

Project Manual

for

HGPC Units 1C, 2E, 3B, 3C, 3D, 3E Renovations
for the

UT Health Science Center – Houston
2800 S. MacGregor Way, Houston, TX 77021

14 October 2016

PBK Project No.: 16103

Issue for Bid

10/14/2016



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Architect

PBK
11 Greenway Plaza Blvd, 22nd Floor
Houston, Texas 77046
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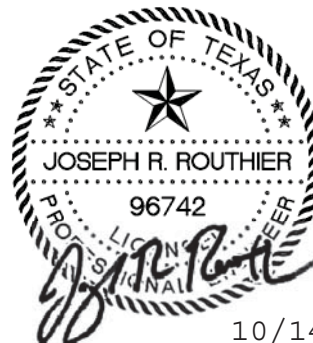
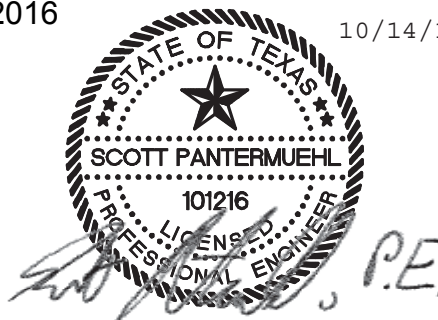
MEP

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TX Registration #:F-2113

10/14/2016



10/14/16



10/14/2016

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Note: Refer to the Owner's Bidding/Proposal Documents for additional information not included within these front-end specifications. Information provided within the Owner's Bidding/Proposal Documents will supersede information provided within these specifications.

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Note: Refer to the Owner's Bidding/Proposal Documents for additional information not included within these Division 1 specifications. Information provided within the Owner's Bidding/Proposal Documents will supersede information provided within these specifications.

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DOCUMENT 00 11 00 - REQUEST FOR COMPETITIVE SEALED PROPOSALS

Competitive Sealed Proposals for the work identified below in accordance with Proposal Documents and addenda as may be issued prior to date of proposal opening will be received by the The University of Texas Health Science Center at Houston, Procurement Services, until proposal closing date and time, as identified below. Proposals from Offerors will then be opened in accordance with stipulations and requirements of The University of Texas Health Science Center at Houston.

OWNER: The University of Texas Health Science Center at Houston
Procurement Services
1851 Crosspoint, OCB1.160
Houston, Texas 77054
University Contact: Laura Lander, Contract Manager
Email: laura.lander@uth.tmc.edu

The University of Texas Health Science Center at Houston
Facilities, Planning & Engineering
7000 Fannin, UCT M125
Houston, Texas 77030
Phone: (713) 500-3441 Fax: (713) 500-0364
Owner Representative: Lamar Singletary, Senior Project Manager

PROJECT: Harris County Psychiatric Center (HCPC)
Units 1C, 2C, 2D, 2E, 3B, 3C, 3D, 3E Renovations
2800 S. MacGregor Way, Houston, Texas 77021

PREPROPOSAL CONFERENCE: Refer to separate documents issued by The University of Texas Health Science Center at Houston Procurement Services for Preproposal Conference location, date, and time, if required. Representatives of the Architect and Owner will be present at this meeting. All proposers are encouraged to attend.

PROPOSAL DATE AND TIME: Refer to separate documents issued by The University of Texas Health Science Center at Houston Procurement Services.

LOCATION OF PROPOSAL OPENING: Refer to separate documents issued by The University of Texas Health Science Center at Houston Procurement Services.

ARCHITECT: PBK Architects, Inc.
11 Greenway Plaza, 22nd Floor
Houston, Texas 77046
Phone: (713) 965-0608 Fax: (713) 961-4571

Qualified Offerors (General Contractors) are to refer to separate bidding documents issued by The University of Texas Health Science Center at Houston Procurement Services to determine requirements related to the availability of plans and specifications.

Submit Proposals to the Owner no later than the date and time specified. Submit proposals in the format stipulated within the separate bidding documents issued by The University of Texas Health Science Center at Houston Procurement Services.

The Owner reserves the right to reject any and all proposals and to waive any irregularities in the Competitive Sealed Proposal process.

No proposal shall be withdrawn within 45 days after the proposal opening without the specific consent of the Owner.

Subcontractors and Suppliers intending to submit proposals to General Construction Offerors are required to prepare proposals based on a complete set of proposal documents. If after reviewing the complete set of proposal documents, Subcontractors and Supplier Offerors desiring to purchase individual drawings and specification sections for their proposal convenience, may do so by ordering the specific drawings and specifications directly from the reproduction company.

Subcontractors and Suppliers purchasing a partial set of proposal documents are responsible for determining the documents it requires and is responsible for costs associated with printing and delivery. Subcontractors and Suppliers exercising this option shall agree that 1) all documents shall be returned to the Architect, without refund, after submitting a proposal, 2) the documents shall not be used on other construction projects, and 3) that the subcontractor or supplier agrees that the Owner and the Architect have no responsibility for errors or interpretations resulting from the use of incomplete set of proposal documents.

Successful Subcontractors and Supplier Offerors may retain their Proposal Documents until completion of the construction.

End of Document

DOCUMENT 00 20 00 - INSTRUCTIONS TO OFFERORS

1.1 QUALIFIED OFFERORS

- A. Competitive Sealed Proposals will be accepted from qualified Offerors (General Contractors) only for the entire scope of work described in the Contract Documents. As a prerequisite to an Offeror's qualifying for the award of contract on this work, the Offeror must complete all requirements stipulated in separate bidding documents issued by The University of Texas Health Science Center at Houston Procurement Services.
- B. The primary purposes of the evaluation process will be to:
 - 1. Gather information for the Owner's evaluation procedure.
 - 2. Enable the Owner and/or Architect to evaluate the Offeror's qualifications.
- C. After review of Proposals and Contractor's qualifications evaluation the Owner will make its decision and each Offeror will be notified.

1.2 OFFEROR'S PRESENTATION

- A. In making its Proposal, the Offeror represents that the Offeror:
 - 1. Has read and understands the Proposal Documents and the Proposal is made in accordance with the drawings and specifications.
 - 2. Has thoroughly familiarized itself with Division 1 General Requirements as applicable to subsequent specification sections.
 - 3. Has visited the site, familiarized itself with local conditions under which the work will be performed and has correlated observations with the requirements of the proposed Contract Documents.
 - 4. Agrees to comply with requirements. An Offeror who subsequently does not agree to comply with the requirements will automatically disqualify itself from proposing or receiving award of the contract.
- B. If the proposal is accepted, the Offeror agrees that:
 - 1. Work on the project will begin immediately upon receipt of signed Contract or Notice to Proceed, or as otherwise described in the Proposal Documents issued by the Owner.
 - 2. It will participate as a team member in cooperation with the Project Architect, Engineers, Owner, and Owners agents and/or consultants.
 - 3. It will assign a competent full time superintendent, to the project, and that superintendent shall remain on the project for the duration of the project, subject only to continuous employment.
 - 4. It shall carry and keep in full force for the duration of the Project, insurance coverage for Builder's Risk, Workmen's Compensation, Comprehensive General Liability, Automobile Liability, and other insurance as required by the Owner's Proposal Documents.
 - 5. By making its Proposal represents that the Proposal includes material and equipment specified in the Proposal Documents and supplemented, if necessary, for a complete and operating system.
 - 6. Where subcontract work is involved and where Acceptable Subcontractors are designated for particular portions or phases of the Work, by making the Proposal, the Contractor represents that its Proposal includes only firms designated as Acceptable Subcontractors.
 - 7. That no asbestos, PCBs, or lead building materials shall be used, and that the Offeror and subofferors and suppliers submitting a proposal to an Offeror, shall submit an affidavit at Project Close Out stating that no asbestos, PCB, or lead building materials has been used on the Project.

1.3 PROPOSAL DOCUMENTS

- A. Proposal Documents include the Request for Competitive Sealed Proposals, Instructions to Offerors, the proposed Contract Documents, including Addenda issued prior to receipt of proposals, and any other documents provided by the Owner in the form of a Request for Proposal.
- B. Contract Documents for the work consist of the Owner's modified Owner-Contractor Agreement, the Owner's General Conditions, the Owner's Supplementary Conditions, the Drawings, the Specifications, and Addenda issued prior to receipt of proposals. Should there be a conflict between the terms of the Owner's Proposal Documents and the remainder of the Contract Documents, the terms of the Owner's Proposal Documents control.

1.4 PROPOSAL PROCEDURES

- A. A proposal is invalid if it has not been received at the designated location prior to the time and date for receipt of proposals indicated in the Request for Competitive Sealed Proposals, or prior to any extension thereof issued to the Offerors by Addenda.
- B. Requested Alternates shall be proposed. If no change in the Base Proposal is required, enter "No Change".
- C. Prior to the receipt of Proposals, Addenda will be forwarded by the Architect and will be available for inspection wherever the proposal documents are kept available for that purpose.
- D. Proposals will be received in the quantities and format stipulated by the Owner's Proposal Documents, filled in, and enclosed in a sealed envelope addressed as follows (and/or as otherwise directed by the Owner's Request for Proposal Documents):

Name of Offeror (General Contractor)
The University of Texas Health Science Center at Houston
Procurement Services
Attn: Laura Lander, Contract Manager

- E. A proposal may be withdrawn upon request by the Offeror or its duly authorized representative, provided the request is received by the Owner at the location designated for receipt of proposals and prior to the time fixed for the opening of proposals. A withdrawal of a proposal shall not be effective unless a written confirmation of the withdrawal is received by the Owner at the location of the bid opening within 48 hours before the time established for the opening of proposals. The withdrawal of a proposal does not prejudice the right of the Offeror to file a new proposal at the time and place stated. No proposal may be withdrawn for 30 days after the time fixed for the opening of proposals.

1.5 INTERPRETATION OF PROPOSAL DOCUMENTS

- A. Offerors and subofferors requiring clarification or interpretation of the Proposal Documents shall make a written or verbal request which shall reach the Architect at least ten days prior to the date for receipt of proposals, or as otherwise stipulated in the Proposal Documents.
- B. Interpretation, correction, or change of the Proposal Documents will be made by Addendum. Interpretations, corrections, or changes of the Proposal Documents made in any other manner are not binding.

1.6 SUBSTITUTIONS OF MATERIALS AND EQUIPMENT

- A. The materials, products and equipment described in the Proposal Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution. The materials and equipment named in, and the procedures covered by these specifications have been selected as a standard because of quality, particular suitability or record of satisfactory performance. It is not intended to preclude the use of equal or better materials or equipment provided that same meets the requirements of the particular project and is approved in an Addendum as a substitution prior to the submission of proposals.
- B. Substitutions will not be considered prior to receipt of proposals unless written request for approval has been received by the Architect at least seven days prior to the date established for receipt of proposals and the substitution request complies with requirements of Section 012500. The proposer shall complete the Substitution Request Form and submit with complete supporting data including drawings, catalogue cuts, performance and test data and other technical data necessary for an evaluation. The Architect's decision of a proposed substitution shall be final.
- C. If the Architect accepts a proposed substitution prior to receipt of proposals, notice of acceptance shall be by Addenda.
- D. No substitutions will be considered after the Contract award.

1.7 REJECTION OF PROPOSALS

- A. The Owner reserves the right to reject any or all proposals and to reject a proposal that is not accompanied by the required proposal security or other data required by the Proposal Documents, and to reject a proposal which the Owner considers incomplete or irregular.
- B. The Owner reserves the right to reject any or all proposals and to waive any formalities or irregularities and to make the award of the contract in the best interest of the Owner.
- C. The Owner reserves the right to reject a proposal if the evidence submitted by, or investigation of, the offeror fails to satisfy the Owner that the offeror is properly qualified to carry out the obligations of the contract and to complete the work. Award of the Contract may be made to other than the low dollar offeror and may be awarded to the Offeror proposing the best value to the Owner, in addition to the purchase price, based on the published selection criteria and on its ranking evaluation.
- D. Do not submit voluntary alternates. The Owner reserves the right to reject proposals accompanied by conditional or qualifying statements, or voluntary alternates.

1.8 INSURANCE

- A. Each Offeror shall include in its proposal the cost of insurance and shall carry and keep insurance in full force for the duration of the project. Provide insurance coverage required by the Owner's General and Supplementary Conditions, or as otherwise described in the Owner's Proposal Documents.

1.9 SUBMISSION OF POST PROPOSAL INFORMATION

- A. The apparent Selected Offeror shall within three days after proposals are received submit the following:

1. A statement of costs for each major item of work included in the proposal described in Section 012900. Each portion of work identified in the specifications shall be considered a major item of work and shall be shown as a separate cost item.

1.10 AWARD OF CONTRACT

- A. The Selected Offeror will be notified within a particular number of days, as stipulated in the Proposal Documents, from the date on which proposals are opened. Offerors shall hold their offer open for that particular number of days after the submission deadline. If the Owner is unable to negotiate a contract with the first selected offeror, the Owner shall formerly end negotiations with that offeror and proceed to the next offeror in the order of the selection ranking until a contract is reached or each proposal is rejected.
- B. The Offeror will be required to submit Certificates of required insurances, using the Owner's respective forms.

1.11 NOTICE TO PROCEED

- A. The Offeror shall not commence work under this Contract until it receives a written Notice to Proceed or the Contract is duly signed by the Owner.

1.12 COMPLETION TIME

- A. Offerors shall familiarize themselves with the Owner's requirements concerning the project schedule, including sequence and phasing of the Work. The project is to be substantially complete no later than the date(s) stipulated in the Owner's Proposal Documents.
- B. Having thoroughly familiarized itself with the conditions as they exist at the building site and acquainted itself with the labor supply and the material market, the Offeror shall state in its proposal that it agrees to be substantially complete with the work within the calendar days stated in its Proposal.

1.13 AFFIDAVIT OF NONDISCRIMINATORY EMPLOYMENT

- A. The Offeror and subofferors agree to refrain from discrimination in terms and conditions of employment to the basis of race, color, religion, sex, or national origin, and agrees to take affirmative action as required by Federal Statutes and Rules and Regulations issued in order to maintain and insure non-discriminatory employment practices.

1.14 SUBCONTRACTOR LISTING

- A. The Offeror shall supply a listing of the primary subcontractors using format prescribed by Owner's Proposal Documents:
 1. Mechanical.
 2. Electrical.
 3. Plumbing.
 4. Masonry.
 5. Steel.
 6. Any other prudent subcontractor.

1.15 AFFIDAVIT OF NO ASBESTOS, LEAD, AND PCB USE IN PROJECT

- A. The use of a construction process or the installation of asbestos, lead, and PCBs or material containing asbestos, lead, and PCBs is strictly prohibited.

- B. Prior to submitting a proposal, Offerors shall notify the Architect, in writing, if a specified material is known to contain or is likely to contain asbestos, lead, or PCBs.
- C. The Offeror and subofferors agree to refrain from using products which are known to contain asbestos, lead, and PCB containing materials as applicable to the project. They shall affirm that lead or materials containing lead have not been incorporated into potable water systems, and that lead sheet flashing used in through roof plumbing penetration applications is the only lead on the Project.
- D. The Selected Offeror and its subofferors shall execute an Affidavit of Non Asbestos, Lead, and PCB Use or other form as prescribed by the Owner's Proposal Documents and submit at Project Closeout.

1.16 PROPOSAL EVALUATION WAIVER

- A. By submitting a proposal, each offeror agrees to waive claims it has or may have against the Owner and its respective employees, the Program Manager, and their respective employees, the Architect/Engineer and consultants, and their respective employees, arising out of or in connection with the administration, evaluation, or recommendation of any proposal; waiver of any requirements under the Proposal Documents, acceptance or rejection of any proposals; and award of the contract.
- B. Offerors shall execute a Proposal Evaluation Waiver or other form as prescribed by the Owner's Proposal Documents and submit with the Proposal.

1.17 CONFLICT OF INTEREST QUESTIONNAIRE

- A. According to Local Government Code, Chapter 176, a person or an agent of a person who contracts or seeks to contract for the sale or purchase of property, goods, or services with any local government agency must file a completed Conflict of Interest Questionnaire (CIQ) with the records administrator of the local government not later than the seventh business day after the date that the person begins contract discussions or negotiations with the Owner or submits to the Owner an application, response to a request for proposals or bids, correspondence, or another writing related to a potential agreement with the Owner.
- B. Offerors and subofferors proposing to do work with the Owner shall execute a Conflict of Interest Questionnaire or other form as prescribed by the Owner's Proposal Documents and submit to the Owner.

1.18 AVAILABILITY OF MATERIALS AND SYSTEMS

- A. A serious effort has been made to select materials that are systems that are readily available. To the extent known at proposal time specified items are available or within a relatively short period of time. If during the proposal period, should an Offeror become aware of an availability or delivery issue with the specified systems or materials, it should notify the Architect immediately. The Architect will promptly explore possibilities for selecting other systems or materials which would eliminate the issue and notify Offerors of changes by addendum. It shall be understood that only specified systems and materials that are readily available are included in the proposal.

1.19 DETERMINATION OF SUCCESSFUL RESPONDENT AND AWARD OF CONTRACT

- A. A decision regarding determination of the successful Offeror will be rendered as soon as practicable, or as otherwise outlined in the Request for Proposal Documents.

- B. Insofar as the Architect's recommendation to the Owner in determining the dollar amount of the Proposal of the responsible Offeror, only the Base Proposal will be considered; any monetary deduction proposed for using a Substitute Subcontractor (i.e., not one designated as a Listed Subcontractor) will not be a factor in the Architect's decision on which Offeror to recommend and if it is subsequently decided to accept any Substitute Subcontractor the substitution will be processed by Change Order.

1.20 USE OF ASBESTOS FREE MATERIALS, PRODUCTS AND SYSTEMS

- A. The Offeror shall consider the use of asbestos free material requirements in preparing its Proposal including requirements during performance of the work regarding the use of asbestos free materials, products, and systems in the Project.
1. Since many materials, products and systems are proprietary, it is not possible to know the specific materials or components that produce each material, product or system without the manufacturer divulging trade secrets or patent information. Every effort has been made to specify materials, products, or systems, which do not contain asbestos.
 2. It is the Contractor's responsibility to submit an affidavit from the manufacturer to ascertain that every material, product or system used in the Project does not contain asbestos. In the event a material, product, or system is found to contain asbestos, the Contractor shall offer for the Architect's consideration a substitution which it knows does not contain asbestos.
 3. Although a material, product, or system is specified or a specification is based on a specific material, product, or system, the Contractor is not be relieved from its responsibility to ascertain that materials, products, and systems used in the Project do not contain asbestos. Under no circumstances shall a material, product, or system which is known, suspected, or found to contain asbestos be used on the Project.
 4. If a material, product, or system containing asbestos is used, the Contractor shall remove and replace the material, product, or system with a comparable or better asbestos free material at no expense to the Owner, including removal and replacement of other materials affected by the removal of the asbestos containing material, product or system, i.e. removal, replacement, and finishing of gypsum board due to removal of asbestos insulation.

End of Document

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements including but not limited to:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Phased construction.
 - 4. Work by Owner.
 - 5. Work under separate contracts.
 - 6. Future work.
 - 7. Purchase contracts.
 - 8. Owner furnished products.
 - 9. Contractor furnished, Owner installed products.
 - 10. Access to site.
 - 11. Coordination with occupants.
 - 12. Work restrictions.
 - 13. Specification and drawing conventions.
 - 14. Miscellaneous provisions.

