification Appliance Circuit Panels:
1. Same manufacturer as fire alarm control equipment.
2. Alarmsaf
3. Altronix
4. Federal Signal
5. Wheelock

6. Or approved equivalent.

C. Fire Alarm Transmitters:
1. Same manufacturer as fire alarm control equipment.
2. AES Corporation
3. DSC
4. Telguard
5. Or approved equivalent.

D. Fire Alarm Annunciators:
1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

E. Manual Pull Stations:
1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

F. Fixed Temperature Heat Detectors:
1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

G. Rate-of-Rise and Fixed Temperature Heat Detectors:
1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

H. Photoelectric Type Detectors:
1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

I. Duct-Mounted Smoke Detectors:
1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

J. Relay Modules:
1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

K. Control Modules:
1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

L. Input Modules:
1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

M. Fault Isolation Modules:
1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

N. Combination Horn/Strobes:
1. Same manufacturer as fire alarm control equipment.
2. Federal Signal
3. Gentex
4. System Sensor
5. Wheelock
6. Or approved equivalent.

O. Strobes:
1. Same manufacturer as fire alarm control equipment.
2. Federal Signal
3. Gentex
4. System Sensor

5. Wheelock
6. Or approved equivalent.

P. Horns:
1. Same manufacturer as fire alarm control equipment.
2. Federal Signal
3. Gentex
4. System Sensor
5. Wheelock
6. Or approved equivalent.

Q. Weatherproof/Surface Backboxes:
1. Same manufacturer as fire alarm detection devices or notification appliances.
2. Or approved equivalent.

R. Protective Guards:
1. Wire Guard:
a. Same manufacturer as fire alarm control equipment.
b. American Wire Guards
c. Chase Security Systems
d. Safety Technology International
e. Shaw-Perkins
f. Or approved equivalent.
2. Protective Cover:
a. Safety Technology International
b. SIGCOM
c. Or approved equivalent.

S. Circuit Conductors:
1. Allied Wire and Cable
2. Belden
3. CCI
4. West Penn Wire
5. Or approved equivalent.

T. Surge Protection:
1. Ditek
2. Transtector
3. Or approved equivalent.

U. Batteries:
1. Same manufacturer as fire alarm control equipment.
2. Power-Sonic
3. Werker
4. Or approved equivalent.

V. Locks and Keys:
1. Same manufacturer as fire alarm control equipment.
2. Or approved equivalent.

W. Document Storage Cabinet:
1. Same manufacturer as fire alarm control equipment.
2. Meir Products
3. Space Age
4. Or approved equivalent.

X. Instruction Charts:
1. Confirm make and model with architect prior to ordering.

Y. Framed Floor Map:
1. Confirm make and model with architect prior to ordering.

Z. Substitutions:
1. For other acceptable manufacturers of specified control units, submit product data showing equivalent features and compliance with Contract Documents.
2. For substitution of products by manufacturers not listed, submit product data showing features and certification by Contractor that the design will comply with contract documents.

AA. Equipment to be supplied by a certified manufacturer representative.

2.02 FIRE ALARM CONTROL PANEL

A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.

B. Multiprocessor Based: Configurable as an addressable, point identified system.

C. Central Processing Unit (CPU):
1. CPU continuously monitors the communications and data processing cycles of microprocessor. CPU failure generates an audible and visual trouble signal on control panel and remote annunciators.
2. House the CPU in fire alarm cabinet with sufficient space to allow maximum system expansion and to enclose alphanumeric display.
3. Retain basic life safety software in field programmable non-volatile memory. Provide CPU with minimum capacity of 50 addressable points.
4. Equip CPU with software to provide a control-by-event feature, whereby receipt of an alarm point is programmed to operate control points within system. Provide control-by-event actions for life safety functions in programmable non-volatile memory. CPU software programming for control of systems defined in this Section is installed as part of this Section.