- B. Refer to the Owner's Proposal Documents for additional information. If conflicts are present between the information presented within this specification section and the Owner's Proposal Documents, the Owner's Proposal Documents will supersede.

1.2 PROJECT INFORMATION

- A. Project Identification:
 - 1. Project Location: UT Health Science Center – Houston: Harris County Psychiatric Center, 2800 S. MacGregor Way, Houston, Texas 77021

- B. Owner:
 - 1. Owner's Representative: Lamar Singletary, Senior Project Manager

- C. Architect: PBK Architects, Houston, Texas.

- D. Consultants: Additional design professionals have been retained who have prepared designated portions of the Contract Documents.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The work of Project is defined by the Contract Documents and consists of the following: The interior renovation of six existing patient units for the purpose of upgrading interior finishes, renovating shared restroom spaces, and incorporating other minor changes to doors, windows, and other elements within each unit.

1.4 WORK BY OWNER AND UNDER SEPARATE CONTRACTS

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

- B. The Owner reserves the right to let separate contract for work outside of the scope of this Contract. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
- C. Purchase Contracts: The Owner reserves the right to negotiate purchase contracts with suppliers of material and equipment that may be incorporated into the work. The Owner will assign these purchase contracts to Contractor. Include costs for purchasing, receiving, handling, storage if required, and installation of material and equipment in the Contract Sum, unless otherwise indicated.
 - 1. Contractor's responsibilities are same as if Contractor had negotiated purchase contracts, including responsibility to renegotiate purchase and to execute final purchasing agreements.
- D. Owner Furnished Products (OFCI): The Owner will furnish products indicated. The work includes receiving, unloading, handling, storing, protecting, and installing Owner furnished products and making building services connections when applicable.
 - 1. Owner Furnished Products: Coordinate with Owner.

1.5 ACCESS TO SITE

- A. Use of Site: Limit use of Project site to work in areas and areas within the Contract limits indicated. Do not disturb portions of site beyond areas in which the work is indicated.
 - 1. Limits: The drawings indicate the limits of the construction operations.
 - 2. Driveways, Walkways, and Entrances: Keep driveways, parking areas, patient drop off and pick up points, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, visitors, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in weathertight condition throughout construction period. Repair damage caused by construction operations.

1.6 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy site and adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform work to prevent interference with Owner's day to day operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 - 2. Notify Owner not less than **72** hours in advance of activities that will affect Owner's operations.
- B. Full Owner Occupancy: Owner will occupy site and **adjacent** buildings during the construction period. Cooperate with Owner during construction operations to minimize conflicts, facilitate Owner usage, and protect patients, staff, and visitors. Perform the work to not interfere with Owner's day to day activity and operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 - 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

- C. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the work, prior to Substantial Completion of the work, provided occupancy does not interfere with completion of the work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total work.
 - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the work to be occupied prior to Owner acceptance of the completed work.
 - 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
 - 3. Before limited Owner occupancy, ensure mechanical and electrical systems are fully operational, and required tests and inspections and start up procedures are successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of work.
 - 4. Upon occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of work.

1.7 WORK RESTRICTIONS

- A. Work Restrictions: Comply with restrictions on construction operations. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On Site Work Hours: Limit work in the existing building to normal working hours, Monday through Friday, unless otherwise indicated. Coordinate with Owner when it is necessary to extend working hours or work on weekends.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and after providing temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Owner not less than two days in advance of proposed disruptive operations.
 - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Controlled Substances, Firearms, and Explosive Devices: Use of tobacco products, controlled substances, firearms, and explosive devices on the site is not permitted.
- F. Employee Identification: Provide identification tags for Contractor personnel working on site. Require personnel to use identification tags at all times.
- G. Employee Screening: Comply with Owner's requirements for **drug and background** screening of Contractor personnel working on site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

- B. Division 1 General Requirements: Requirements of Sections in Division 1 apply to the work of each specification section.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

End of Section

SECTION 01 23 00 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes: Administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described are part of the Work when enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate. Refer to Drawings for locations within each unit where the listed alternates apply.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. The alternates within this schedule are listed in numerical/alphabetical order for clarity, but this sequence is not necessarily indicative of the final order in which the patient units are to be constructed. Refer to the proposal documents provided by the Owner for final direction on the sequence of construction. Refer to the Drawings for additional information pertaining to this sequencing as well.
- B. Alternate No. 1C-01:

1. Alternate applies to Unit 1C renovation.
 2. Base Bid: Existing partition to remain; protect in place.
 3. Alternate: Demolish portion of existing partition where shown to accommodate new window. Install new 3'-0" wide x 6'-0" high window in 2" hollow metal frame, painted to match existing frames in the immediate vicinity. Glazing to be type G-3. Mount window at height of 1'-0" above finished floor to the bottom of window frame.
- C. Alternate No. 1C-02:
1. Alternate applies to Unit 1C renovation.
 2. Base Bid: Existing partition to remain; protect in place.
 3. Alternate: Install wall-mounted workstation (Precision Medical Cabinetry Model STS-3037-FD-HTA-A with key lock, double extension arm, and with laminate to match Wilsonart #7951K-18 "Asian Sun") where located in plan. Workstation should be installed 1'-7" a.f.f. to the bottom of the cabinet and 3'-7" from the nearest adjacent corner or other obstruction. Provide appropriate blocking within the wall or mount per manufacturer's direction for particular substrate conditions encountered. Coordinate routing of electrical and data to each location. At each workstation, provide a custom fold-out plastic laminate-clad desk to match the wall-mounted workstation plastic laminate and in a configuration to match the existing installation at Unit 2B.
- D. Alternate No. 1C-03:
1. Alternate applies to Unit 1C renovation.
 2. Base Bid: Existing metal cabinets to remain; protect in place.
 3. Alternate: Paint all existing metal cabinets within the Staff Room, Chart Room, and Medication Room within each unit, or as otherwise noted in plan. Paint finish to be Sherwin Williams "White", with appropriate primer and/or finish coats as designated in the specifications for the substrate material to be painted.
- E. Alternate No. 1C-04:
1. Alternate applies to Unit 1C renovation.
 2. Base Bid: Existing ceiling to remain unless noted otherwise; protect in place.
 3. Alternate: Coordinate installation of ceiling-mounted patient monitor camera in location depicted. Camera equipment is to be provided by Fisk Electric and data cabling is to be provided by the Harris County Psychiatric Center. Coordinate final position and installation in the field with the Owner and Fisk Electric.
- F. Alternate No. 1C-05:
1. Alternate applies to Unit 1C renovation.
 2. Base Bid: Existing cross-corridor doors and frame to remain; protect in place.
 3. Alternate: Remove existing cross-corridor doors where indicated, protect existing door frame in place. Salvage all existing door hardware and glazing lite kits for re-installation. Return existing doors to Owner for building attic stock. Re-paint existing door frame with scheduled finish and install new cross-corridor doors to match original configuration. Re-install existing door hardware and glazing lites in original configurations within new doors.
- G. Alternate No. 2E-01:
1. Alternate applies to Unit 2E renovation.
 2. Base Bid: Existing partition to remain; protect in place.
 3. Alternate: Demolish portion of existing partition where shown to accommodate new window. Install new 3'-0" wide x 6'-0" high window in 2" hollow metal frame, painted to match existing frames in the immediate vicinity. Glazing to be type G-3. Mount window at height of 1'-0" above finished floor to the bottom of window frame.
- H. Alternate No. 2E-02:
1. Alternate applies to Unit 2E renovation.
 2. Base Bid: Existing partition to remain; protect in place.

3. Alternate: Install wall-mounted workstation (Precision Medical Cabinetry Model STS-3037-FD-HTA-A with key lock, double extension arm, and with laminate to match Wilsonart #7951K-18 "Asian Sun") where located in plan. Workstation should be installed 1'-7" a.f.f. to the bottom of the cabinet and 3'-7" from the nearest adjacent corner or other obstruction. Provide appropriate blocking within the wall or mount per manufacturer's direction for particular substrate conditions encountered. Coordinate routing of electrical and data to each location. At each workstation, provide a custom fold-out plastic laminate-clad desk to match the wall-mounted workstation plastic laminate and in a configuration to match the existing installation at Unit 2B.
- I. Alternate No. 2E-03:
1. Alternate applies to Unit 2E renovation.
 2. Base Bid: Existing metal cabinets to remain; protect in place.
 3. Alternate: Paint all existing metal cabinets within the Staff Room, Chart Room, and Medication Room within each unit, or as otherwise noted in plan. Paint finish to be Sherwin Williams "White", with appropriate primer and/or finish coats as designated in the specifications for the substrate material to be painted.
- J. Alternate No. 2E-04:
1. Alternate applies to Unit 2E renovation.
 2. Base Bid: Existing ceiling to remain unless noted otherwise; protect in place.
 3. Alternate: Coordinate installation of ceiling-mounted patient monitor camera in location depicted. Camera equipment is to be provided by Fisk Electric and data cabling is to be provided by the Harris County Psychiatric Center. Coordinate final position and installation in the field with the Owner and Fisk Electric.
- K. Alternate No. 2E-05:
1. Alternate applies to Unit 2E renovation.
 2. Base Bid: Existing cross-corridor doors and frame to remain; protect in place.
 3. Alternate: Remove existing cross-corridor doors where indicated, protect existing door frame in place. Salvage all existing door hardware and glazing lite kits for re-installation. Return existing doors to Owner for building attic stock. Re-paint existing door frame with scheduled finish and install new cross-corridor doors to match original configuration. Re-install existing door hardware and glazing lites in original configurations within new doors.
- L. Alternate No. 3B-01:
1. Alternate applies to Unit 3B renovation. Note that renovation of this particular entire unit will be considered optional, contingent on the Owner's final determination. Refer to the Owner's proposal documents and the Drawings for additional information pertaining to the sequence of construction for the patient units.
 2. Base Bid: Existing partition to remain; protect in place.
 3. Alternate: Demolish portion of existing partition where shown to accommodate new window. Install new 3'-0" wide x 6'-0" high window in 2" hollow metal frame, painted to match existing frames in the immediate vicinity. Glazing to be type G-3. Mount window at height of 1'-0" above finished floor to the bottom of window frame.
- M. Alternate No. 3B-02:
1. Alternate applies to Unit 3B renovation. Note that renovation of this particular entire unit will be considered optional, contingent on the Owner's final determination. Refer to the Owner's proposal documents and the Drawings for additional information pertaining to the sequence of construction for the patient units.
 2. Base Bid: Existing partition to remain; protect in place.
 3. Alternate: Install wall-mounted workstation (Precision Medical Cabinetry Model STS-3037-FD-HTA-A with key lock, double extension arm, and with laminate to match Wilsonart #7951K-18 "Asian Sun") where located in plan. Workstation should be installed 1'-7" a.f.f. to the bottom of the cabinet and 3'-7" from the nearest adjacent corner or other obstruction. Provide appropriate

blocking within the wall or mount per manufacturer's direction for particular substrate conditions encountered. Coordinate routing of electrical and data to each location. At each workstation, provide a custom fold-out plastic laminate-clad desk to match the wall-mounted workstation plastic laminate and in a configuration to match the existing installation at Unit 2B.

N. Alternate No. 3B-03:

1. Alternate applies to Unit 3B renovation. Note that renovation of this particular entire unit will be considered optional, contingent on the Owner's final determination. Refer to the Owner's proposal documents and the Drawings for additional information pertaining to the sequence of construction for the patient units.
2. Base Bid: Existing metal cabinets to remain; protect in place.
3. Alternate: Paint all existing metal cabinets within the Staff Room, Chart Room, and Medication Room within each unit, or as otherwise noted in plan. Paint finish to be Sherwin Williams "White", with appropriate primer and/or finish coats as designated in the specifications for the substrate material to be painted.

O. Alternate No. 3B-04:

1. Alternate applies to Unit 3B renovation. Note that renovation of this particular entire unit will be considered optional, contingent on the Owner's final determination. Refer to the Owner's proposal documents and the Drawings for additional information pertaining to the sequence of construction for the patient units.
2. Base Bid: Existing ceiling to remain unless noted otherwise; protect in place.
3. Alternate: Coordinate installation of ceiling-mounted patient monitor camera in location depicted. Camera equipment is to be provided by Fisk Electric and data cabling is to be provided by the Harris County Psychiatric Center. Coordinate final position and installation in the field with the Owner and Fisk Electric.

P. Alternate No. 3B-05:

1. Alternate applies to Unit 3B renovation. Note that renovation of this particular entire unit will be considered optional, contingent on the Owner's final determination. Refer to the Owner's proposal documents and the Drawings for additional information pertaining to the sequence of construction for the patient units.
2. Base Bid: Existing cross-corridor doors and frame to remain; protect in place.
3. Alternate: Remove existing cross-corridor doors where indicated, protect existing door frame in place. Salvage all existing door hardware and glazing lite kits for re-installation. Return existing doors to Owner for building attic stock. Re-paint existing door frame with scheduled finish and install new cross-corridor doors to match original configuration. Re-install existing door hardware and glazing lites in original configurations within new doors.

Q. Alternate No. 3C-01:

1. Alternate applies to Unit 3C renovation. Note that renovation of this particular entire unit will be considered optional, contingent on the Owner's final determination. Refer to the Owner's proposal documents and the Drawings for additional information pertaining to the sequence of construction for the patient units.
2. Base Bid: Existing partition to remain; protect in place.
3. Alternate: Demolish portion of existing partition where shown to accommodate new window. Install new 3'-0" wide x 6'-0" high window in 2" hollow metal frame, painted to match existing frames in the immediate vicinity. Glazing to be type G-3. Mount window at height of 1'-0" above finished floor to the bottom of window frame.

R. Alternate No. 3C-02:

1. Alternate applies to Unit 3C renovation. Note that renovation of this particular entire unit will be considered optional, contingent on the Owner's final determination. Refer to the Owner's proposal documents and the Drawings for additional information pertaining to the sequence of construction for the patient units.

2. Base Bid: Existing partition to remain; protect in place.
 3. Alternate: Install wall-mounted workstation (Precision Medical Cabinetry Model STS-3037-FD-HTA-A with key lock, double extension arm, and with laminate to match Wilsonart #7951K-18 "Asian Sun") where located in plan. Workstation should be installed 1'-7" a.f.f. to the bottom of the cabinet and 3'-7" from the nearest adjacent corner or other obstruction. Provide appropriate blocking within the wall or mount per manufacturer's direction for particular substrate conditions encountered. Coordinate routing of electrical and data to each location. At each workstation, provide a custom fold-out plastic laminate-clad desk to match the wall-mounted workstation plastic laminate and in a configuration to match the existing installation at Unit 2B.
- S. Alternate No. 3C-03:
1. Alternate applies to Unit 3C renovation. Note that renovation of this particular entire unit will be considered optional, contingent on the Owner's final determination. Refer to the Owner's proposal documents and the Drawings for additional information pertaining to the sequence of construction for the patient units.
 2. Base Bid: Existing metal cabinets to remain; protect in place.
 3. Alternate: Paint all existing metal cabinets within the Staff Room, Chart Room, and Medication Room within each unit, or as otherwise noted in plan. Paint finish to be Sherwin Williams "White", with appropriate primer and/or finish coats as designated in the specifications for the substrate material to be painted.
- T. Alternate No. 3C-04:
1. Alternate applies to Unit 3C renovation. Note that renovation of this particular entire unit will be considered optional, contingent on the Owner's final determination. Refer to the Owner's proposal documents and the Drawings for additional information pertaining to the sequence of construction for the patient units.
 2. Base Bid: Existing ceiling to remain unless noted otherwise; protect in place.
 3. Alternate: Coordinate installation of ceiling-mounted patient monitor camera in location depicted. Camera equipment is to be provided by Fisk Electric and data cabling is to be provided by the Harris County Psychiatric Center. Coordinate final position and installation in the field with the Owner and Fisk Electric.
- U. Alternate No. 3C-05:
1. Alternate applies to Unit 3C renovation. Note that renovation of this particular entire unit will be considered optional, contingent on the Owner's final determination. Refer to the Owner's proposal documents and the Drawings for additional information pertaining to the sequence of construction for the patient units.
 2. Base Bid: Existing cross-corridor doors and frame to remain; protect in place.
 3. Alternate: Remove existing cross-corridor doors where indicated, protect existing door frame in place. Salvage all existing door hardware and glazing lite kits for re-installation. Return existing doors to Owner for building attic stock. Re-paint existing door frame with scheduled finish and install new cross-corridor doors to match original configuration. Re-install existing door hardware and glazing lites in original configurations within new doors.
- V. Alternate No. 3D-01:
1. Alternate applies to Unit 3D renovation.
 2. Base Bid: Existing partition to remain; protect in place.
 3. Alternate: Demolish portion of existing partition where shown to accommodate new window. Install new 3'-0" wide x 6'-0" high window in 2" hollow metal frame, painted to match existing frames in the immediate vicinity. Glazing to be type G-3. Mount window at height of 1'-0" above finished floor to the bottom of window frame.
- W. Alternate No. 3D-02:
1. Alternate applies to Unit 3D renovation.
 2. Base Bid: Existing partition to remain; protect in place.

3. Alternate: Install wall-mounted workstation (Precision Medical Cabinetry Model STS-3037-FD-HTA-A with key lock, double extension arm, and with laminate to match Wilsonart #7951K-18 "Asian Sun") where located in plan. Workstation should be installed 1'-7" a.f.f. to the bottom of the cabinet and 3'-7" from the nearest adjacent corner or other obstruction. Provide appropriate blocking within the wall or mount per manufacturer's direction for particular substrate conditions encountered. Coordinate routing of electrical and data to each location. At each workstation, provide a custom fold-out plastic laminate-clad desk to match the wall-mounted workstation plastic laminate and in a configuration to match the existing installation at Unit 2B.
- X. Alternate No. 3D-03:
1. Alternate applies to Unit 3D renovation.
 2. Base Bid: Existing metal cabinets to remain; protect in place.
 3. Alternate: Paint all existing metal cabinets within the Staff Room, Chart Room, and Medication Room within each unit, or as otherwise noted in plan. Paint finish to be Sherwin Williams "White", with appropriate primer and/or finish coats as designated in the specifications for the substrate material to be painted.
- Y. Alternate No. 3D-04:
1. Alternate applies to Unit 3D renovation.
 2. Base Bid: Existing ceiling to remain unless noted otherwise; protect in place.
 3. Alternate: Coordinate installation of ceiling-mounted patient monitor camera in location depicted. Camera equipment is to be provided by Fisk Electric and data cabling is to be provided by the Harris County Psychiatric Center. Coordinate final position and installation in the field with the Owner and Fisk Electric.
- Z. Alternate No. 3D-05:
1. Alternate applies to Unit 3D renovation.
 2. Base Bid: Existing cross-corridor doors and frame to remain; protect in place.
 3. Alternate: Remove existing cross-corridor doors where indicated, protect existing door frame in place. Salvage all existing door hardware and glazing lite kits for re-installation. Return existing doors to Owner for building attic stock. Re-paint existing door frame with scheduled finish and install new cross-corridor doors to match original configuration. Re-install existing door hardware and glazing lites in original configurations within new doors.
- AA. Alternate No. 3E-01:
1. Alternate applies to Unit 3E renovation.
 2. Base Bid: Existing partition to remain; protect in place.
 3. Alternate: Demolish portion of existing partition where shown to accommodate new window. Install new 3'-0" wide x 6'-0" high window in 2" hollow metal frame, painted to match existing frames in the immediate vicinity. Glazing to be type G-3. Mount window at height of 1'-0" above finished floor to the bottom of window frame.
- BB. Alternate No. 3E-02:
1. Alternate applies to Unit 3E renovation.
 2. Base Bid: Existing partition to remain; protect in place.
 3. Alternate: Install wall-mounted workstation (Precision Medical Cabinetry Model STS-3037-FD-HTA-A with key lock, double extension arm, and with laminate to match Wilsonart #7951K-18 "Asian Sun") where located in plan. Workstation should be installed 1'-7" a.f.f. to the bottom of the cabinet and 3'-7" from the nearest adjacent corner or other obstruction. Provide appropriate blocking within the wall or mount per manufacturer's direction for particular substrate conditions encountered. Coordinate routing of electrical and data to each location. At each workstation, provide a custom fold-out plastic laminate-clad desk to match the wall-mounted workstation plastic laminate and in a configuration to match the existing installation at Unit 2B.
- CC. Alternate No. 3E-03:

1. Alternate applies to Unit 3E renovation.
2. Base Bid: Existing metal cabinets to remain; protect in place.
3. Alternate: Paint all existing metal cabinets within the Staff Room, Chart Room, and Medication Room within each unit, or as otherwise noted in plan. Paint finish to be Sherwin Williams "White", with appropriate primer and/or finish coats as designated in the specifications for the substrate material to be painted.

DD. Alternate No. 3E-04:

1. Alternate applies to Unit 3E renovation.
2. Base Bid: Existing ceiling to remain unless noted otherwise; protect in place.
3. Alternate: Coordinate installation of ceiling-mounted patient monitor camera in location depicted. Camera equipment is to be provided by Fisk Electric and data cabling is to be provided by the Harris County Psychiatric Center. Coordinate final position and installation in the field with the Owner and Fisk Electric.

EE. Alternate No. 3E-05:

1. Alternate applies to Unit 3E renovation.
2. Base Bid: Existing cross-corridor doors and frame to remain; protect in place.
3. Alternate: Remove existing cross-corridor doors where indicated, protect existing door frame in place. Salvage all existing door hardware and glazing lite kits for re-installation. Return existing doors to Owner for building attic stock. Re-paint existing door frame with scheduled finish and install new cross-corridor doors to match original configuration. Re-install existing door hardware and glazing lites in original configurations within new doors.

END OF SECTION 01 23 00

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements for substitutions.
- B. Refer to the Owner's Proposal Documents for additional information. If conflicts are present between the information presented within this specification section and the Owner's Proposal Documents, the Owner's Proposal Documents will supersede.

1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.
 - 3. Definitions and requirements as further defined in the Owner's Proposal Documents.
- B. Products: Items purchased for incorporation in the work, regardless if specifically purchased for the project or taken from the Contractor's previously purchased stock. The term *product* is inclusive for *material, equipment, assembly, system* and other terms of similar intent.

1.3 SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use facsimile of form provided in Project Manual.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the work and to construction performed by Owner and separate contractors, which are necessary to accommodate proposed substitution.
 - c. 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.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

- i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed 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.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

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

1.5 PROCEDURES

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

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

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

- B. Substitutions for Convenience: Architect will consider requests for substitution if received prior to the Award of the Contract. Requests received after that time may be considered or rejected at discretion of Architect.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Substitution request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's construction schedule.
 - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - g. Requested substitution is compatible with other portions of the work.
 - h. Requested substitution has been coordinated with other portions of the work.
 - i. Requested substitution provides specified warranty.
 - j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION

Not Used

End of Section

REQUEST FOR SUBSTITUTION

Contract Award Date: _____

To: _____

Substitution Requested By: _____

Project Name and Number: _____

We submit for consideration the following product in lieu of the specified item for the above project:

Drawing No.	Specification Section	Paragraph	Specified Item
_____	_____	_____	_____

Proposed Substitution: _____

Request is made during ____ bidding ____ construction period.

Submit in accordance with Section 01 33 00.

1. Technical data, cost, and time information relating to changes to Construction Documents required by proposed substitution.
2. Detailed comparison of proposed substitution and specified product including but not limited to warranty, significant variations, qualifications of manufacturers, and maintenance.
3. Complete technical data, detailed shop drawings, samples, installation procedures, warranty, and substantiating data marked to indicate equivalent quality and performance to that specified. Manufacturer sell sheets are not acceptable submittals.

Cause for Request: _____

Cost saving realized by Owner _____

Does substitution affect adjacent work, Construction Documents, cost, schedule, quality, and related submittals?

Yes ____ No ____ On separate sheet, explain affects to the work, documents, schedule, and submittals.

The Contractor is responsible for associated costs and additional time of the proposed substitution including costs incurred by the Architect for evaluation of substitution and changes to the documents. Describe costs for changes to design, including engineering and detailing costs caused by the requested substitution.

Warranty: Is the warranty for the requested substitution the same or different? Yes ____ No ____

Explain Differences: _____

Contractor Certification:

In making a request for substitution, the Contractor certifies that:

1. The proposed substitution has been thoroughly researched and evaluated and determined as equivalent or superior to specified product or material, will fit into space provided, and is compatible with adjacent materials.

- 2. It will provide the same or better warranty for the proposed substitution at no additional cost to the Owner.
- 3. Cost data is complete and includes related costs under the Contract. Claims for additional costs related to the proposed substitution that may subsequently become apparent are waived.
- 4. It will assume the responsibility for delays and costs caused by the proposed substitution, if approved, are accepted by the Contractor unless delays are and costs are specifically mentioned and approved in writing by the Owner and the Architect.
- 5. It will assume the liability for the performance of the substitution and its performance.
- 6. The installation of the proposed substitution is coordinated with the work and with changes required for the work.
- 7. It will reimburse the Owner and Architect for evaluation and redesign services associated with the substitution request and, when required, by approval by governing authorities.

Submitted by:

Signature of Contractor	Title
-------------------------	-------

Firm	Telephone	Date
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Signature shall be by the individual authorized to legally bind the Contractor's to the above terms. Failure to provide legally binding signature will result in retraction of approval.

FOR USE BY ARCHITECT:

Accepted Accepted as Noted
 Not Accepted Received Too Late

FOR USE BY OWNER:

Accepted Not Accepted

By: _____

By: _____

Date: _____

By: _____

Remarks: _____

Remarks: _____

End of Document

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Work:
 - 1. Section 012500 - Substitution Procedures.
- C. Refer to the Owner's Proposal Documents for additional information. If conflicts are present between the information presented within this specification section and the Owner's Proposal Documents, the Owner's Proposal Documents will supersede.

1.2 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710 *Architect's Supplemental Instructions*.

1.3 PROPOSAL REQUESTS

- A. Owner Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request after receipt of Proposal Request, submit quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
 - 1. Include statement outlining reasons for the change and the effect of the change on the work. Provide complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.

5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use AIA Document G709, or in format otherwise prescribed by Owner's Proposal Documents.

1.4 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: When an allowance is specified, refer to Section 012100 for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.
 1. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work in place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 - a. Include installation costs in purchase amount only where indicated as part of the allowance.
 - b. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 - c. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit cost allowances.
 - d. Owner reserves the right to establish the quantity of work in place by independent quantity survey, measure, or count.
 2. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 20 days of receipt of the Change Order authorizing work to proceed. Owner will reject claims submitted later than 20 days after authorization.
- B. Unit Price Adjustment: When a unit price is required, refer to Section 012200 for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit price work.

1.5 CHANGE ORDER PROCEDURES

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

1.6 CONSTRUCTION CHANGE DIRECTIVE

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

PART 2 - PRODUCTS

Not Used,

PBK Architects
Project No. 16103

HCPC Units 1C, 2E, 3B, 3C, 3D, 3E Renovations
UT Health Science Center - Houston
Harris County Psychiatric Center

PART 3 - EXECUTION
Not Used

End of Section

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Refer to the Owner's Proposal Documents for additional information. If conflicts are present between the information presented within this specification section and the Owner's Proposal Documents, the Owner's Proposal Documents will supersede.

1.2 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.3 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect at earliest possible date, but no later than **seven** days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange schedule of values consistent with format of AIA Document G703, or as otherwise prescribed by Owner's Proposal Documents.
 - 3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 - 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide separate line item in the schedule of values for each part of the work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on site and items stored off site. Include evidence of insurance.
6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line item value of unit cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work in place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
8. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Submit Application for Payment to Architect at the time stated in the Agreement. The period covered by each Application for Payment is one month.
- D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 for Applications for Payment, unless otherwise prescribed by Owner's Proposal Documents.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on site and items stored off site.
 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.

3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

- G. Transmittal: Submit four signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 1. List of subcontractors.
 2. Schedule of values.
 3. Sustainable design submittal for project materials cost data.
 4. Contractor's construction schedule (preliminary if not final).
 5. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
 6. Products list (preliminary if not final).
 7. Sustainable design action plans.
 8. Schedule of unit prices.
 9. Submittal schedule (preliminary if not final).
 10. List of Contractor's staff assignments.
 11. List of Contractor's principal consultants.
 12. Copies of building permits.
 13. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 14. Initial progress report.
 15. Report of preconstruction conference.
 16. Certificates of insurance and insurance policies.
 17. Performance and payment bonds.
 18. Data necessary to acquire Owner's insurance.

- J. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the work claimed as substantially complete.
 1. Include documentation supporting claim that the work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the work.

- K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706 Contractor's Affidavit of Payment of Debts and Claims, or form as otherwise prescribed by Owner's Proposal Documents.
 5. AIA Document G706A Contractor's Affidavit of Release of Liens, or form as otherwise prescribed by Owner's Proposal Documents.
 6. AIA Document G707 Consent of Surety to Final Payment, or form as otherwise prescribed by Owner's Proposal Documents.
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

End of Section

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Refer to the Owner's Proposal Documents for additional information. If conflicts are present between the information presented within this specification section and the Owner's Proposal Documents, the Owner's Proposal Documents will supersede.

1.2 SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and the duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.3 COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations to ensure efficient and orderly installation of each part of the work. Coordinate construction operations that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, which depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain best results where installation of one part of the work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of the work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the work. Administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.
- E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the work. Refer to the Specifications Sections for disposition of salvaged materials that are designated as Owner's property.

1.4 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade specific information to the coordination drawings by multiple contractors in sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide

alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

- B. Coordination Drawing Organization: Organize coordination drawings:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the work.
 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire-alarm, and electrical equipment.
 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 6. Mechanical and Plumbing work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
 7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 8. Fire Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 9. Review: Architect will review coordination drawings to confirm that the work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
 10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300.
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
 2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format.
 3. BIM File Incorporation: Develop and incorporate coordination drawing files into Building Information Model established for Project.
 - a. Perform three dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.
 4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.

- a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
- b. Digital Data Software Program: Drawings are available in Revit..
- c. Contractor shall execute a data licensing agreement in the form of AIA Document C106.

1.5 PROJECT MEETINGS

- A. Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect.
 1. Conduct the conference to review responsibilities and personnel assignments.
 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that affect progress.
 4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at site before each construction activity that requires coordination with other construction.
 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout.
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at weekly intervals.
 1. Coordinate dates of meetings with preparation of payment requests.

2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Coordination Meetings: Conduct coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present.
 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

End of Section

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes Administrative and procedural requirements for documenting the progress of construction during performance of the work, including the following:
 - 1. Startup construction schedule.
 - 2. Contractor's construction schedule.
 - 3. Construction schedule updating reports.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Site condition reports.
 - 7. Special reports.

- B. Refer to the Owner's Proposal Documents for additional information. If conflicts are present between the information presented within this specification section and the Owner's Proposal Documents, the Owner's Proposal Documents will supersede.

1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.

- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.

- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

- E. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

- F. Resource Loading: The allocation of manpower and equipment necessary for completion of an activity as scheduled.

1.3 SUBMITTALS

- A. Submittal Format: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic file.
- B. Startup Diagram: Of size necessary to display entire network for entire construction period. Show logic ties for activities.
- C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - 3. Total Float Report: List of all activities sorted in ascending order of total float.
 - 4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.
- E. Construction Schedule Updating Reports: Submit with Applications for Payment.
- F. Daily Construction Reports: Submit at monthly intervals.
- G. Material Location Reports: Submit at monthly intervals.
- H. Site Condition Reports: Submit at time of discovery of differing conditions.
- I. Special Reports: Submit at time of unusual event.

1.4 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at site. Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
 - 4. Review delivery dates for Owner furnished products.
 - 5. Review schedule for work of Owner's separate contracts, if any.
 - 6. Review submittal requirements and procedures.
 - 7. Review time required for review of submittals and resubmittals.
 - 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 9. Review time required for Project closeout and Owner startup procedures.
 - 10. Review and finalize list of construction activities to be included in schedule.
 - 11. Review procedures for updating schedule.

1.5 COORDINATION

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

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Time is of the essence to the Owner. Commence work immediately upon issuance of the Notice to Proceed. There is a critical need for the work to be substantially complete within the time frame identified in the Agreement.
- B. Time Frame: Extend schedule from date established for commencement of the work to date of Substantial Completion and date of final completion.
 - 1. Contract completion date shall not be changed by submission of schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each separate area or story as a separate numbered activity for each main element of the work. Comply with the following:
 - 1. Activity Duration: Define activities in terms of number of days anticipated.
 - 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 - 4. Startup and Testing Time: Include number of days anticipated for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 - 6. Punch List and Final Completion: Include a maximum of 30 days for completion of punch list items and final completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and show how the sequence of the work is affected.
 - 1. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 - 2. Work Stages: Indicate important stages of construction for each major portion of the work, including, but not limited to, the following:
 - a. Submittals.
 - b. Mockups.
 - c. Fabrication.
 - d. Installation.

- e. Tests and inspections.
 - f. Adjusting.
 - g. Curing.
- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the work performed as of planned and actual dates used for preparation of payment requests.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
- 1. Unresolved issues.
 - 2. Unanswered Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
 - 5. Pending modifications affecting the Work and Contract Time.
- G. Recovery Schedule: When periodic update indicates the work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
- I. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time impact analysis to demonstrate the effect of the proposed change on the overall project schedule.
- J. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
- 1. Identification of activities that have changed.
 - 2. Changes in early and late start dates.
 - 3. Changes in early and late finish dates.
 - 4. Changes in activity durations in workdays.
 - 5. Changes in the critical path.
 - 6. Changes in total float or slack time.
 - 7. Changes in the Contract Time.

2.2 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording information concerning events at the site:
- 1. List of subcontractors at Project site.
 - 2. List of separate contractors at Project site.
 - 3. Approximate count of personnel at Project site.
 - 4. Equipment at Project site.
 - 5. Material deliveries.
 - 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 - 7. Accidents.
 - 8. Meetings and significant decisions.
 - 9. Unusual events (see special reports).
 - 10. Stoppages, delays, shortages, and losses.
 - 11. Meter readings and similar recordings.
 - 12. Emergency procedures.
 - 13. Orders and requests of authorities having jurisdiction.

14. Change Orders received and implemented.
 15. Construction Change Directives received and implemented.
 16. Services connected and disconnected.
 17. Equipment or system tests and startups.
 18. Partial completions and occupancies.
 19. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information (RFI). Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- D. Special Reports: Submit special reports directly to Owner within 24 hours of an occurrence. Distribute copies of report to parties affected by the occurrence.
1. Reporting Unusual Events: When an event of an unusual and significant nature occurs at site, whether or not related directly to the work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and interested parties identified by Contractor with a need to know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

End of Section

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Refer to the Owner's Proposal Documents for additional information. If conflicts are present between the information presented within this specification section and the Owner's Proposal Documents, the Owner's Proposal Documents will supersede.

1.2 DEFINITIONS

- A. Submittals: Written and graphic information and physical samples that require Architect's responsive action or are for information and do not require the architect's action.
- B. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- C. Portable Document Format (PDF): An open standard file format used for representing documents in a device independent and display resolution independent fixed layout document format.

1.3 SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Initial Submittal: Submit concurrently with construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
 - 1. Upon request, Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in Revit.
 - c. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.

- d. The following digital data files will be furnished for each appropriate discipline:
 - 1) Floor plans.
 - 2) Reflected ceiling plans.

- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit submittal items required for each Specification Section concurrently unless partial submittals for portions of the work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- C. Processing Time: Allow time for submittal review, including time for resubmittals. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the work to permit processing, including resubmittals.
 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file:
 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
 4. Transmittal Form for Electronic Submittals: Use software generated form from electronic project management software acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.
 - i. Submittal purpose and description.
 - j. Specification Section number and title.

- k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number, numbered consecutively.
 - q. Submittal and transmittal distribution record.
 - r. Other necessary identification.
 - s. Remarks.
5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
- a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- E. Options: Identify options requiring selection by Architect.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
- 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
- 1. Submit electronic submittals via email as PDF electronic files.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 2. Submittals: Submit three paper copies of each submittal if required by the nature of the submittal, unless otherwise indicated. Architect will return two copies.
 - 3. Certificates and Certifications Submittals: Provide statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in PDF electronic file.
- C. Shop Drawings: Prepare Project specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full size drawings, submit Shop Drawings on sheets size indicated in specification section.
 3. Submit Shop Drawings in PDF electronic file.
 4. BIM File Incorporation: Develop and incorporate Shop Drawing files into Building Information Model established for Project.
 - a. Prepare Shop Drawings in same digital data software program, version, and operating system as the original Drawings.
 - b. Refer to Section 013100 for requirements for coordination drawings.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 5. Samples: Submit full size units or Samples of size indicated, prepared from same material to be used for the work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
 5. Submit product schedule in PDF electronic file.
- F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100.
- G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200.
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900.
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000.
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700.
- K. Maintenance Data: Comply with requirements specified in Section 017820.
- L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

- M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
- C. BIM File Incorporation: Incorporate delegated design drawing and data files into Building Information Model established for Project.
 - 1. Prepare delegated design drawings in the same digital data software program, version, and operating system as the original Drawings.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Partial submittals prepared for a portion of the work will be reviewed when use of partial submittals has received prior approval from Architect.
- C. Incomplete submittals are not permitted, will be considered nonresponsive, and will be returned for resubmittal without review.
- D. Submittals not required by the Contract Documents will be returned by the Architect without action.

End of Section

SECTION 01 35 10 - ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Special procedures for alteration work.
- B. Refer to the Owner's Proposal Documents for additional information. If conflicts are present between the information presented within this specification section and the Owner's Proposal Documents, the Owner's Proposal Documents will supersede.

1.2 DEFINITIONS

- A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.
- B. Consolidate: To strengthen loose or deteriorated materials in place.
- C. Design Reference Sample: A sample that represents the Architect's prebid selection of work to be matched; it may be existing work or work specially produced for the Project.
- D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.
- F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- G. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- H. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- I. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
- J. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.
- K. Retain: To keep existing items that are not to be removed or dismantled.
- L. Strip: To remove existing finish down to base material unless otherwise indicated.

1.3 COORDINATION

- A. Alteration Work Subschedule: A construction schedule coordinating the sequencing and scheduling of alteration work for entire Project, including each activity to be performed, and

based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for alteration work.