D. System Capabilities:
1. System capable of addressing and operating smoke detectors, manual pull stations, open contact devices and addressable auxiliary control relays on the same communication loop.
2. System capable of displaying sensitivity of each smoke detector, address and condition of fire alarm monitoring points.

E. Program Software:
1. Field configuration program provides programmable operating instructions for system. Store resident program in non-volatile memory.
2. Devices meet criterion specified under materials.
3. Verification and display of sensitivity of each addressable smoke detector can be read using the operating software.

F. Control Panel Display Modules:
1. Provide keyboard display module with minimum 80-character backlit LCD. Each alarm/trouble condition appears in English language with description and location of alarm/supervisory/trouble.
2. Alarm/supervisory/trouble may be acknowledged, silenced and system reset from control panel or remote annunciator(s).

G. Power Supply: Provide power supply(s), adequate to serve control panel modules, remote annunciators, addressable devices, notification appliances and other connected devices.

H. Power Requirements:
1. Loss of 120VAC power automatically causes system to transfer to secondary power. Indicate battery power operation by yellow lamp and audible annunciation at

control panel and remote annunciator panels. Upon return of 120VAC power, unit recharges batteries to full capacity and maintains battery on float charge. Provide trickle charge adequate capacity to maintain battery fully charged with automatic rate charge.

2. Provide batteries in locking cabinet manufactured for purpose.

I. Auxiliary Relays: Provide sufficient SPDT auxiliary relay contacts for each function in this portion of the Specifications and for equipment interconnections required under electrical and mechanical specifications.

J. Auxiliary Switches: Provide auxiliary equipment control switches with labeled status indicating lights for each switch.

K. System Reset:

1. Key-accessible control function returns system to normal, non-alarm state, if initiating circuits have cleared.
2. Provide reset on both main fire alarm control panel and remote annunciators.

L. Addressing: Provide each initiating device with its own discrete address.

2.03 NOTIFICATION APPLIANCE CIRCUIT PANELS

A. Provide power supply(s), adequate to serve modules, remote annunciators, initiating devices, notification appliances and other connected devices or appliances.

B. Provide batteries in locking cabinet manufactured for purpose.

2.04 FIRE ALARM TRANSMITTERS

A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.

B. Electrically supervised, capable of transmitting alarm, supervisory and trouble signals over Radio Alarm Transmitter (RAT), Cellular, or Ethernet lines to off-premises receiver. Signal transmitter interfaces fully with receiver station of local fire department or Owner's selected vendor.

C. For radio and cellular transmitters, provide exterior antenna where required to facilitate communication with supervising station.

2.05 FIRE ALARM ANNUNCIATORS

A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.

B. Alphanumeric Remote Annunciator with Controls: Back lit LCD alphanumeric annunciator minimum 80 characters long. Provide under locking cover test switch, alarm and trouble buzzer, buzzer silence switch and buzzer silence message and reset switch, flush mount with finished cover, vandal-resistant UV stabilized Lexan (or approved equivalent) overlay and required modules, control panel, etc., to drive annunciator. Self-contained, suitable for wet location where located exterior.

2.06 MANUAL PULL STATIONS

A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.

B. Semi-flush, red finish, nongrasping operation; maximum pull strength as allowed per ADA criteria.

C. Stations do not allow closure without keyed reset.

2.07 FIXED TEMPERATURE HEAT DETECTORS

A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.

B. Rated 135 degrees F or 190 degrees F as required by space use.

C. Provide off-white, low-profile detectors.

2.08 RATE-OF-RISE AND FIXED TEMPERATURE HEAT DETECTORS

A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.

B. Responding to 15 degrees F temperature rise per minute and to 135 degrees F fixed temperature as required by space use.

C. Provide off-white, low-profile detectors.

2.09 PHOTOELECTRIC TYPE DETECTORS

A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.

B. Panel adjustable sensitivity, LED source, multiple cell, 360 degree smoke entry, visual latching operation indicator, insect screen, functional test switch, two-wire operation and vandal-resistant locking feature.