1. Schedule construction operations in sequence required to obtain best Work results.
 2. Coordinate sequence of alteration work activities to accommodate the following:
 - a. Owner's continuing occupancy of portions of existing building.
 - b. Owner's partial occupancy of completed work.
 - c. Other known work in progress.
 - d. Tests and inspections.
 3. Detail sequence of alteration work, with start and end dates.
 4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
 5. Use of elevator and stairs.
 6. Equipment Data: List gross loaded weight, axle-load distribution, and wheel base dimension data for mobile and heavy equipment proposed for use in existing structure. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.
- B. Pedestrian and Vehicular Circulation: Coordinate alteration work with circulation patterns within Project building(s) and site. Some work is near circulation patterns and adjacent to restricted areas. Circulation patterns cannot be closed off entirely and in places can be only temporarily redirected around small areas of work. Access to restricted areas may not be obstructed. Plan and execute the work accordingly.

1.4 PROJECT MEETINGS FOR ALTERATION WORK

- A. Preliminary Conference for Alteration Work: Before commencing alteration work, conduct conference at site.
- B. Coordination Meetings: Conduct coordination meetings specifically for alteration work at regular intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
 1. Review items of significance that affect progress of alteration work.
 - a. Interface requirements of alteration work with other Project work.
 - b. Status of submittals for alteration work.
 - c. Access to alteration work locations.
 - d. Effectiveness of fire prevention plan.
 - e. Quality and work standards of alteration work.
 - f. Change Orders for alteration work.
 2. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.5 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.
 1. Carefully dismantle and salvage each item or object in a manner to prevent damage and protect it from damage, then promptly deliver it to Owner where directed.
- B. Alteration Work Subschedule: Submit alteration work subschedule within seven days of date established for commencement of alteration work.

- C. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements that are to remain, including finish surfaces, that might be misconstrued as damage caused by Contractor's alteration work operations.
- D. Alteration Work Program: Submit 30 days before work begins.
- E. Fire Prevention Plan: Submit 30 days before work begins.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Building Code: Comply with the IBC and the IEBC for alteration work.
 - 2. Fire Prevention Plan: Prepare a written plan for preventing fires during the work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire control devices during each phase or process. Coordinate plan with Owner's fire protection equipment and requirements. Include fire watch personnel's training, duties, and authority to enforce fire safety.
 - 3. Safety and Health Standard: Comply with ANSI/ASSE A10.6.
 - 4. Title X Requirement: Each firm conducting activities that disturb painted surfaces shall be a *Lead-Safe Certified Firm* according to 40 CFR 745, Subpart E, and use only workers that are trained in lead safe work practices.
 - 5. Accessibility Requirements: Comply with applicable requirements.
 - a. U.S. Architectural and Transportation Barriers Compliance Board Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG).
 - b. ICC/ANSI A117.1 Accessible and Useable Building and Facilities.
 - c. Texas Accessibility Standards (TAS).
- B. Specialist Qualifications: An experienced firm having minimum 10 years documented experience that is regularly engaged in specialty work similar in nature, materials, design, and extent to alteration work specified.
 - 1. Field Supervisor Qualifications: Full time supervisors experienced in specialty work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on site when specialty work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.
 - a. Construct new mockups of required work whenever a supervisor is replaced.
- C. Alteration Work Program: Prepare a written plan for alteration work for whole Project, including each phase or process and protection of surrounding materials during operations. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole Project alteration work program with specific requirements of programs required in other alteration work Sections.
 - 1. Dust and Noise Control: Include locations of proposed temporary dust and noise control partitions and means of egress from occupied areas coordinated with continuing on site operations and other known work in progress.
 - 2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.

1.7 STORAGE AND HANDLING OF SALVAGED MATERIALS

- A. Salvaged Materials:
 - 1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
 - 2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.

3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- B. Salvaged Materials for Reinstallation:
1. Repair and clean items for reuse as indicated.
 2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.
- C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.
- D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.
1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
 2. Secure stored materials to protect from theft.
 3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 degrees F (3 degrees C) or more above the dew point.
- E. Storage Space:
1. Owner will arrange for limited on site location(s) for free storage of salvaged material. Storage space may include security and climate control for stored material.
 2. Arrange for off site locations for storage, protection, and insurance coverage of salvaged material that cannot be stored and protected on site.

1.8 FIELD CONDITIONS

- A. Survey of Existing Conditions: Record existing conditions that affect the work by use of measured drawings and preconstruction photographs.
1. Comply with requirements specified in Section 013230.
- B. Discrepancies: Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.
- C. Owner's Removals: Before beginning alteration work, verify in correspondence with Owner that the following items have been removed:
- D. Size Limitations in Existing Spaces: Materials, products, and equipment used for performing the work and for transporting debris, materials, and products shall be of sizes that clear surfaces within existing spaces, areas, rooms, and openings, including temporary protection, by 12 inches (300 mm) or more.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.
 - 1. Use proven protection methods, appropriate to each area and surface being protected.
 - 2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
 - 3. Erect temporary barriers to form and maintain fire egress routes.
 - 4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
 - 5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
 - 6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
 - 7. Protect floors and other surfaces along hauling routes from damage, wear, and staining..
 - 8. Provide supplemental sound control treatment to isolate demolition work from other areas of the building.

- B. Temporary Protection of Materials to Remain:
 - 1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
 - 2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.

- C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

- D. Utility and Communications Services:
 - 1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
 - 2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
 - 3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.

- E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.
 - 1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
 - 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

3.2 PROTECTION FROM FIRE

- A. Follow fire prevention plan and the following:
 - 1. Comply with NFPA 241 requirements unless otherwise indicated.
 - 2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.

- a. If combustible material cannot be removed, provide fire blankets to cover materials.
- B. Heat Generating Equipment and Combustible Materials: Comply with procedures while performing work with heat generating equipment or combustible materials, including welding, torch cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:
1. Obtain Owner's approval for operations involving use of welding or other high heat equipment. Use of open flame equipment is not permitted. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
 2. As far as practicable, restrict heat generating equipment to shop areas or outside the building.
 3. Do not perform work with heat generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
 4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
 5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
 6. Fire Watch: Before working with heat generating equipment or combustible materials, station personnel to serve as a fire watch at each location where work is performed. Firewatch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:
 - a. Train each fire watch in the proper operation of fire control equipment and alarms.
 - b. Prohibit firewatch personnel from other work that would be a distraction from firewatch duties.
 - c. Cease work with heat generating equipment whenever fire watch personnel are not present.
 - d. Have fire watch personnel perform final fire safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
 - e. Maintain fire watch personnel at each area of site until 60 minutes after conclusion of daily work.
- C. Fire Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.
- D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.
1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

3.3 PROTECTION DURING APPLICATION OF CHEMICALS

- A. Protect motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.
- B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and

UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.

- C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.
- D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.
- E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.4 ALTERATION WORK

- A. Have specialty work performed only by qualified specialists.
- B. Ensure that supervisory personnel are present when work begins and during its progress.
- C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs or video recordings. Comply with requirements in Section 013230.
- D. Perform surveys of site as the Work progresses to detect hazards resulting from alterations.
- E. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
 - 1. Do not proceed with the work in question until directed by Architect.

End of Section

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality assurance and quality control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and quality control procedures that facilitate compliance with Contract Document requirements.
 - 3. Requirements for Contractor to provide quality assurance and quality control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions.
 - 4. Specific test and inspection requirements are not specified in this Section.
- C. Refer to the Owner's Proposal Documents for additional information. If conflicts are present between the information presented within this specification section and the Owner's Proposal Documents, the Owner's Proposal Documents will supersede.

1.2 DEFINITIONS

- A. Quality Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Laboratory Mockups: Full size physical assemblies constructed at testing facility to verify performance characteristics.
 - 2. Integrated Exterior Mockups: Mockups of exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
 - 3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the work, to verify performance or compliance with specified criteria.

- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality Control Testing: Tests and inspections performed on site for installation of the work and for completed work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, *experienced* means having successfully completed a minimum of five years documented experience with projects similar in nature, size, and extent; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 SUBMITTALS

- A. Shop Drawings: Submit plans, sections, and elevations, indicating materials and size of mockup construction.
 - 1. Indicate manufacturer and model number of individual components.
 - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.
- B. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic force resisting system, designated seismic system, or component listed in the designated seismic system quality assurance plan prepared by Architect.
 - 2. Main wind force resisting system or wind resisting component listed in the wind force resisting system quality assurance plan prepared by Architect.
- C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

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

1.5 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified. Include the following:
1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at 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 as to whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement as to whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.

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

1.6 QUALITY ASSURANCE

- A. Qualifications establish the minimum qualification levels required; refer to individual Specification Sections for additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated and sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated and with record of successful in service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Texas, experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products.
- I. Factory Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens with sufficient time for testing and analyzing results to prevent delaying the work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.

- d. Build site assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed work.
 - f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
2. Testing Agency Responsibilities: Submit certified written report of each test, inspection, and similar quality assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- K. Mockups: Before installing portions of the work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 2. Notify Architect a minimum of seven days in advance of dates and times when mockups will be constructed.
 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction.
 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 5. Obtain Architect's approval of mockups before starting work, fabrication, or construction. Allow seven days for initial review and each re-review of each mockup.
 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.
 7. Demolish and remove mockups when directed unless otherwise indicated.
- L. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.

1.7 QUALITY CONTROL

- A. Owner Responsibilities: Where quality control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform the services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality control activities required to verify that the work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality control services specified and those required by authorities having jurisdiction. Perform quality control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform the quality control services. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when work that requires testing or inspecting will be performed.
 4. Where quality control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality control service.
 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. **Manufacturer's Field Services:** Where indicated, engage a factory authorized service representative to inspect field assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300.
- D. **Manufacturer's Technical Services:** Where indicated, engage a manufacturer's technical representative to observe and inspect the work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. **Testing Agency Responsibilities:** Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- G. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 1. Access to the work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. **Schedule of Tests and Inspections:** Prepare a schedule of tests, inspections, and similar quality control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the work progresses.
 1. **Distribution:** Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the work where tests and inspections are required.

1.8 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner:
- B. Special Tests and Inspections: Conducted by a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections.
 - 1. Verifying that manufacturer maintains detailed fabrication and quality control procedures and reviews the completeness and adequacy of those procedures to perform the work.
 - 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the work during performance of its services.
 - 3. Submitting a certified written report of each test, inspection, and similar quality control service to Architect with copy to Contractor and to authorities having jurisdiction.
 - 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 - 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 - 6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

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

3.2 REPAIR AND PROTECTION

- A. On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300.
- B. Protect construction exposed by or for quality control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality control services.

End of Section

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

- A. Section Includes: Requirements for temporary utilities, support facilities, and security and protection facilities, including but not limited to:
 - 1. Water service and distribution.
 - 2. Sanitary facilities, including toilets, wash facilities, and drinking water facilities.
 - 3. Heating and cooling facilities.
 - 4. Ventilation.
 - 5. Electric power service.
 - 6. Lighting.
 - 7. Telephone service.
 - 8. Waste disposal facilities.
 - 9. Field office.
 - 10. Storage and fabrication sheds.
 - 11. Lifts and hoists.
 - 12. Construction aids and miscellaneous services and facilities.
 - 13. Environmental protection.
 - 14. Pest control.
 - 15. Enclosure fence.
 - 16. Security enclosure and lockup.
 - 17. Barricades, warning signs, and lights.
 - 18. Temporary partitions.
 - 19. Fire protection.
 - 20. Accessories necessary for a complete installation.

- B. Refer to the Owner's Proposal Documents for additional information. If conflicts are present between the information presented within this specification section and the Owner's Proposal Documents, the Owner's Proposal Documents will supersede.

1.2 USE CHARGES

- A. Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

- B. Water and Sewer Service: Pay sewer service use charges for water used and sewer usage by all entities for construction operations.

- C. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.

1.3 SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

- B. Moisture Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
 - 1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.

2. Indicate procedures for discarding water damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged work.
 3. Indicate sequencing of work that requires water, such as sprayed fire resistive materials, plastering, and tile grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- C. Dust and HVAC Control Plan: Submit coordination drawing and narrative that indicates the dust and HVAC control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
1. HVAC system isolation schematic drawing.
 2. Location of proposed air-filtration system discharge.
 3. Waste handling procedures.
 4. Other dust control measures.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
1. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board ADA-ABA Accessibility Guidelines (ADAAG), ICC/ANSI A117.1, and Texas Accessibility Standards (TAS) 2012.
- B. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- C. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.
- B. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10 mils (0.25 mm) minimum thickness, with flame spread rating of 15 or less per ASTM E 84.
- C. Dust Control Adhesive Surface Walk off Mats: Provide mats minimum 36 inches by 60 inches (914 mm by 1624 mm).
- D. Insulation: Unfaced mineral fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame spread and smoke developed indexes of 25 and 50, respectively.
- E. Lumber and Plywood: Comply with requirements in Section 061050.

- F. Gypsum Board: Minimum 1/2 inch (12.7 mm) thick by 48 inches (1219 mm) wide by maximum available lengths; Type X or Type C panels with tapered edges. Comply with Section 092900.
- G. Paint: Comply with requirements in Section 099000.
- H. Tarpaulins: Fire resistive labeled with flame-spread rating of 15 or less.
- I. Water: Potable.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. Air Filtration Units: HEPA primary and secondary filter equipped portable units with four stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.
- C. Drinking Water: Containerized, tap dispenser, bottled water drinking water units, including paper cup supply. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 degrees F to 55 degrees F (7.2 degrees C to 12.7 degrees C).
- D. Electrical Outlets: Properly configured, NEMA polarized outlets to prevent insertion of 110V to 120V plugs into higher voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.
- E. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.
- F. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self contained, liquid propane gas or fuel oil heaters with individual space thermostatic control.
 - 1. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 - 2. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of **8** at each return air grille in system and remove at end of construction. Clean HVAC system as required in Section 017700 and install new filter with MERV 11 or greater.
- G. Air Filtration Units: Primary and secondary HEPA filter equipped portable units with four stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Locate facilities where they will serve project adequately and result in minimum interference with performance of the work. Relocate and modify facilities as required by progress of the work.
 - 1. Locate facilities to limit site disturbance as specified in Section 011000.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. Install temporary service. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
 - 2. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.
- E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area using HEPA equipped air filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 - 2. Maintain dust partitions during the work. Use vacuum collection attachments on dust producing equipment. Isolate limited work within occupied areas using portable dust containment devices.
 - 3. Perform daily construction cleanup and final cleanup using approved, HEPA filter equipped vacuum equipment.
- G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or

elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- H. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations. Install electric power service underground unless otherwise indicated.
1. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.
 - a. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length voltage ratio.
 - b. Provide warning signs at power outlets other than 110 to 120 V.
 - c. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or traffic areas.
 - d. Provide metal conduit enclosures or boxes for wiring devices.
 - e. Provide 4 gang outlets, spaced so 100 foot (30 m) extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.
- I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 2. Install lighting for Project identification sign.
- J. Telephone Service: Provide temporary telephone service in common use facilities for use by construction personnel. Install one telephone line(s) for each field office.
1. Provide dedicated telephone line for each facsimile machine in each field office.
 2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.
 3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
- K. Electronic Communication Service: Provide a desktop computer and printer/scanner in the primary field office adequate for use by Architect and Owner to access Project electronic documents and maintain electronic communications.
1. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall.
 2. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.
 3. Backup: External hard drive, minimum 1 terabyte, with automated backup software providing daily backups.

3.3 SUPPORT FACILITIES INSTALLATION

- A. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 - 1. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Parking: Provide temporary parking areas for construction personnel.
- D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 - 2. Remove snow and ice as required to minimize accumulations.
- E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 - 3. Maintain and touchup signs so they are legible at all times.
- F. Waste Disposal Facilities: Provide waste collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300.
- G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- H. Temporary Elevator Use: Use of elevators is permitted as directed by Owner.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
 - 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree or plant protection zones.
 - 2. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Pest Control: Engage pest control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- F. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- H. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- J. Temporary Partitions: Provide floor to ceiling dustproof partitions to limit dust and dirt migration and to separate occupied areas occupied from fumes and noise.
1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire retardant treated plywood on construction operations side.
 2. Construct dustproof partitions with two layers of 6 mil (0.14 mm) polyethylene sheet on each side. Cover floor with two layers of 6 mil (0.14 mm) polyethylene sheet, extending sheets 18 inches (460 mm) up the sidewalls. Overlap and tape full length of joints. Cover floor with fire retardant treated plywood.
 - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches (1219 mm) between doors. Maintain water dampened foot mats in vestibule.
 3. Where fire resistance rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 4. Insulate partitions to control noise transmission to occupied areas.
 5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 6. Protect air handling equipment.
 7. Provide walk off mats at each entrance through temporary partition.
- K. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas.
 2. Supervise welding operations, combustion type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

3. Develop and supervise an overall fire prevention and protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Controlled Construction Phase of Construction: Prior to the full operation of permanent HVAC systems, maintain as follows:
 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use permanent HVAC system to control humidity.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum based products that become wet during the course of construction and remain wet for 48 hours are considered defective.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24 hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700.

End of Section

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements for selection of products, including but not limited to:
 - 1. Product delivery, storage, and handling.
 - 2. Manufacturers' written warranties on products.
 - 3. Special warranties.
 - 4. Comparable products.
- B. Refer to the Owner's Proposal Documents for additional information. If conflicts are present between the information presented within this specification section and the Owner's Proposal Documents, the Owner's Proposal Documents will supersede.

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the work, whether purchased for Project or taken from previously purchased stock. The term *product* includes the terms *material*, *equipment*, *system*, *assembly*, and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis of Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words *basis of design product*, including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the specified requirements.
 - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 013300.
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

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

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long term storage at site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 6. Protect stored products from damage and liquids from freezing.
 - 7. Provide a secure location and enclosure at site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 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. Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

- B. Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 - 2. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. 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 items needed for complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 4. Where products are accompanied by the term as selected, Architect will make selection.
 - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
 - 1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - 3. Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - 4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - 5. Basis of Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and characteristics based on the product named. Comply with requirements for consideration of an unnamed product by one of the named manufacturers.
- C. Visual Matching Specification: Where Specifications require *match Architect's sample*, provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - 1. If no product available within specified category matches and complies with specified requirements, comply with requirements of Section 012500 for proposal of product.

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

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION

Not Used

End of Section

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements governing execution of the work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Installation of the work.
 - 3. Coordination of Owner-installed products.
 - 4. Progress cleaning.
 - 5. Starting and adjusting.
 - 6. Protection of installed construction.

- B. Refer to the Owner's Proposal Documents for additional information. If conflicts are present between the information presented within this specification section and the Owner's Proposal Documents, the Owner's Proposal Documents will supersede.

1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.3 SUBMITTALS

- A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.4 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

2.1 MATERIALS

- A. Comply with requirements specified in other Sections.

- B. In Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not warranted. Before beginning site work, investigate and verify existence and location of underground utilities, mechanical and electrical systems, and construction affecting the work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water service piping; underground electrical services, and other utilities.
 - 2. Furnish location data for work related to the work that must be performed by public utilities serving the site.

- B. Examination and Acceptance of Conditions: Before proceeding with each component of the work, examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the work.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.

- D. Proceed with installation after correcting unsatisfactory conditions. Proceeding with the work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

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

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

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

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

3.3 INSTALLATION

- A. Locate the work and components of the work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions ensuring the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous. Materials containing asbestos and BCPs are prohibited.

3.4 OWNER INSTALLED PRODUCTS

- A. Site Access: Provide access to site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the work with work performed by Owner's construction personnel.