2.10 DUCT-MOUNTED SMOKE DETECTORS

A. Photoelectric type. Duct sampling tubes extending width of duct, visual indication of detector actuation, direct housing mount. Detector powered from control panel, power on indicator light. Detector rated for air velocity, humidity and temperature of duct and environment where installed.

2.11 RELAY MODULES

A. Signaling line circuit interface module that connects to other building systems for control of fire/life safety functions, e.g., air-handler shutdown, fire/smoke damper closure, elevator recall.

B. Module powered from control panel.

2.12 CONTROL MODULES

A. Signaling line circuit interface module that provides notification appliance circuits or system control outputs.

B. Module powered from control panel.

2.13 INPUT MODULES

A. Signaling line circuit interface module that provides initiating device circuits for connection to contact closure initiating devices.

B. Module powered from control panel.

2.14 FAULT ISOLATION MODULES

A. Signaling line circuit interface modules that provide isolation of wire-to-wire shorts on a signaling line circuit with automatic reconnection upon correction of short circuit.

B. Provide module with status indicator LED.

2.15 COMBINATION HORN/STROBES

A. Multi-candela, flush wall and ceiling mount, white finish, insect-proof.

B. Provide horn/strobes that meet the latest requirements of NFPA 72, ANSI 117.1 and UL 1971. Candela rating as required by NFPA 72.

C. Must be compatible with fire alarm control equipment and notification appliance circuit panels.

2.16 STROBES

A. Multi-candela, flush wall and ceiling mount, white finish, insect-proof.

B. Provide strobes that meet the latest requirements of NFPA 72, ANSI 117.1 and UL 1971. Candela rating as required by NFPA 72.

C. Must be compatible with fire alarm control equipment and notification appliance circuit panels.

2.17 HORNS

A. Flush wall and ceiling mount, white finish, insect-proof.

B. Provide horns that meet the latest requirements of NFPA 72.
C. Must be compatible with fire alarm control equipment and notification appliance circuit panels.

2.18 PROTECTIVE GUARDS

A. Wire Guard: Steel wire guard.
B. Protective Cover: Polycarbonate construction.

2.19 CIRCUIT CONDUCTORS

A. Copper or optical fiber; color code and label. Type FPL, FPLR and FPLP. Cable type as required by the NEC and the manufacturer.
B. Minimum signaling line circuit and initiating device circuit wire size: AWG18.
C. Minimum notification appliance circuit wire size: AWG14, or as approved by Engineer.
D. Fiber optic cable as required by manufacturer.
E. Provide two hour rated pathway or two hour rated circuit integrity cabling for all wiring used to activate or monitor smoke control equipment.

2.20 SURGE PROTECTION

A. Install per manufacturer's instructions and recommendations.
B. In accordance with IEEE C62.41 B3 combination waveform and NFPA 70; except for optical fiber conductors.
C. Provide for alternating current circuits powering fire alarm equipment.
D. Initiating Device Circuits, Notification Appliance Circuits and Communications Circuits: Rated to protect applicable equipment; for 24V(dc) maximum dc clamping voltage of 36V(dc), line-to-ground and 72V(dc), line-to-line.

2.21 BATTERIES

A. Provide additional cabinet, if required due to space limitations in control panels.

2.22 LOCKS AND KEYS

A. Deliver keys to Owner.
B. Provide same standard lock and key for each key operated switch and lockable panel and cabinet; provide five keys of each type.

2.23 DOCUMENT STORAGE CABINET

A. Suitable for as-built drawings, operation and maintenance manual, system data file disk and tools.
B. Constructed from steel with baked enamel finish; size adequate for full size drawings, operation and maintenance manual, spare parts and tools.

2.24 INSTRUCTION CHARTS

A. Printed instruction chart for operators, showing steps to be taken when signal is received (normal, alarm, supervisory and trouble); easily readable from normal operator's station.
B. Frame: Stainless steel or aluminum with polycarbonate or glass cover.

2.25 FRAMED FLOOR MAP

A. Provide framed floor plan of facility.
B. Frame: Stainless steel or aluminum with polycarbonate or glass cover.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Provide a complete and operable system compliant with all applicable codes and standards.
B. Obtain Architect's approval of locations of devices, appliances and annunciators before installation.
C. Circuits:
   1. Signaling Line Circuits (SLC): Class B

2. Notification Appliance Circuits (NAC): Class B.

D. Spare Capacity:
1. New Notification Appliance Circuits:
a. Minimum 25 percent spare current capacity.
b. Maximum 10 percent voltage drop.
c. Utilize UL maximum current draw value for notification appliances in calculations.
2. New Signaling Line Circuit: Minimum 25 percent spare device capacity.

E. Power Sources:
1. Primary: Dedicated branch circuits of facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate fire alarm system under normal supervisory condition for 24 hours and operate alarm signals for five minutes at end of standby period.

F. Obtain approval of system design from AHJ prior to installation. Do not begin installation without approval from AHJ and submittal review comments from Engineer.

G. Install in accordance with applicable codes, NFPA 72, NFPA 70 and the Contract Documents.

H. In accordance with manufacturer's instructions, provide wiring, conduit and outlet boxes required for the erection of a complete system as described in these specifications, as shown on Drawings and as required by AHJ.

I. Conceal wiring, conduit, boxes and supports where installed in finished areas.

J. Provide raceway system for cabling concealed in walls and hard ceilings and in locations where cabling is exposed. Where exposed, provide surface raceway in finished areas and surface mounted EMT in non-finished areas.

K. Provide cabling and conduits system suitable for wet locations for below grade systems.

L. At junction boxes and termination points, provide identification tags on wires and cables.

M. Route wiring to avoid blocking access to equipment requiring service, access, or adjustment.

N. Fire Safety Systems Interfaces:
1. Provide conduit, wiring, boxes and terminations from fire alarm system to monitored components. Provide a separate input module for each switch or relay to be monitored.
a. Alarm Inputs: Provide connection in accordance with NFPA 72 for the following systems and components:
1) Fire sprinkler water flow switches.
2) Kitchen hood fire suppression activation.
3) Other alarm inputs.
b. Supervisory Inputs: Provide connection in accordance with NFPA 72 for the following systems and components:
1) Fire sprinkler water control valve tamper switches.
2) Elevator shunt trip power monitoring circuit.
c. Trouble Inputs: Provide connection in accordance with NFPA 72 for the following systems and components:
1) Other trouble inputs.
2. Fire Safety Functions: Provide power and control conduit, wiring, boxes and terminations to power devices and interface to fire alarm system.
a. Doors:

1) Provide smoke detectors and addressable control relays to release magnetic hold open devices and roll-down fire doors and door locks. Verify requirements and quantities prior to bidding.
2) Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door.
3) Electronic Locks or Electromagnetic Door Locks on Egress Doors: Unlock smoke zone egress doors upon activation of any alarm initiating device or suppression system in smoke zone.
4) Overhead Coiling Fire Doors: Release upon activation of smoke detectors on either side of door.

b. Elevators:
1) Provide elevator recall smoke detectors, addressable control relays and connection to elevator equipment per NFPA 72 and as required by the AHJ.
2) Provide elevator shunt trip heat detectors, addressable control relays for shunt trip operation, addressable input module for monitoring shunt trip power and connection to elevator equipment per NFPA 72 and as required by the AHJ.
3) Elevator Lobby and Machine Room Smoke Detectors: Elevator recall for fire fighters' service.
4) Elevator Machine Room Heat Detector: Shut down elevator power prior to Elevator Machine Room sprinkler activation.