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

3.5 PROGRESS CLEANING

- A. Clean 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 (27 degrees C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the work.
 1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

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

3.6 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with mechanical, plumbing, and electrical requirements.
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

End of Section

SECTION 01 73 20 – CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Procedural requirements for cutting and patching.
- B. Refer to the Owner's Proposal Documents for additional information. If conflicts are present between the information presented within this specification section and the Owner's Proposal Documents, the Owner's Proposal Documents will supersede.

1.2 DEFINITIONS

- A. Cutting: Removal of existing construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.3 SUBMITTALS

- A. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
 - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 - 2. Changes to In Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 - 3. Products: List products used for patching and firms or entities that will perform patching work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.4 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
- B. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
- C. Operational Elements: Do not cut and patch operating elements and related components that results in reducing the capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 - 1. Primary operational systems and equipment.
 - 2. Fire separation assemblies.

3. Air or smoke barriers.
 4. Fire suppression systems.
 5. Mechanical systems piping and ducts.
 6. Control systems.
 7. Communication systems.
 8. Fire-detection and -alarm systems.
 9. Conveying systems.
 10. Electrical wiring systems.
 11. Operating systems of special construction.
- D. Miscellaneous Elements: Do not cut and patch the following elements or related components that change the load bearing capacity, resulting in a reduction of capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
1. Water, moisture, or vapor barriers.
 2. Membranes and flashings.
 3. Exterior curtain wall construction.
 4. Equipment supports.
 5. Piping, ductwork, vessels, and equipment.
 6. Noise and vibration control elements and systems.
 7. Sprayed fire resistive material.
- E. Visual Requirements: Do not cut and patch construction resulting in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
1. If possible, retain original Installer or fabricator to cut and patch exposed work. If possible, engage original Installer or fabricator. If original installer is not available, engage recognized, experienced, and specialized firm for the work.
 - a. Processed concrete finishes.
 - b. Ornamental metal.
 - c. Matched veneer woodwork.
 - d. Preformed metal panels.
 - e. Roofing.
 - f. Firestopping.
 - g. Window system.
 - h. Fluid applied flooring.
 - i. Wall covering.
 - j. HVAC enclosures, cabinets, or covers.
- F. Cutting and Patching Conference: Before proceeding, meet at site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with specified requirements.

- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of work to be cut.
- B. Protection: Protect existing 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.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where removal, relocation, or abandonment is necessary, bypass existing services before cutting to avoid interruption of services to occupied areas.

3.3 CUTTING AND PATCHING

- A. Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at earliest feasible time, and complete without delay.
 - 1. Cut existing construction to provide for installation of components or performance of construction, and subsequently patch as necessary to restore surfaces to an original condition.
 - 2. Cut in place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of work to be cut.
- C. Protection: Protect in place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000.
- E. Cutting: Cut existing 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. Use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable earthwork specifications by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- F. 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 possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction to eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions are removed, extend one finished area into another, patch and repair surfaces in new space. Provide even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.
 4. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 5. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
 6. Exterior Building Enclosure: Patch components and restore enclosure to a weathertight condition.

End of Section

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the work.
- B. Refer to the Owner's Proposal Documents for additional information. If conflicts are present between the information presented within this specification section and the Owner's Proposal Documents, the Owner's Proposal Documents will supersede.

1.2 SUBMITTALS

- A. Contractor's List of Incomplete Items (Punchlist): Initial submittal at Substantial Completion.
- B. Certified List of Incomplete Items (Punchlist): Final submittal at Final Completion.
- C. Certificates of Release: From authorities having jurisdiction.
- D. Certificate of Insurance: For continuing coverage.
- E. Field Report: For pest control inspection.
- F. List of Extra Materials.

1.3 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Minimum of 10 days prior to requesting an inspection for determining date of Substantial Completion. List items that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.

- a. List of Extra Materials: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
 5. Submit test/adjust/balance records.
 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: A minimum of 10 days prior to requesting inspection for determining date of Substantial Completion, submit list items that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings as applicable.
 6. Advise Owner of changeover in heat and utilities.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from site, including mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements, including touchup painting.
 10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.4 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment in accordance with the Contract Documents.
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled

requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

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

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in a PDF electronic file. Architect will return annotated file.

1.6 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 1. Bind warranties and bonds in heavy duty, three ring, loose leaf binders, thickness necessary to accommodate contents, and sized to receive 8-1/2 inch by 11 inch (215 mm by 280 mm) paper.
 2. Provide heavy paper dividers with plastic covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 4. Warranty Electronic File: In addition to the Warranty Binder, scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project. Cleaning activities include but are not limited to:
 - a. Clean site in areas disturbed by construction activities of rubbish, waste material, litter, and other foreign substances.
 - b. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - c. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - d. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - e. Sweep concrete floors broom clean in unoccupied spaces.
 - f. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - g. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - h. Remove labels that are not permanent.
 - i. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - j. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - k. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - l. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
 - m. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - n. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000. Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
 - a. Do not paint over *UL* and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

End of Section

SECTION 01 78 00 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements for project record documents, including but not limited to:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Refer to the Owner's Proposal Documents for additional information. If conflicts are present between the information presented within this specification section and the Owner's Proposal Documents, the Owner's Proposal Documents will supersede.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings:
 - 1. Number of Copies: Submit one set of marked up record prints.
 - 2. Number of Copies: Submit copies of record Drawings:
 - a. Initial Submittal:
 - 1) Submit PDF electronic files of scanned record prints and one of file prints.
 - 2) Submit record digital data files and one sets of plots.
 - 3) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit PDF electronic files of scanned record prints and three sets of prints.
 - 2) Submit record digital data files and three sets of record digital data file plots.
 - 3) Plot each drawing file, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit one paper copy and one annotated PDF electronic files of the Project Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one paper copy and one annotated PDF electronic files and directories of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: Refer to the individual Specification Sections for miscellaneous record keeping requirements and submittals in connection with various construction activities. Submit one paper copy and annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report monthly indicating items incorporated into project record documents concurrent with progress of the work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.3 PROJECT RECORD DOCUMENT PROCEDURES

- A. Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference.
 - 1. Do not use As Built Drawings and Specifications for Record Drawings and Specifications.
- B. Recording Procedures: Update drawings and specifications on daily bases to record actual conditions. Record information concurrently with construction progress. Do not conceal work until required information is accurately recorded.
- C. Store Record Documents and samples apart from as built documents used for construction.
 - 1. Label and file Record Documents and samples in accordance with section number listings in Table of Contents. Label each document *PROJECT RECORD* in neat, large, printed letters.
 - 2. Maintain Record Documents in clean, dry and legible condition.
 - 3. Make Record Documents and samples available for inspection upon request of Architect.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked up paper copies of the Contract Drawings and Shop Drawings.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked up record prints. Show actual installation conditions where installation varies from that shown originally.
 - a. Give attention to information on concealed elements difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross reference record prints to corresponding shop drawings or archive photographic documentation.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the work that is shown only schematically.
 - 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked up record prints.

4. Mark record sets with erasable, red colored pencil. Use colors to distinguish between changes for different categories of the work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked up record prints with Architect. When authorized, prepare full set of corrected digital data files of the Contract Drawings:
1. Format: Same digital data software program, version, and operating system as the original Contract Drawings and annotated PDF electronic file with comment function enabled.
 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 3. Refer instances of uncertainty to Architect for resolution.
 4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
 - a. Refer to Section 013300 for requirements related to use of Architect's digital data files.
 - b. Architect will provide data file layer information. Record markups in separate layers.
- C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or modification.
 2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- D. Format: Identify and date each record Drawing; include the designation *PROJECT RECORD DRAWING* in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation PROJECT RECORD DRAWINGS.
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

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

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
 5. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as annotated PDF electronic file and marked up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as annotated PDF electronic file. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 RECORD SAMPLES

- A. Record Samples: Determine with Architect and Owner which submitted Samples are to be maintained as Record Samples. Maintain and mark one set to indicate date of review and approval by Architect; note any deviations or variations between reviewed sample and installed product or material.

2.5 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by the individual Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the work. Bind or file miscellaneous records and identify each, ready for continued use and reference. Include the following:
1. Reviewed shop drawings, product data, and samples.
 2. Field test reports.
 3. Inspection certificates and manufacturer's certificates.
 4. Inspections by authorities having jurisdiction (AHJ).
 5. Documentation of foundation depths.
 6. Special measurements or adjustments.
 7. Tests and inspections.
 8. Surveys.
 9. Design mixes.
- B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked up miscellaneous record submittals. Include miscellaneous record submittals directory organized

by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

End of Section

SECTION 02 41 10 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Partial demolition of existing building as required to accommodate additions and renovations as shown on the drawings or required. Include removal of existing utilities as indicated or encountered; removal of masonry, and mechanical, electrical, and plumbing items as indicated or required.

1.2 SUBMITTALS

- A. Submit the following items.
 - 1. Itemized Demolition Schedule.
 - 2. Detail all demolition methods to be used.

1.3 PERMITS

- A. Procure and pay for all necessary permits or certificates required to complete the work specified. Make any and all required notifications and comply with all applicable Federal, State and local ordinances.

1.4 QUALITY ASSURANCE

- A. Provide at least one (1) person who shall be present and in charge of the Demolition Work at all times and who shall be thoroughly familiar with all phases of all work performed under this Section.
- B. Comply with all pertinent codes and regulations applying to this work.

1.5 JOB CONDITIONS

- A. Use all means necessary to prevent the spread of dust during performance of this work. Provide additional clean filters for the existing air handling system serving those areas to remain to protect them from construction dust.
- B. Use all means necessary to protect the existing building to remain from all types of damage, including fire, water damage, and unnecessary interruption of utility services. In the event of damage of any kind, immediately make all repairs and replacements necessary to the approval of the Owner at no additional cost to the Owner.
- C. Motor driven equipment shall have functional mufflers.
- D. Visit the site and examine the existing structure. Note all conditions as to the character and extent of work involved.

1.6 PRE-INSTALLATION CONFERENCE

- A. Refer to Section 01 31 13 - Notification of Architect requirements.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide all barricades, shoring, and bracing necessary to protect the tenants, workmen, and Public from danger. Barricades shall be sufficiently designed to protect and or exclude the public from all hazards.
- B. All other materials not specifically described but required for proper completion of Work of this Section, shall be as selected by the Contractor subject to the approval of the Owner.
- C. The Owner and Architect are not responsible and make no claims for the quality or quantity of the materials being demolished. The General Contractor or subcontractors that undertake or assume the benefits of salvage efforts shall assume all risks associated with that effort.

2.2 DEMOLITION WORK

- A. Perform demolition work in manner so as to allow Owner's safe use of existing facility.
- B. Perform demolition work in order to maintain Owner's construction schedule.

2.3 REMOVAL OF PARTITIONS, COLUMNS AND STRUCTURE

- A. Masonry walls or other sections of masonry shall not be permitted to fall on floors of building in masses to exceed safe carrying capacity of floors. Existing floors shall be properly protected with plywood on both sides of a partition to be demolished.
- B. Provide temporary shoring or bracing wherever necessary for the protection of occupants, workmen, walls, partitions, roofs, floors and structure to remain.
- C. Structural or load-supporting members shall not be cut or removed adjacent to existing structures to remain until all loads carried by members have been removed or adequately supported.
- D. No masonry walls shall be removed until it has been determined that the walls to be removed do not support the roof. To determine this, all adjacent materials such as finish ceilings shall be removed to provide adequate views of existing structure. Provide temporary shoring as needed. The Contractor shall take all precautions necessary to ensure the safety of the demolition workers and all occupants of the building.
- E. No demolition will be allowed above, below, adjacent to or near any occupied areas of the building.
- F. Where access holes in existing ceilings or removal of existing ceilings are required, minimize the access in order to minimize the repair work and repair or replace removed or damaged work to match adjacent undamaged work.
- G. Cut and tooth new openings in masonry where required, of correct size to permit installation of frames and anchors for new doors.

PART 3 - EXECUTION

3.1 DEMOLITION

- A. Before commencing the Work of this Section, verify with the Owner that all items to be removed by the Owner have been removed. Schedule the work in a careful manner with all necessary consideration for the Public and the Owner. All items of existing equipment and materials or any other item of value to the Owner shall be salvaged by the Owner prior to demolition.
- B. All material removed under this Contract, which is not to be salvaged or reused, shall become the property of the Contractor and be promptly removed from the site. At all times use movable debris boxes, covered, to convey the material through the building. Do not store or permit debris to accumulate on the site. Dumpsters shall not overflow and shall be emptied on a regular basis. Remove all debris from the building premises and leave the construction site "Clean" each day. All debris shall be dumped in an approved disposal facility and all fees for this shall be paid by the Contractor. Contractor is responsible for completely removing all demolished materials from the site and disposing of them in accordance with all local, State and Federal Regulations. If Contractor fails to remove debris promptly, Owner reserves the right to have debris removed at Contractor's expense.
- C. Conduct operations so as not to interfere with adjacent occupied spaces, roads, streets, drives, walks, service lines and the like.
- D. Keep all pedestrian areas clear for passage at all times.

3.2 PROTECTION OF STRUCTURES, PROPERTY

- A. Execute demolition work to ensure adjacent property no damage from falling debris or other causes.
- B. Take precautions to guard against movement, settlement, or be liable for such movement, settlement, or collapse; repair promptly such damage when so ordered.
- C. Repair damage to Owner's property or any other person or persons on or off premises by reason of required work.

END OF SECTION

SECTION 03 54 00 - SELF-LEVELING UNDERLAYMENT

PART I - GENERAL

1.1 SECTION INCLUDES

- A. Provide Self-Leveling Portland cement-based underlayment for use over existing concrete floors where items have been removed and to level or fill in low areas.
- B. Sloped application where indicated

1.2 QUALITY ASSURANCE

- A. Installation of Self-Leveling Portland cement-based underlayment must be by an applicator using mixing equipment and tools approved by the manufacturer.
- B. Underlayment shall be able to be installed from 1/8 inch to 1-1/2 inch in one pour and up to 5 inches with the addition of aggregate. It may also be feathered to match existing elevations.
- C. Underlayment to be applied to a minimum thickness of 1/8 inch over highest point in the subfloor, with an average typical thickness of 1/4 inch.
- D. Underlayment compressive strength shall be 4,100 psi after 28 days in accordance with ASTM C109/mod (air cure only).
- E. Underlayment shall be walkable after 2 hours and allow floor covering to be installed after 16 hours at 70 degrees F.
- F. Manufacturer's certification that the product is Portland cement-based having an inorganic binder content which is a minimum 80 percent Portland cement when tested in accordance with ASTM C150: Standard Specification for Portland Cement.
- G. Qualifications
 - 1. Installer Qualifications: All work in this section shall be preformed by a factory trained applicator with minimum five years experience in the installation of cementitious underlayment material.
 - 2. Manufacturer Qualifications: Obtain required products from a single manufacturer specializing in the production of products of this type for not less than 20 Years.
 - 3. Manufacturer to provide confirmation installation procedures.
- H. Allowable Tolerances
 - 1. Variation from level: Do not exceed 1/8 inch in any bay or 10 feet in distance.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in their unopened packages and protect from extreme temperatures and moisture. Protect liquids from freezing.

1.4 SITE CONDITIONS

- A. The product is a cementitious material. Observe the basic rules of concrete work. Do not install below 50 degrees F surface temperature. Install quickly if floor is warm and follow hot weather precautions available from the manufacturer's Technical Service Department. Never mix with cement or additives other than the manufacturer's approved products.
- B. Do not proceed with installation until temperature and relative humidity have been stabilized and been maintained within values established by the manufacturer for optimum quality control.
- C. Provide adequate ventilation to prevent accumulation of hazardous fumes during application of components in enclosed spaces, and maintain ventilation until materials have thoroughly cured.

PART 2 - PRODUCTS

2.1 APPROVED PRODUCT/MANUFACTURER

- A. Product for level applications: ARDEX K-15 Self-Leveling Underlayment Concrete manufactured by ARDEX ENGINEERED CEMENTS Aliquippa, PA; (724) 203-5000. No substitutions.
- B. Product for sloped applications: ARDEX SD-P, Self-Drying Patch manufactured by ARDEX ENGINEERED CEMENTS Aliquippa, PA; (724) 203-5000. No substitutions.
- C. Primer for standard absorbent concrete shall be ARDEX P-51 Primer.
- D. Primer for non-porous subfloors, cutback and other non-water soluble adhesive residues, metal, and wooden subfloors shall be ARDEX P-82 Ultra Prime.
- E. The additive to be mixed with ARDEX K-15 when used over cutback adhesive, other non-water soluble adhesives, metal, or wooden subfloors shall be ARDEX E-25 Resilient Emulsion.
- F. Aggregate shall be well graded, washed gravel (1/8 inch to 1/4 inch or larger) for use when underlayment is installed over 1-1/2 inches thick.
- G. Water shall be clean, potable, and sufficiently cool (not warmer than 70°F).

2.2 MIX DESIGNS

- A. Standard mixing ratio: ARDEX K-15 is mixed in 2-bag batches at one time. Mix each bag of ARDEX K-15 (55 lb.) with 7 quarts of water. Product shall be mixed in an ARDEX T-10 Mixing Drum using an ARDEX T-1 Mixing Paddle and a 1/2 inch heavy-duty drill (min. 650 rpm). Mix thoroughly for approximately 2-3 minutes to obtain a lump-free mixture. Follow written instructions per the ARDEX K-15 bag label.
- B. Resilient mix for applications over cutback and non-water soluble adhesive residues, wood, and metal: Use 6 qt. of water and 2 qt. of ARDEX E-25 Resilient Emulsion for each bag of ARDEX K-15.

- C. Aggregate mix: For areas to be installed over 1-1/2 inches thick, aggregate may be added to reduce material costs. Mix ARDEX K-15 with water first, then add from 1/3 up to 1 part by volume of aggregate (1/8 inch to 1/4 inch or larger). Do not use sand.
- D. For pump installations, ARDEX K-15 shall be mixed using an ARDEX Levelcraft Automatic Mixing Pump. Start the pump at 210 gallons of water per hour, and then adjust to the minimum water reading that still allows self-leveling properties. Do not over-water. Check the consistency of the product on the floor to ensure a uniform distribution of the sand aggregate at both the top surface and bottom of the pour. If settling is occurring, reduce the water amount and recheck. Conditions during the installation, such as variations in water, powder, substrate, and ambient temperature, require that the water setting be monitored and adjusted carefully to avoid over watering.