c. HVAC Systems:
1) Fire/Smoke Dampers and Smoke Dampers:
(a) Provide required smoke detectors, relays, wiring and the like.
(b) Connect control and power wiring to dampers per manufacturer's instructions.
(c) Verify quantities, location and requirements of dampers with Division 23, HVAC Drawings and Specifications and mechanical system installer.
2) Air Moving Systems:
(a) Provide duct-mounted smoke detector for air systems with air flow rates exceeding 2000 CFM. Coordinate with Division 23, HVAC.
(b) Install duct-mounted smoke detector(s) on return side of air system.
(c) Provide control wiring from addressable relay contacts to air handling equipment controller.
(d) Provide duct-mounted smoke detectors rated for air velocity, temperature and humidity of duct. Verify quantities, locations and requirements with Division 23, HVAC Drawings and mechanical system installer.
(e) Where duct-mounted smoke detectors are mounted in inaccessible building void spaces provide access hatch. Provide access hatch with fire rating equivalent to rating of wall, ceiling, or shaft being penetrated.
(f) Provide control wiring from addressable relay contacts to HVLS fan equipment controller.

O. Inspection and Testing for Completion:

1. System testing and commissioning to be performed by a certified manufacturer representative.
2. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
3. Document audibility measurements and verify intelligibility for each space on record drawings.
4. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction and adjustments.
5. Provide tools, software and supplies required to accomplish inspection and testing.
6. Prepare for testing by ensuring that work is complete and correct; perform preliminary tests as required to test system.
7. Correct defective work, adjust for proper operation and retest until entire system complies with Contract Documents.
8. Notify Owner seven days prior to beginning completion inspections and tests.
9. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
10. Diagnostic Period: After successful completion of inspections and tests, operate system in normal mode for at least 14 days without any system or equipment malfunctions.
    a. Record all system operations and malfunctions.
    b. If a malfunction occurs, start diagnostic period over after correction of malfunction.
    c. Replace devices with readings outside of allowed value at time of system check out.
    d. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
    e. At end of successful diagnostic period, complete and submit NFPA 72 "Inspection and Testing Form."

P. Owner Personnel Instruction:
1. Provide the following instruction to designated Owner personnel:
    a. Hands-On Instruction: On-site, using operational system.
    b. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.
2. Basic Operation: One-hour sessions for attendant personnel, security officers and engineering staff; combination of classroom and hands-on:
    a. Initial Training: One session pre-closeout.
    b. Refresher Training: One session post-occupancy.
3. Detailed Operation: Two-hour sessions for engineering and maintenance staff; combination of classroom and hands-on:
    a. Initial Training: One session pre-closeout.
    b. Refresher Training: One session post-occupancy.
4. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data and record drawings available during instruction.
5. Provide means of evaluation of trainees suitable to type of training given; report results to Owner.

Q. Closeout:
1. Closeout Demonstration:
    a. Demonstrate proper operation of functions to Owner.
    b. Be prepared to conduct any of the required tests.

c. Have at least one copy of operation and maintenance data, copy of project record drawings, input/output matrix and operator instruction chart(s) available during demonstration.
d. Have authorized technical representative of control unit manufacturer present during demonstration.
e. Demonstration may be combined with inspection and testing required by AHJ. Notify AHJ in time to schedule demonstration.
f. Repeat demonstration until successful.

2. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
   a. Specified diagnostic period without malfunction has been completed.
   b. Approved operating and maintenance data has been delivered.
   c. Spare parts, extra materials and tools have been delivered.
   d. All aspects of operation have been demonstrated to Architect.
   e. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
   f. Occupancy permit has been granted.
   g. Specified pre-closeout instruction is complete.
3. Perform post-occupancy instruction within three months after date of occupancy.