PART 3 - EXECUTION

3.1 PREPARATION

- A. All subfloors must be sound, solid, clean, and primed:
 - 1. All concrete subfloors must be of adequate strength, clean, and free of all oil, grease, dirt, curing compounds and any substance that might act as a bondbreaker before priming. Mechanically clean if necessary using shot blasting or other. Acid etching and the use of sweeping compounds and solvents are not acceptable.
 - 2. Cutback and other non-water soluble adhesive residues must be wet scraped to a thin, well-bonded layer.
 - 3. Non-porous subfloors such as ceramic and quarry tile as well as terrazzo should be clean and free of all waxes and sealers. If necessary, have the surface professionally cleaned.
 - 4. All cracks in the subfloor shall be repaired to minimize telegraphing through the underlayment.
 - 5. Substrates shall be inspected and corrected for moisture or any other conditions that could affect the performance of the underlayment or the finished floor covering.
- B. Joint Preparation:
 - 1. Moving Joints - honor all expansion and isolation joints up through the underlayment.
 - 2. Saw Cuts and Control Joints - fill all non-moving joints with ARDEX SD-F Feather Finish or ARDEX SD-P InstantPatch, as required.
- C. Priming:
 - 1. Primer for standard absorbent concrete subfloors: Mix ARDEX P-51 1:1 with water and apply evenly with a soft push broom. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, thin film (min. 3 hours, max. 24 hours). Underlayment shall not be applied until the primer is dry. Primer coverage is approximately 400 to 600 sq. ft. per gallon.
 - 2. Primer for extremely absorbent concrete subfloors: Make an initial application of ARDEX P-51 mixed with 3 parts water using a soft push broom. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry thoroughly before proceeding with the standard application of primer as described above for standard absorbent concrete.
 - 3. Primer for non-porous subfloors, wooden or metal subfloors, or cutback and other non-water soluble adhesive residues over concrete: Prime with ARDEX P-82 Ultra Prime. Mix Part A (red) with Part B (white) and apply with a short-nap or sponge paint roller, leaving a thin coat of primer no heavier than a thin coat of

paint. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, slightly tack film (minimum 3 hours, maximum 24 hours). Underlayment shall not be installed until primer is dry. Primer coverage is approximately 200 to 400 square feet per gallon.

4. Minimum drying time for ARDEX P-82 Ultra-Prime over cutback adhesive is 18 hours.

3.2 APPLICATION OF UNDERLAYMENT

A. Installation:

1. Pour or pump the liquid ARDEX K-15 and spread in place with the ARDEX T-4 Spreader. Use the ARDEX T-5 Smoother for featheredge and touch-up. Wear baseball or soccer shoes with non-metallic cleats to avoid leaving marks in the liquid ARDEX K-15. Underlayment can be walked on in 2-3 hours at 70 degrees F.

3.3 PREPARATION FOR FLOORING INSTALLATION

- A. Underlayment can accept finish floor covering materials after 16 hours at 70 degrees F and 50 percent relative humidity.
- B. Due to the wide range of adhesives that are used to install floor coverings, some adhesives may dry more quickly over Ardex underlayments than over other substrates. If this condition occurs, priming the surface of the underlayment with ARDEX P-51 Primer diluted 1:3 with water will even out the drying of the adhesive. Allow the primer to dry 1-3 hours before proceeding with the adhesive installation.

3.4 FIELD QUALITY CONTROL

- A. Where specified, field sampling of the Ardex underlayment is to be done by taking an entire unopened bag of the product being installed to an independent testing facility to perform compressive strength testing in accordance with ASTM C 109/modified: air-cure only. There are no in situ test procedures for the evaluation of compressive strength.

3.5 PROTECTION

- A. Prior to the installation of the finish flooring, the surface of the underlayment should be protected from abuse by other trades by the use of plywood, Masonite or other suitable protection course.

End of Section

SECTION 04 23 00 - GLASS UNIT MASONRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Glass masonry units
- B. Mortar, grout, reinforcement, anchorages, insulation, and accessories shown, specified, or required to complete Work.
- C. Contractor performing Work of this Section shall be responsible for performing unit masonry work specified in Section 04 20 00.

1.2 RELATED WORK

- A. Section 07 92 00 - Joint Sealants

1.3 SUBMITTALS

- A. Product Data: Schedules, charts, literature, and illustrations to indicate the performance, fabrication procedures, product variations, and accessories.
- B. Samples: Two (2) samples of each pattern and size units indicated.
- C. Sample Panel(s):
 - 1. Do not start masonry until Architect has approved samples.
 - 2. Sample panel shall be 4 feet long x 4 feet high showing selected block, bonding, joint shape, and quality of workmanship. Include a block and expansion joint, and any specialty details, such as reveals, soldier courses, etc.
 - 3. Sample panel(s) shall remain at the jobsite until all masonry is completed.
- D. Certification: Submit manufacturer's affidavit that materials used in Project contain no asbestos.
- E. Mortar and Grout Mix Designs: Submit two (2) copies of proposed mortar and grout mix designs to Owner's testing laboratory.

1.4 PRE-INSTALLATION CONFERENCE

- A. Refer to Section 01 31 13 – Project Coordination.

1.5 WARRANTY

- A. Warrant the Work specified herein for one (1) year against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.
- B. Defects shall include, but not be limited to, the following:
 - 1. Noticeable deterioration of unit or mortar finish.
 - 2. Chalking or dusting excessively.
 - 3. Changing color in irregular fashion.
 - 4. Cracking or spalling.
 - 5. Releasing from substrate.
 - 6. Staining or discoloring, including efflorescence.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Specifications are based on product manufactured by Pittsburgh Corning Corporation, Pittsburgh, PA; (800) 992-5769. Manufacturers listed whose product meet or exceed the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications for and comply with Division 1 requirements regarding substitutions to be considered.
1. Solaris Glasstein, Houston, TX; (713) 681-4651.
 2. Weck Glass Blocks, Glaushaus, Inc., Crystal Lake, IL; (815) 356-8440

2.2 MATERIALS

- A. Glass Block:
1. Size: 12 inches x 12 inches x 4 inches thick or as shown on drawings.
 2. Pattern: "Decora".
 3. Color: Clear (without fibrous insert)
- B. Panel Reinforcing:
1. Shall be panel reinforcing of galvanized steel double wire mesh formed of two (2) parallel wires either 1-5/8 inch or 2 inches on centers with electrically welded cross wires at regular intervals.
 2. Reinforcing shall be embedded in horizontal mortar joints on approximately 24 inch centers and in joints immediately above and below all openings within panels.
 3. Reinforcing shall run continuously from end to end of panels and shall be lapped not less than 6 inches wherever it is necessary to use more than one length. Do not bridge expansion joints with reinforcing.
- C. Panel Anchors:
1. Where shown on drawings or required shall be panel anchors as furnished by manufacturer and shall be No. 20 gauge perforated steel strips 24 inches long by 1-3/4 inch wide galvanized after perforation.
 2. All panel anchors must be bent within expansion joints, and shall generally be placed 24 in. apart occurring in the same joint as panel reinforcing and must be completely embedded in the mortar joint of the glass block panels.
- D. Mortar:
1. Shall be one (1) part Portland Cement, 1/4 to 1/2 parts lime, and sand equal to between 2-1/4 and 3 times the amount of cementitious material (cement plus lime), all measured by volume.
 2. Admixtures in the form of setting accelerators and anti-freeze compounds shall not be used.
 3. Any combinations of the above mortar mixes will fall within type S mortar as recommended by "American Standard Building Code Requirements for Masonry", and approved by the American Standards Association as American Standard A41.1 (as revised) and ASTM C270.

- E. Packing:
 - 1. Where indicated on drawings or required as a lateral cushioning for glass block panels at jambs, heads and intermediate supports, shall be oakum (non-staining, dry-rot treated, silver type) or a filler approved by the sealant manufacturer.
- F. Sealant:
 - 1. Shall be non-staining, waterproof mastic. This shall be evenly applied to the full depth of recesses as indicated on the details.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Steel tools must not be used to tap blocks into position.
- B. Install panel reinforcing in horizontal joints where required as follows:
 - 1. Place lower half of mortar in bed joint. Do not furrow.
 - 2. Press panel reinforcing in place.
 - 3. Cover panel reinforcing with upper half of mortar bed and trowel smooth. Do not furrow.
 - 4. Panel reinforcing must run from end to end of panels and where used continuously must lap 6 inches. Panel reinforcing must not bridge expansion joints.
- C. Place full mortar beds for joints not requiring panel reinforcing - do not furrow.
- D. Place succeeding courses of blocks in the same fashion. Strike joints smoothly while mortar is still plastic and before final set.
- E. After final mortar set, pack filler tightly between glass block panel and jamb and head construction. Leave space for sealant. Seal panels as indicated on details.
- F. Refer to Section 04 20 00, Unit Masonry, for additional information.

3.2 CLEAN UP

- A. Surplus mortar shall be removed and the faces of the blocks wiped dry at the time joints are tooled.
- B. Do not use abrasive cleaners (steel wool, wire brush, or acid) in conjunction with removing mortar or dirt from the faces of glass block.

End of Section

SECTION 05 50 00 - MISCELLANEOUS METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements including but not limited to:
 - 1. Steel framing and supports for countertops.
 - 2. Steel framing and supports for mechanical and electrical equipment.
 - 3. Steel framing and supports for applications where framing and support is necessary but is not specified.
 - 4. Shelf angles.
 - 5. Loose bearing and leveling plates for applications necessary but not specified.
 - 6. Accessories necessary for a complete installation.

- B. Products furnished, but not installed, under this Section:
 - 1. Loose steel lintels.
 - 2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
 - 3. Steel weld plates and angles for casting into concrete for applications.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design framing and supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

- B. Structural Performance:
 - 1. Countertops and Vanities: Provide countertop and vanity framing capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections, or of exhibiting excessive deflections in any of the components making up the countertops and vanities:
 - a. All deadloads.
 - b. 500 pound live load placed on the countertop and vanity.
 - c. Deflection at Midspan: $L/1000$ times span or 1/8 inch whichever is less.

1.3 SUBMITTALS

- A. Product Data: Submit data for miscellaneous metal fabrications and paint, coatings, and grout accessories.

- B. Shop Drawings: Show fabrication and installation details for metal fabrications. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

- C. Delegated Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- D. Qualification Data: For qualified professional engineer.

- E. Welding certificates.

- F. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M *Structural Welding Code - Steel*.
- B. Fabricator/Installer Qualifications: A firm experienced in producing metal fabrications similar to those indicated for a minimum of 5 years, with a record of successful in-service performance, with sufficient production capacity to produce required units without causing delay in the work.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Texas and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal fabrications that are similar to those indicated in material, design, and extent.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Where metal fabrications are indicated to fit walls and construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.6 COORDINATION

- A. Coordinate selection of shop primers with applied topcoats. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, embedded in concrete or masonry. Deliver items to site in time for installation.

PART 2 - PRODUCTS

2.1 METALS

- A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500, cold formed steel tubing.
- D. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

- E. Fasteners: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
1. Steel Bolts and Nuts: Regular hexagon head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
 2. Stainless Steel Bolts and Nuts: Regular hexagon head annealed stainless-steel bolts, ASTM F 593 (ASTM F 738M); with hex nuts, ASTM F 594 (ASTM F 836M); and, where indicated, flat washers; Alloy Group 1 (A1).
 3. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers. Hot dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
 4. Eyebolts: ASTM A 489.
 5. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
 6. Lag Screws: ASME B18.2.1 (ASME B18.2.3.8M).
 7. Wood Screws: Flat head, ASME B18.6.1.
 8. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).
 9. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).
 10. Slotted Channel Inserts: Cold formed, hot dip galvanized steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with temporary filler and tee head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.
- F. Miscellaneous Materials:
1. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 2. Shop Primer for Ferrous Metal: Universal primer, organic zinc rich primer, complying with SSPC-Paint 20 and compatible with topcoat. Provide 10-99 (red) or 10-09 (gray) by Tnemec Company.
 3. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in steel, complying with SSPC-Paint 20. Provide Tneme-Zinc 90-97 by Tnemec Company.
 4. Bituminous Paint: Cold applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold applied asphalt emulsion complying with ASTM D 1187.
 5. Grout: Factory packaged, nonshrink, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
 6. Concrete: Comply with requirements in Section 033100 for normal weight, air entrained, concrete with a minimum 28 day compressive strength of 3000 psi (20 MPa).

2.2 FABRICATION

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously:

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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and connections exposed to weather to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 inch by 1-1/2 inches (3.2 by 38 mm), with a minimum 6 inch (150 mm) embedment and 2 inch (50 mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.
- J. Miscellaneous Framing And Supports: Provide steel framing and supports as necessary to complete the work.
1. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction. Fabricate units from slotted channel framing where indicated. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - a. Modular Structural Framing System: ASTM A569; modular, structural quality steel preformed U channel framing system with continuous open slot prepared to receive attachment nuts, bolts, straps, threaded rods, beam clamps, hanger rods support brackets and other accessories. Provide corrosion resistant finish.
 - 1) Provide steel rods, 1/2 inch diameter, spaced at maximum 36 inches o.c. Thread rods to receive anchor and stop nuts. Fit hangers with wedge shape washers for full bearing on sloping flanges of support beam.
 2. Countertop and Vanity Framing: Custom fabricate countertop and vanity framing, using steel shapes and plates, and cold finished mild steel bars at exposed conditions, for support framing and plywood, to the thicknesses, sizes and shapes shown, and as required to produce work of adequate strength and durability, without objectionable deflections. Use proven details of fabrication, as required, to achieve proper assembly and alignment of the various components of the work.
- K. Shelf Angles: Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4 inch (19 mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.
1. Provide mitered and welded units at corners.
 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches (50 mm) larger than expansion or control joint.
 3. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
 4. Prime shelf angles located in exterior walls with specified zinc rich primer.

- L. Miscellaneous Steel Trim: Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
 - 1. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
 - 2. Galvanize miscellaneous steel trim.
- M. Loose Bearing And Leveling Plates: Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
 - 1. Prime plates with zinc rich primer.
- N. Loose Steel Lintels: Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
 - 1. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches (200 mm) unless otherwise indicated.
 - 2. Prime loose steel lintels located in exterior walls with zinc rich primer.
- O. Steel Weld Plates And Angles: Provide steel weld plates and angles, for items supported from concrete construction as necessary to complete the work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.3 FINISHES

- A. Comply with NAAMM *Metal Finishes Manual for Architectural and Metal Products* for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.
- C. Galvanizing: Hot dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- D. Shop prime steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed on fireproofing, or masonry, or unless otherwise indicated. Shop prime with specified universal shop primer.
- E. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning.
- F. Shop Priming: Apply shop primer to comply with SSPC-PA 1 *Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel*, for shop painting. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLION

- A. Framing and Supports: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
 - 1. Anchor supports for operable partitions securely to and rigidly brace from building structure.
- B. Bearing and Leveling Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
 - 1. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - a. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations unless otherwise indicated.
 - b. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0 mil (0.05 mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

End of Section

SECTION 06 10 50 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements including but not limited to:
1. Framing with dimension lumber.
 2. Wood blocking, cants, and nailers.
 3. Wood furring and grounds.
 4. Wood sleepers.
 5. Plywood backing panels.
 6. Accessories necessary for a complete installation.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
1. Building Code: Comply with applicable requirements of IBC Chapter 23 for miscellaneous wood.
 2. Fire Retardant Treated Lumber and Plywood by Pressure Process: Provide products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1.4 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 3. Dress lumber, S4S, unless otherwise indicated.
 4. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.
- B. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground and Use Category UC4a for items in contact with ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
 2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
 3. Kiln dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
 4. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
 5. Application: Treat items indicated on Drawings, and the following:
 - a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - b. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
- C. Fire Retardant Treatment: Where indicates as fire retardant treated, provide materials acceptable to authorities having jurisdiction, and with fire test response characteristics specified as determined by testing identical products per ASTM E 84 by a qualified testing agency.
1. Treatment shall not promote corrosion of metal fasteners.
 2. Interior Type A: Provide treated materials with moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 3. Design Value Adjustment Factors: Test treated lumber according to ASTM D 5664, and calculate design value adjustment factors according to ASTM D 6841.
 4. Kiln dry lumber after treatment to a maximum moisture content of 19 percent.
 5. Identify fire retardant treated wood with appropriate classification marking of qualified testing agency.
 6. Application: Treat items indicated on Drawings, and the following:
 - a. Framing for raised platforms.
 - b. Concealed blocking.
 - c. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
 - d. Plywood backing panels.
- D. Miscellaneous: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including but not limited to blocking, nailers, cants, grounds, furring, roof top equipment bases and support curbs, and utility shelving.
1. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.

2. For blocking not used for attachment of other construction, use Utility, Stud, or No. 3 grade lumber of any species provided that it is cut and selected to eliminate defects that interfere with attachment and purpose.
 3. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that interfere with attachment of work.
 4. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent over nails and damage to paneling.
 5. Utility Shelving: Lumber with 19 percent maximum moisture content of any of the following species and grades:
 - a. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Premium or No. 2 Common (Sterling) grade; NeLMA, NLGA, WCLIB, or WWPA.
 - b. Mixed southern pine or southern pine No. 2 grade; SPIB.
 - c. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
- E. Concealed Boards: 19 percent maximum moisture content of any of the following species and grades:
1. Mixed southern pine or southern pine, No. 2 grade; SPIB.
 2. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 3. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
 4. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
 5. For furring strips for installing plywood, select boards with no knots capable of producing bent over nails and damage to paneling.
- F. Plywood Backing Panels:
1. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, C-C Plugged or Exposure 1, C-D Plugged, fire retardant treated, in thickness not less than 3/4 inch (19 mm)] nominal thickness.
- G. Fasteners: Provide fasteners of size and type indicated that comply with requirements.
1. Where carpentry is exposed to weather, in ground contact, pressure preservative treated, or in area of high relative humidity, provide fasteners with hot dip zinc coating complying with ASTM A 153/A 153M.
 2. Nails, Brads, and Staples: ASTM F 1667.
 3. Screws for Fastening to Metal Framing: ASTM C 1002 drywall type or ASTM C 954 non-load-bearing steel stud, length recommended by screw manufacturer for material being fastened.
 4. Power Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
 5. Post Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 mechanical, masonry or ICC-ES AC58 mechanical, concrete, as appropriate for the substrate.
 - a. Material, Interior: Carbon steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
- H. Metal Framing Anchors:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cleveland Steel Specialty Co.
 - b. KC Metals Products, Inc.
 - c. Phoenix Metal Products, Inc.
 - d. Simpson Strong-Tie Co., Inc.

2. Galvanized Steel Sheet: Hot dip, zinc coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation. Use for interior locations unless otherwise indicated.
 3. Hot Dip, Heavy Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high strength low alloy steel Type A (HSLAS Type A), or high strength low alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick. Use for wood preservative treated lumber and where indicated.
- I. Miscellaneous Materials:
1. Flexible Flashing: Composite, self adhesive, flashing product consisting of a pliable, butyl rubber or rubberized asphalt compound, bonded to high density polyethylene film, aluminum foil, or spunbonded polyolefin to produce overall thickness of not less than 0.025 inch (0.6 mm).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Framing Standard: Comply with AF&PA WCD 1 *Details for Conventional Wood Frame Construction* unless otherwise indicated.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire retardant treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Do not splice structural members between supports unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.
- G. Provide fire blocking in furred spaces, stud spaces, and concealed cavities indicated and as follows:
 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 2. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.
- H. Sort and select lumber so natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- I. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative treated lumber.
 1. Use inorganic boron for items that are continuously protected from liquid water.
 2. Use copper naphthenate for items not continuously protected from liquid water.

- J. Where wood preservative treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with Table 2304.9.1 *Fastening Schedule* in the International Building Code. Provide ICC-ES evaluation report for fastener.
- L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- M. Wood Blocking and Nailer Installation: Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
 - 1. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
 - 2. Provide permanent grounds of dressed, pressure preservative treated, key beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.
- N. Wood Furring Installation: Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

3.2 PROTECTION

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

End of Section

SECTION 06 20 00 - FINISH CARPENTRY AND MILLWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Providing all finish carpentry items including, but not limited to:
 - 1. Finish Carpentry
 - 2. Millwork and Cabinetry
 - 3. Plastic Laminate
 - 4. Casework Hardware
 - 5. Miscellaneous Millwork

1.2 RELATED WORK

- A. Section 06 10 50 - Rough Carpentry
- B. Section 08 71 00 - Door Hardware
- C. Section 09 91 00 - Painting and Staining

1.3 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A156.9 - Cabinet Hardware
 - 2. ANSI A161.1 - Woodwork Testing Standards
 - 3. ANSI A208.1 - Mat-Formed Wood Particleboard.
- B. Architectural Woodwork Institute:
 - 1. AWI - Quality Standards Illustrated.
- C. National Electrical Manufacturers Association:
 - 1. NEMA LD 3 - High Pressure Decorative Laminates.

1.4 PERFORMANCE REQUIREMENTS

- A. Unless otherwise indicated, perform work in accordance with AWI "Quality Standards Illustrated", Custom Grade, except where specification exceeds those standards, the more stringent shall govern.
- B. Fabricate millwork and cabinetry in accordance with ANSI A161.1, NEMA LD3, and general static load testing performed and certified by an independent testing agency, covering the following areas of product performance, with these minimum results:
 - 1. Base cabinet construction/racking test: 800 lbs.
 - 2. Cabinet front joint loading test: 425 lbs.
 - 3. Wall cabinet static load test: 2,000 lbs.
 - 4. Drawer front joint loading test: 600 lbs.
 - 5. Drawer construction/static load test: 750 lbs.
 - 6. Cabinet adjustable shelf support device/static load test: 300 lbs.
- C. Shelf Loading: Comply with loading/deflection standards of the Composite Panel Association.

1.5 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
 - 2. Manufacturer's preprinted product information for all hardware proposed on the project.
 - 3. Manufacturer's preprinted maintenance instructions for the casework hardware.
- B. Shop Drawings:
 - 1. Indicate size, material and finish.
 - 2. Show locations and installation procedures, including hardware, sinks, service fixtures, trim and other pertinent data for each unit.
- C. Certification: Provide manufacturer's certification that casework has been fabricated and installed according to AWI "Custom" Grade guidelines or better.
- D. Samples: Two (2) each, 6 inch by 6 inch by 3/4 inch sample of specified particleboard core with grade stamp for use as verification of installed product.
- E. Closeout:
 - 1. Record Drawings: indicate revisions to original drawings and shop drawings
 - 2. Manufacturer contact names, addresses and phone numbers.
 - 3. Finish Material Schedule: names and color numbers of laminates and stains.
 - 4. Keys: Provide additional master key for each room and additional locksets totaling one percent of total project for attic stock.

1.6 QUALITY ASSURANCE

- A. Manufacturer: Minimum of five (5) years experience in providing manufactured casework systems for similar types of projects, produce evidence of financial stability, bonding capacity, and adequate facilities and personnel required to perform on this project.
- B. Delivery conference: 48 hours prior to delivery, notify Architect of delivery date and time. At the Architect's discretion, a representative of the Architect may be present at the time of delivery. Casework not conforming to the specified requirements, as reasonably determined by the Architect's representative, shall be removed and returned to manufacturer for repair or replacement at no additional cost to the Owner or increase in time.

1.7 PRE-INSTALLATION CONFERENCE

- A. Section 01 31 13 – Project Coordination.

1.8 PRODUCT HANDLING

- A. Deliver completed laminate clad casework, countertops and related products only after wet operations in building are completed. Store in ventilated place, protected from the weather, with relative humidity range of 20 to 50 percent.
- B. Protect finished surfaces from soiling and damage during handling and installation with a protective covering.

1.9 JOB CONDITIONS

- A. Environmental Requirements: do not install casework until permanent HVAC systems are operating and temperature and humidity have been stabilized for at least one (1) week.
 - 1. Manufacturer/Supplier shall advise Contractor of temperature and humidity requirements for architectural casework installation areas.
 - 2. After installation, control temperature and humidity to maintain relative humidity between 25 and 55 percent.
- B. Conditions: Do not store or install casework in building until concrete, masonry, and drywall/plaster work is dry.

1.10 COORDINATION

- A. Coordinate the Work of this Section with plumbing work specified in Division 15. Coordinate sink opening construction with sinks specified in Division 15.
- B. Coordinate location of blocking in walls for installation and support of wall cabinets.

1.11 WARRANTY

- A. Warranty the work specified herein for five (5) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.
- B. Defects shall include, but not be limited to the following:
 - 1. Rough or difficult operation, or loose or missing parts.
 - 2. Delamination of surfaces.
 - 3. Noticeable deterioration of finish.
 - 4. Warped or misaligned surfaces or telegraphing of subsurface imperfections.

PART 2 - PRODUCTS

2.1 MILLWORK MANUFACTURERS

- A. Manufacturers listed below are certified by AWI Quality Certification Program and are listed for the Contractor's convenience only and shall not preclude the Contractor from using other manufacturers, provided they produce equivalent products of the type specified for the scope and size of the Project. Other manufacturers must have experience manufacturing products meeting or exceeding the specifications and must comply with the criteria specified in paragraph 1.6 above and with Division 1 requirements regarding substitutions.
 - 1. Casework:
 - a. Ameritek Design Inc., Houston, TX (281) 442-7767
 - b. Calmar Manufacturing Co., Inc., Calmar, IA (563)562-3261
 - c. Case Systems, Inc., Midland, MI (989) 496-9510
 - d. Global Casework Manufacturing, Inc., Sugar Land, TX; (281) 494-6181
 - e. Imperial Mill & Fixture, Inc., Corpus Christi, TX; (361) 883-4630
 - f. Jericho Woodworks, Stafford, TX; (281) 969-7947
 - g. Jim R. Reynolds & Associates, Inc., Houston, TX; (281) 350-1133
 - h. LSI Corporation of America, Inc., Minneapolis, MN; (763) 559-4664
 - i. MGC Millwork, LP, Stafford, TX (281) 340-1400
 - j. South Texas Woodmill, Inc., Brownsville, TX; (956) 831-3304
 - k. Stevens Industries, Inc. Teutopolis, IL (217) 540-3100
 - l. Terrill Manufacturing Co., San Angelo, TX; (915) 655-7133

- m. TMI Systems Design Corp., Dickenson, ND; (701) 225-6716
- n. Victoria Cabinetworks, Victoria, TX (361) 578-0263
- o. Alpha Omega Casework LLC, Temple, TX (512) 365-1776

2.2 MILLWORK MATERIALS

- A. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD3, and the following requirements:
 - 1. Color Selection Available:
 - a. Architect to select from manufacturer's standard color, including wood grain patterns and solid colors, or as noted in Drawings.
 - b. If laminate has wood grain, direction of grain shall be vertical on door, end panels, fascia panels, and exposed backs; horizontal on drawer faces, aprons, and top rails.
 - 2. Laminate grades:
 - a. Exposed doors, finished end panels, and other vertical surfaces: GP28 (0.028 inch thick nominal)
 - b. Horizontal surfaces other than top: GP28 (0.028 inch thick nominal)
 - c. Cabinet Liner: CL20 (0.020 inch nominal), white.
 - d. Work Surfaces and Countertops: GP50 (0.050 inch thick nominal) with BK20 (0.20 inch thick) backer sheet.
 - e. Backsplash: PH42 (0.042 inch nominal) with nominally balanced backer sheet.
 - 3. Adhesive: PVA water resistant adhesive. Contact adhesives not permitted.
 - 4. Pressure Fused Laminate:
 - a. NEMA LD3 VGL, and NEMA LD3 CLS, Melamine resin impregnated, 120 gram PSM minimum, thermofused to core under pressure.
 - b. Color:
 - 1) Closed interiors, underside of wall cabinets: White.
 - 2) Exposed and Semi-exposed open cabinets: Match exterior.
 - c. Provide balanced construction with same thermofused melamine. Unsurfaced coreboard or simple backers not allowed.
- B. Core Material:
 - 1. Particleboard: ANSI 208.1, minimum 45 pcf density, Grade M-3.
 - 2. Plywood: Shop sanded, exterior grade veneer cored, hardwood faced, any species, with no defects affecting strength or utility. Overlay plywood not permitted. Plywood allowed at countertops and toe-base only.
 - 3. Water resistant treated plywood: shall have 24 hour thickness swell factor of five percent or less and 24 hour water absorption factor of ten percent or less; P.S. 51, Type II or better.
 - 4. Cabinet components shall be of the following minimum core thicknesses:
 - a. Cabinet backs, drawer body, and drawer bottoms: 1/2 inch particleboard
 - b. Door and drawer face, base, wall, and tall cabinet tops and bottoms, cabinet sides, drawer spreaders, cabinet back rear hangstrips, structural dividers, and exposed cabinet backs: 3/4 inch particleboard
 - c. Work surfaces and countertops: minimum 1 inch particleboard or plywood, except use water resistant treated plywood core at counters with sinks.
 - d. Shelves: 3/4 inch particleboard core for 30 inches long or less, 1 inch thick particleboard core for more than 30 inches long; 14 inch deep, unless otherwise noted. Provide vertical dividers for shelves over 36 inches long.

- e. Cabinet Toe-Base: 3/4 inch plywood. No particleboard within four (4) inches of floor.
- C. Countertops and Backsplashes:
 - 1. Countertops: Provide countertops with PVC edge in as long as practical continuous lengths. Provide field glued splines at joints. No joints closer than 24 inches either side of sink cutout.
 - 2. Backsplash: Integral to countertop, 4 inch high unless otherwise shown. Fabricate with single continuous sheet of laminate from front counter to top of splash with no joints from horizontal to vertical application. No joints shall occur at sink openings.
 - 3. At exposed countertop end corners, provide 1 inch radius, or similar safety treatment.
- D. Toe Spaces: Leave toe spaces unfinished for installation of resilient base, unless otherwise shown.
- E. End Panels and Filler Strips: Match adjacent case-piece.
- F. Edging:
 - 1. Provide the following in accordance with "Edging Locations":
 - a. Flat Edge PVC: 0.020 inch. Solid, high-impact, purified, color-thru, acid resistant, machine-applied with hot melt adhesives.
 - b. 3 mm PVC: Solid, high-impact, purified, color-thru, acid resistant, pre-lamination primed edging, machine-applied with hot melt adhesives, and machine profiled to 1/8 inch radius.
 - 2. Edging Locations:
 - a. Cabinet body edge, including door/drawer front spacer rail: Flat Edge PVC, color matched to door/drawer face or as selected.
 - b. Forward edge of interior body components, interior dividers, shelf, and top edges of drawer body: Flat Edge PVC to match cabinet interior surface color.
 - c. Door/Drawer-Front edging: 3mm PVC, color matched to standard laminates.
 - 3. Fasteners:
 - a. Tamper resistant

2.3 CABINET HARDWARE

- A. All hardware shall meet ANSI A156.9 and shall be subject to approval by the Architect. All keying shall match existing master key system and be approved by the Owner.
 - 1. Acceptable Manufacturers:
 - a. Accuride
 - b. National
 - c. Knap & Vogt
 - d. Ives
 - e. Stanley
 - f. As specified herein, provide specified product, or Architect approved equal.
- B. Hinges:
 - 1. Heavy duty, five-knuckle 2 3/4 inch institutional type hinge shall meet ANSI/BHMA A156.9 Grade 1 requirements. Mill ground, hospital tip, Teflon coated tight pin

- feature with all edges eased. Hinge shall be full wrap around type of tempered steel 0.095 inch thick. Each hinge shall have minimum of 9 screws, #7, 5/8 inch FHMS to assure positive door attachment.
2. One pair per door to 48 inch height. One and one-half pair over 48 inches in height. Hinge shall accommodate 13/16 thick laminated door and allow 270 degree swing.
 3. Finish: US26D.
- C. Pulls:
1. Recessed design, EPCO DP485-SS, 304 stainless steel with satin finish.
- D. Drawer / Door Slides:
1. Standard Drawers: 3/4 extension, self-closing, white epoxy-coated, lever disconnect, positive in-stop/out-stop, nylon rollers, minimum 100 pound dynamic load rating at full extension.
 2. File Drawers: Full extension, 3-part progressive opening slide, precision steel ball bearing, minimum 100 pound dynamic load rating at full extension, zinc plated or epoxy coated at manufacturer's option.
 3. Provide body mounted molded rails for hanging file system for legal or letter size as indicated by manufacturer's model number. Cutting or machining of drawer body/face not permitted.
 4. Paper Storage Drawers: Full extension, self-closing, white epoxy-coated, lever disconnect, positive in-stop/out-stop, nylon rollers, minimum 150 pound dynamic load rating at full extension.
 5. Nourishment Station Recessed Pocket Doors: Accuride 1319, horizontal application, with 110-degree hinges, compact cruciform mounting plates, and mounting brackets; finish to be zinc-plated or nickel-plated steel, as provided by manufacturer; solid wood or plywood hinge carrier strut to be provided separately. Per manufacturer's instructions, heavier and taller doors may require the use of synchronized control system Accuride 1316 in conjunction with this hardware. Consult manufacturer's requirements prior to ordering and fabrication, as this will have an impact on hinge quantities and positions. Refer to Drawings for additional information and detail.
- E. Catches: Provide opening resistance in compliance with the Americans with Disabilities Act.
1. Provide top-mounted magnetic catch for base and wall cabinet door.
 2. Provide two at each tall cabinet door. Catch housing shall be molded in White.
- F. Adjustable Shelf Supports:
1. Dual-pin design with anti tip-up shelf restraints for both 3/4 inch and 1 inch shelves.
 2. Include keel to retard shelf slide-off, and slot for mechanical attachment of shelf to clip.
 3. Load rating shall be minimum 300 pounds each support without failure.
- I. Locks: Five-disk tumbler cam-style with strike. Locks on cabinets in same room keyed alike. Provide two (2) keys per room where doors and drawers are scheduled to receive locks. Dull chrome finish. Lock core shall be removable with a control key, permitting Owner to change lock arrangements without tools.

2.4 SPECIALTY ITEMS

- A. Grommets:
 - 1. Size: As indicated in Drawings with "Flip-Top"™ tab in cap.
 - 2. Colors: As selected by Architect from manufacturer's available colors, or as indicated in Drawings.
 - 3. Number/Location: Where electrical, telephone, and computer data wiring need to pass through tops whether shown or not.
 - 4. Approved Product/Manufacturer: Model No. EDP3 manufactured by Doug Mockett & Company, Inc., Manhattan Beach, CA; (800) 523-1269, or Architect approved equal.

- B. Keyboard Drawers (At all knee spaces):
 - 1. Approved Product/Manufacturer: No. SD-1 as manufactured by Knape & Vogt; or Architect approved equal.

- C. Molded Personal Pencil Drawer: High-impact 100 Polystyrene with in-stop, out-stop, and self-closing features. Provide under top mounted 100 lb self-closing slides. Twelve compartment drawer body, and slides, Black. Provide where indicated on plans.

2.6 MILLWORK FABRICATION

- A. Fabricate casework, countertops and related products to dimensions, profiles and details shown on drawings. Fabricate casework square, plumb, and true.

- B. Detailed Requirements For Cabinet Construction:
 - 1. Toe-Base:
 - a. Continuous, ladder type platform with concealed fastening to cabinet bottom, level and secured to floor
 - b. Toe-base at exposed cabinet end panels shall be recessed 1/4 inch from face of finished end, for flush installation of finished base material.
 - c. No cabinet sides-to-floor will be allowed.
 - 2. Cabinet Top and Bottom:
 - a. Solid sub-top shall be furnished for all base and tall cabinets.
 - b. At cabinets over 36 inches bottoms and tops shall be mechanically joined by a fixed divider.
 - c. Assembly devices shall be concealed on bottom side of wall cabinets.
 - 3. Cabinet Sides:
 - a. Doweled, and glued under pressure, or attached with fully concealed interlocking mechanical fasteners to sub-top and bottom.
 - b. Drill holes for adjustable shelves 1-1/4 inches on center.
 - 4. Cabinet Backs:
 - a. Side bound, captured in grooves, recessed from cabinet rear, and securely fastened at top and bottom.
 - b. Hang rails shall be located at rear of cabinet back and fastened to cabinet sides. Provide minimum of two (2) at base, two (2) at wall, and three (3) at tall cabinets as instructed by casework manufacturer.
 - 5. Exposed end corner and face frame attachment:
 - a. Butt joint, glued and finish nailed; or attached with fully concealed interlocked mechanical fasteners.
 - 6. Door and Drawer Fronts:
 - a. Drawer fronts and hinged doors shall overlay the cabinet body. Maintain a maximum 1/8 inch reveal between pairs of doors, between door and drawer front, or between multiple drawer fronts within the cabinet.

- b. Where indicated, provide Stile and Rail doors with full 1/4 inch plate glass, hinged or sliding. Exposed lite-opening edges shall be trimmed and glazed with extruded glazing bead.
 - c. Where indicated, frameless sliding glass doors shall be 1/4 inch thick plate glass with ground and polished edges. Fit with anodized aluminum shoes and nylon rollers.
 - d. All edges shall be radiused.
- C. Drawers:
- 1. Drawer fronts: apply to separate drawer body component sub-front.
 - 2. Drawer sides: doweled to receive front and back, glued under pressure, machine squared.
 - 3. Drawer bottom: set into front and sides, 1/4 inch deep groove with minimum 3/8 inch standing shoulder, continuously glued. Reinforce drawer bottoms with 1/2 inch by 4 inch front-to-back intermediate underbody stiffeners, mechanically fastened. One at 24 inches, two at 36 inches, and over.
 - 4. Paper storage drawers: fitted with full width hood at back.
 - 5. Hanging file drawers shall be fabricated to accept letter size hanging folders compatible with Pendaflex system.
- D. Vertical and Horizontal Dividers: As required by manufacturer for type and style of component.
- E. Door/Drawer Front Rail: As required by manufacturer for type and style of component, and hardware placement.

PART 3 - EXECUTION

3.1 MILLWORK INSTALLATION

- A. Positioning: Place approximately level, plumb and at right angles to adjacent work.
- B. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging the products and adjacent work.
- C. Anchorage: Attach securely so the products will perform to their maximum ability without damage from inadequate fastenings.
- D. Fasten tops to frames with concealed clips, screws and glue.

3.2 FINISH HARDWARE INSTALLATION

- A. The supplier will mark each item of hardware for location. Protect the markings until each item is installed. If any item is delivered to the job not properly marked, return it to the supplier for marking before attempting to install it.
- B. Check markings on hardware for proper location. Install and make necessary adjustments for proper working order. Any hardware damaged by improper adjustment or careless abuse will be replaced by the Contractor at his expense.
- C. Provide clean, properly sized and accurately placed mortises and drilled holes for all mortise hardware such as locksets and for cylindrical locks where specified only.

- D. Fit all surface-applied hardware accurately.
- E. After hardware is installed, protect exposed surfaces by use of heavy paper and masking tape and maintain until job completion.
- F. Remove all finish hardware except that which is primed for painting before painter's finish is applied. Permanently replace and re-adjust for proper function after painter's finish has dried hard.
- G. Millwork contractor shall be responsible for hardware on millwork.

END OF SECTION

SECTION 07 13 00 -SHOWER STALL WATERPROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Shower stall waterproofing installed at floors of all showers.