3.02 FIRE ALARM CONTROL PANEL

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide control panels with 120VAC dedicated circuit per NFPA requirements.
D. Do not install cabinets or equipment below the battery cabinet. Do not locate battery and charging system cabinets in ceiling space.
E. Provide instruction charts at each control panel where system operations are performed. Obtain approval from the Architect prior to mounting.
F. Perform system programming at the fire alarm control panel. Program the system without shutting the system down. Programming is done off line. Provide copy of site-specific program on electronic storage media. Locate in document enclosure.
G. Room Name Labeling: Control panel schedules, programming and labeling for electrical equipment, to use the room names and room numbers that the Architect adopts at the date of substantial completion of construction. This work is to be done at no added cost to the Owner.
H. Programmable Function Keys: Provide control panel accessible function keys for the notification bypass, fire drill, fire door bypass, elevator control bypass, and supervising station bypass.
I. Programmed control point activation includes selective control of HVAC, fire door release, elevator recall, elevator shunt trip, and other fire safety and auxiliary functions.
J. Provide machine printed labels on switches and indicators.

3.03 NOTIFICATION APPLIANCE CIRCUIT PANELS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide notification appliance circuit panel power supplies with 120VAC dedicated circuit per NFPA requirements.
D. Do not install cabinets or equipment below the battery cabinet. Do not locate battery and charging system cabinets in ceiling space.

3.04 FIRE ALARM TRANSMITTERS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide conduit and wiring for connections to the transmitter as required for fire alarm system off site supervision.
D. Verify and provide call sequence and message as directed by Owner and the AHJ.

3.05 FIRE ALARM ANNUNCIATORS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. When required by the manufacturer, provide fire alarm annunciator with 120VAC dedicated circuit per NFPA requirements.
D. Provide machine printed labels on switches and indicators.
E. Verify location with AHJ before installation.

3.06 MANUAL PULL STATIONS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed address labels on addressable devices.
D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.07 FIXED TEMPERATURE HEAT DETECTORS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.
D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.08 RATE-OF-RISE AND FIXED TEMPERATURE HEAT DETECTORS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.
D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.09 PHOTOELECTRIC TYPE DETECTORS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.
D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.10 DUCT-MOUNTED SMOKE DETECTORS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.

3.11 RELAY MODULES

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.

3.12 CONTROL MODULES

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.

3.13 INPUT MODULES

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.

3.14 FAULT ISOLATION MODULES

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.
D. Provide Fault Isolator Modules for signaling line circuit per code requirements and manufacturer instructions.

3.15 COMBINATION HORN/STROBES

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed labels on notification appliances with appliance circuit number and sequence. Labels to be visible from the floor without magnification.
D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.16 STROBES

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed labels on notification appliances with appliance circuit number and sequence. Labels to be visible from the floor without magnification.
D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.17 HORNS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed labels on notification appliances with appliance circuit number and sequence. Labels to be visible from the floor without magnification.
D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.18 WEATHERPROOF/SURFACE BACKBOXES

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide manufacturer's weatherproof backbox listed for use in areas where the device or appliance is subject to humidity in excess of listed rating. Provide manufacturer surface backboxes where devices cannot be installed recessed.

3.19 PROTECTIVE GUARDS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Wire Guard.
D. Protective Cover.

3.20 CIRCUIT CONDUCTORS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.

C. Provide wiring to meet the requirements of national, state and local electrical codes. Provide color coded wiring as recommended and specified by the fire alarm and detection system manufacturer. Provide Type FPLR cable when in a riser application or FPLP cable when installed in plenums.

3.21 SURGE PROTECTIONS

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

3.22 BATTERIES

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Provide machine printed label with installation date.

3.23 LOCKS AND KEYS

A. Deliver to Owner.

3.24 DOCUMENT STORAGE CABINET

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Provide document storage cabinet adjacent to fire alarm control panel.

3.25 INSTRUCTION CHARTS

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Install chart adjacent to fire control panel.

3.26 FRAMED FLOOR MAP

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Provide framed floor plan of facility adjacent to the annunciator panel identifying room names/numbers, device/addresses or fire zone number and description as utilized on the annunciator panel, as required by local AHJ. Check with the local fire department for size and approved mounting location.

END OF SECTION