1.2 REFERENCES

- A. ASTM International (ASTM)
 - 1. D4068, Standard Specification for Chlorinated Polyethylene (CPE) Sheeting for Concealed Water-Containment Membrane

1.3 RESPONSIBILITY OF COORDINATION

- A. Coordinate the work specified with the following work:
 - 1. Concrete work
 - 2. Plumbing work
 - 3. Gypsum wallboard work

1.4 SUBMITTALS

- A. Product Data: Submit literature and illustrations to indicate the performance and fabrication procedures.
- B. Samples: Submit 12 inch by 12 inch samples for final approval.

1.5 DELIVERY AND STORAGE

- A. Delivery: Deliver clearly labeled, undamaged materials in the manufacturer's unopened containers.
- B. Timing and Coordination: Deliver materials to allow for minimum storage time at the project site. Coordinate delivery with the scheduled time of installation.
- C. Storage: Store materials in a clean, dry location, protected from weather and abuse.

1.6 PRE-INSTALLATION CONFERENCE

- A. Refer to Section 01 31 13 – Project Coordination

1.7 WARRANTY

- A. Warrant the work specified herein for the life of the original installation against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.
- B. Defects shall include, but not be limited to, the following:
 - 1. Deterioration
 - 2. Leaking
 - 3. Releasing from substrate

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers listed whose products meet or exceed the specifications are approved for use on the project. Other manufacturers must have a minimum of five (5) years experience manufacturing equivalent products to those specified and comply with Division 1 requirements regarding substitutions to be considered.
1. Chloraloy 240 CPE Shower Pan Liner manufactured by The Noble Company, Grand Haven, MI; (800) 878-5788

2.2 MATERIALS

- A. Shower Pan:
1. Type: Chlorinated polyethylene (CPE) waterproofing/cleavage membrane for full mortar bed ceramic tile installations at shower pans and shower floor waterproofing and drain systems.
 2. Thickness: 0.040 inch nominal.
 3. Weight: Approximately 60 lbs. per roll.
 4. Coverage: 200 square feet per roll.
 5. Roll Sizes: 60 inches wide x 40 feet long and 48 inches wide x 50 feet long.
- B. Adhesive and Accessories: Type recommended by manufacturer to suit application.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Locations: Install membrane in accordance with manufacturer's instructions under shower stall floors and around perimeter of shower area, up walls and over curbs, where indicated.
- B. Coordinate work with Section 03 30 00, Cast-In-Place Concrete and Section 09 21 16, Gypsum Wallboard Systems.
- C. Adjacent work: Protect work by masking, covering, or other precautionary methods. Remove protection when no longer necessary.
- D. Lengths: Install membrane with minimum number of joints within the shower floor. If membrane is not available in a single width, join by lapping membrane minimum two (2) inches and seal joint throughout its length in accordance with manufacturer's instructions.
- E. Penetrations: Where drain penetrates membrane, make opening snug and seal in accordance with manufacturer's instructions.

End of Section

SECTION 07 84 00 - FIRESTOPPING AND FIRE SAFING

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Non-combustible firestopping and fire safing materials, and accessories as shown on drawings, or if not shown, as required, including, but not limited to the following:
 - 1. Intumescent Caulks, Elastomerics, Sealants, Compounds, Putties, Joint Sprays, Wrap Strips, and Coatings
 - 2. Silicone Sealants
 - 3. Mortar Materials (Cementitious)
 - 4. Firestopping Foam Materials
 - 5. Fire Block Materials
 - 6. Pillow Materials
 - 7. Mat Materials

- B. General description of the work in this section:
 - 1. Only tested firestop systems shall be used in specific locations as follows:
 - a. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
 - b. Blank openings through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
 - c. Openings and penetrations in fire-rated partitions or walls containing fire doors.
 - d. Openings around structural members which penetrate floors or walls.

1.2 RELATED WORK

- A. Section 07 92 00 - Building Sealants
- B. Section 09 21 16 - Gypsum Wallboard Systems: Wallboard used for fire rated construction.
- C. Division 23 - Mechanical: Requirements for penetrations through fire rated construction.
- D. Division 26 - Electrical: Requirements for penetrations through fire rated construction.

1.3 REFERENCES

- A. ASTM International (ASTM)
 - 1. C665, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
 - 2. E84, standard Test Method for Surface Burning Characteristics of Building Materials
 - 3. E119, Standard Test Methods for Fire Tests of Building Construction and Materials
 - 4. E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops
 - 5. E2174, Standard Practice for On-Site Inspection of Installed Fire stops

- B. National Fire Protection Association (NFPA)

1. 70, National Electric Code
 2. 101, Life Safety Code
- C. Underwriters Laboratories (UL)
1. 263, Fire Tests of Building Construction and Materials
 2. 1479, Fire Test of Through-Penetration Firestops
 3. 2079, Tests for Fire Resistance of Building Joint Systems
 4. UL Fire Resistance Directory:
 - a. Firestop Devices (XHJI)
 - b. Fire Resistance Ratings (BXRH)
 - c. Through-Penetration Firestop Systems (XHEZ)
 - d. Fill, Voids, or Cavity Material (XHHW)
 - e. Forming Materials (XHKU)
 - f. Joint Systems (XHBN)

1.4 PERFORMANCE AND QUALITY ASSURANCE REQUIREMENTS

- A. Firestopping Materials:
1. Shall be rated as non-combustible when tested in accordance with ASTM E119 to achieve fire rating noted on the drawings and provide a fire rating equal to that of construction being penetrated. If no such fire rating is noted on the drawings, the fire rating shall be required by the authorities having jurisdiction.
 2. If such materials are used in a through-penetration seal condition, they shall be approved for such use, with all required devices and accessories forming an assembly or included in the test, when tested in accordance with ASTM E814 or UL 1479.
 3. Tests shall be performed by an approved testing agency to indicate compliance with specified requirements and the resulting approval number shall be the latest or current test approved by authorities having jurisdiction. For those firestop applications that exist for which no UL tested system is available through a manufacturer, an engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth by the International Firestop Council.
- B. Fire safing Materials:
1. Shall be tested and rated non-combustible to achieve fire rating noted on the drawings, or if not noted, as required by authorities having jurisdiction.
 2. If such materials are used in an assembly, they shall be approved for such use, with all required devices and accessories forming an assembly or included in the test.
 3. Tests shall be performed by an approved testing agency to indicate compliance with specified requirements and the resulting approval number shall be the latest or current test approved by authorities having jurisdiction.
 4. Proposed fire safing materials and methods shall conform to applicable governing codes having local jurisdiction.
- C. Definitions: As they appear in this Section:
1. Combustible: Penetrations composed of any material which will burn or melt in a fire, including, but not limited to the following:
 - a. Nonmetallic pipes made of glass or plastic.
 - b. Metallic pipes made of lead or aluminum.
 - c. Electrical, data, communication, security, and telephone cables.
 2. Non-combustible: Penetrations composed of any material which will not burn or melt in a fire, including, but not limited to the following:

- a. Metallic pipes made of steel, iron or copper.
 3. Approved Testing Agencies: UL or other testing agency licensed and equipped to conduct the required fire tests and approved by authorities having jurisdiction.
 4. Authorities Having Jurisdiction: Shall be the person or entity responsible for applicable governing code enforcement.
- D. Manufacturer Qualifications: Those listed in Paragraph 2.1, A, or company specializing in manufacturing the products specified in this Section with minimum of five (5) years experience. Refer Division 1 for substitutions.
- E. Installer Qualifications: Company specializing in performing the Work of this Section with minimum three (3) years experience installing tested and classified firestop and fire safing systems or manufacturer certification and approval.
- F. Standards: All firestop and fire safing systems shall have a flame (F) rating and temperature (T) rating conforming to applicable building codes and in accordance with Drawings and Specifications.
- G. Single Source Responsibility: Obtain firestopping and fire safing materials from a single manufacturer for each different product required.
- H. No firestopping or fire safing materials shall be concealed or covered until they have been observed and approved for use by the Architect and/or authorities having jurisdiction.

1.5 CONTRACTOR'S RESPONSIBILITIES

- A. As scope and performance documents, the Drawings and Specifications do not necessarily indicate or describe all the Work required for the performance and completion of the Work. Contracts will be let on the basis of such documents with the understanding that the Contractor shall furnish and install the items required for proper completion of the Work without adjustment to price or schedule. Work shall be of sound, quality construction and the Contractor shall be solely responsible for the inclusions of adequate labor and materials to cover the proper and timely furnishing and installation of the firestopping and fire safing indicated, described, or implied.
- B. As a performance specification, the criteria for the solution of the firestopping and fire safing indicated on the Drawings or specified herein are for the sole purpose of defining the design intent and performance requirements. The details shown, if any, are intended to emphasize the acceptable performance requirements for this Project. To avoid any misunderstanding or lack of interpretation, the Contractor is hereby advised that the responsibility for all firestopping and fire safing are totally his and that designs and resolutions proposed by the Contractor through his submittals and related documentation shall be demonstrated throughout the Work and warranty period specified herein.
- C. Design proposal submissions which follow exactly the details indicated on the Drawings, will not relieve the Contractor of his responsibility for the design, furnishing, installation, or performance of the Work of this Section.
- D. In the event of a controversy over any requirements of this Section, the decision of the Architect will take precedence.

1.6 SUBMITTALS

- A. Product Data:
1. Manufacturer's technical data on product characteristics, performance, and

- limitation criteria for each material including UL firestop systems to be used.
2. Manufacturer's installation instructions.
 3. Manufacturer's Material Data Sheets (MSDS)
- B. Shop Drawings: Manufacturer's shop drawings or detail sheets indicating each condition that requires a penetration or joint seal. Details must be in accordance with the proposed approved system. Include materials to be used, anchorage, methods of installation and relationship to all adjacent construction.
- C. Manufacturer's engineering judgment identification number and drawing details when no UL system is available for an application. Engineering judgment must include both project name and contractor's name who will install firestop system as described in drawing.
- D. Certifications:
1. Manufacturer's certification of compliance indicating approval of authorities having jurisdiction for combustibility and use of materials, and that their installation conforms to shown or required fire rating.
 2. Manufacturers affidavit that materials used in Project contain no asbestos.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.
- B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.
- C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.
- D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.
- E. Do not use damaged or expired materials.

1.8 INSTALLER QUALIFICATIONS

- A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.
- B. Installer Training: A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

1.9 REGULATORY REQUIREMENTS

- A. Conform to fire resistance ratings and surface burning characteristics of authorities having jurisdiction.
- B. Provide certificate of compliance from manufacturer indicating approval of authorities having jurisdiction for combustibility and use of materials, and that their installation

conforms to shown or required fire rating.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Do not use materials that contain flammable solvents.
- B. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
- C. Environmental conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.
- D. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.
- E. Provide ventilation in areas to receive solvent cured materials.

1.11 PRE-INSTALLATION CONFERENCE

- A. Refer to Section 01 31 13 – Project Coordination

1.12 SEQUENCING

- A. Sequence Work to permit firestopping and fire safing materials to be installed after adjacent and surrounding work is complete.

1.13 WARRANTY

- A. Warrant the work specified herein for two (2) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials and workmanship.
- B. Defects shall include, but not be limited to:
 - 1. Use of incorrect material within the installation
 - 2. No mineral wool insulation within a system that requires it.
 - 3. Use of mineral wool insulation when ceramic fiber insulation is required.
 - 4. Incorrect amount of material is installed within system.
 - 5. No use of an accessory seal within a system that requires one.
 - 6. Use of an incorrect system with a firestop or fire safing installation
 - 7. Failure to meet specified performance or quality assurance requirements.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/PRODUCTS

- A. Subject to compliance with through penetration firestop systems listed in Volume II of the UL Fire Resistance Directory (XHEZ), manufacturers specified are approved for use in the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 01.
 - 1. Hilti, Inc.
 - 2. Nelson Firestop Products

3. Specified Technologies, Inc.
 4. Tremco Inc.
 5. 3M Fire Protection Products
- B. To maintain clarity of products, specifications are based on specified products manufactured by Hilti, Inc.; Tulsa, OK. Listed manufacturers providing equivalent products are acceptable for use on this project.
- C. It is recognized that the manufacturers listed may not produce all of the specified types of products, therefore, products from several manufacturers may be used throughout the project as long as consistent use of each individual product is maintained throughout the project, they meet the requirements specified herein for the intended use, and are approved for that use by authorities having jurisdiction. Products which are combined to form a UL listed assembly must be provided as tested and approved as shown in the Fire Resistance Directory.

2.2 MATERIALS AND COMPONENTS

- A. General:
1. Any of the following materials, either by itself or in combination with other materials may be used on the Project provided they:
 - a. Satisfy the firestopping and fire safing requirements for use in the required application on the Project.
 - b. Meet the performance and quality assurance requirements specified herein.
 - c. Are approved for use in that application by the authorities having jurisdiction.
 2. Materials shall comply with ASTM E814 (UL 1479) or ASTM E119 (UL 263), and shall be manufactured of non-toxic, non-hazardous, asbestos free materials. Product shall bear proper independent test laboratory label/logo and shall conform to construction assembly type, penetrating item type, annular space requirements, and fire rating involved for each separate instance.
- B. Primers: Conform to firestop manufacturer's recommendations for primers required for various substrates and conditions.
- C. Back-Up (Damming) Materials: Conform to firestop manufacturer's recommendations for back-up (damming) materials. Material may be removable or permanent as recommended by manufacturer to suit application and as required by UL testing or other testing agency approved by authorities having jurisdiction.
- D. Retainers: Steel angles, clips, sheet metal, and impaling fasteners to support damming material and fire safing material and where required by UL testing or other testing agency approved by authorities having jurisdiction.
- E. Adhesives and Fasteners: Conform to firestop manufacturer's recommendations for adhesives and fasteners required for various substrates and conditions and to suit intended use. Materials must conform to those required by UL testing or other testing agency approved by authorities having jurisdiction.
- F. Firestopping Fill, Void, and Cavity Materials: Shall conform to those required by UL testing or other testing agency approved by authorities having jurisdiction, including, but not be limited to the following. Refer to list of approved manufacturers:

1. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
 - a. "FS-ONE Intumescent Firestop Sealant" manufactured by Hilti, Inc.
 - b. "CP 604 Self-leveling Firestop Sealant" manufactured by Hilti, Inc.
 - c. "CP 620 Fire Foam" manufactured by Hilti, Inc.
 - d. "CP 606 Flexible Firestop Sealant" manufactured by Hilti, Inc.
 - e. "CP 601s Elastomeric Firestop Sealant" manufactured by Hilti, Inc.
2. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:
 - a. "CP 601s Elastomeric Firestop Sealant" manufactured by Hilti, Inc.
 - b. "CP 606 Flexible Firestop Sealant" manufactured by Hilti, Inc.
 - c. "FS-ONE Intumescent Firestop Sealant" manufactured by Hilti, Inc.
3. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:
 - a. "FS-ONE Intumescent Firestop Sealant" manufactured by Hilti, Inc
4. Foams, Intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:
 - a. "FS-ONE Intumescent Firestop Sealant" manufactured by Hilti, Inc
 - b. "CP 620 Fire Foam" manufactured by Hilti, Inc
 - c. "CP 601s Elastomeric Firestop Sealant" manufactured by Hilti, Inc
 - d. "CP 606 Flexible Firestop Sealant" manufactured by Hilti, Inc
5. Non curing, re-penetrable, intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:
 - a. "CP 618 Firestop Putty Stick" manufactured by Hilti, Inc
 - b. "CP 658T Firestop Plug" manufactured by Hilti, Inc
6. Wall opening protective materials for use with U.L. listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:
 - a. "CP 617 Firestop Putty Pad" manufactured by Hilti, Inc.
7. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:
 - a. "CP 643N Firestop Collar" manufactured by Hilti, Inc
 - b. "CP 644 Firestop Collar" manufactured by Hilti, Inc
 - c. "CP 645/648 Wrap Strips" manufactured by Hilti, Inc.
8. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
 - a. "CP 637 Firestop Mortar" manufactured by Hilti, Inc
 - b. "FS 657 FIRE BLOCK" manufactured by Hilti, Inc
 - c. "CP 620 Fire Foam" manufactured by Hilti, Inc
 - d. "CP 675T Firestop Board" manufactured by Hilti, Inc
9. Non curing, re-penetrable materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
 - a. "FS 657 FIRE BLOCK" manufactured by Hilti, Inc
 - b. "CP 675T Firestop Board" manufactured by Hilti, Inc.
10. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected, the following products are acceptable:
 - a. "FS 657 FIRE BLOCK" manufactured by Hilti, Inc
 - b. "CP 658T Firestop Plug" manufactured by Hilti, Inc

- G. Fire Related Construction Joints and Other Gaps:
 - 1. "CP 601S" Elastomeric Firestop Sealant" manufactured by Hilti, Inc.
 - 2. "CP 606" Flexible Firestop Sealant" manufactured by Hilti, Inc.
 - 3. "CP 672" Firestop Joint Speed Spray" manufactured by Hilti, Inc.

- H. Fire Safing Materials: Comply with ASTM C665, Type I, high-melt mineral-fiber insulation with minimum nominal density of 4.0 lbs. per cubic foot and having a maximum flame spread rating of 15 and smoke developed rating of 0. Size shall be 4 inches thick by 24 inches wide by 48 inches long, unless noted otherwise. Products containing asbestos strictly prohibited.
 - 1. "Thermafiber Safing Insulation" manufactured by Thermafiber, Inc.
 - 2. "Fibrex Safing Insulation" manufactured by Fibrex Insulations, Inc.
 - 3. "Delta Safing Board" manufactured by Rock Wool Manufacturing Company.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine joints and openings indicated or required to receive firestop and fire safing materials, for compliance with requirements for proper configuration, installation tolerances and other conditions affecting firestop and fire safing performance.

- B. Do not proceed with installation until unsatisfactory conditions are corrected.

- C. Beginning installation shall indicate acceptance of existing conditions. Work found to be defective or deficient due to uncorrected existing conditions prior to installation should be repaired or replaced at no additional expense to Owner.

3.2 PREPARATION

- A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
 - 1. Verify penetrations are properly sized and in suitable condition for application of materials.
 - 2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
 - 3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
 - 4. Install back-up (damming) materials to arrest liquid material leakage.
 - 5. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

3.3 COORDINATION

- A. Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.

- B. Responsible trades to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

3.4 INSTALLATION

- A. General:
 - 1. Install firestop and fire safing materials in accordance with manufacturer's recommendations to provide F and T ratings as required by authorities having jurisdiction.
 - 2. Install firestop materials in accordance with UL Fire Resistance Directory.
 - 3. Install firestop and fire safing materials with sufficient pressure to properly fill and seal openings, then tool or trowel exposed surfaces.

- B. Firestopping Materials:
 - 1. Install primer and firestopping material in sufficient thickness, with required accessories to achieve rating, to uniform density and texture, in accordance with manufacturer's instructions and authorities having jurisdiction.
 - 2. Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping.
 - 3. Consult with mechanical engineer, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
 - 4. Remove dam material after firestopping material has cured or allow dam material to remain if required to maintain fire rating integrity or required by authorities having jurisdiction.
 - 5. Do not conceal or enclose any firestopping materials until they have been examined and approved for use by the Architect and authorities having jurisdiction.

- C. Fire Safing Materials:
 - 1. Install fire safing in sufficient thickness, with retainer materials where shown or required to achieve fire rating in accordance with manufacturer's instructions and authorities having jurisdiction.
 - 2. Do not conceal or enclose any fire safing materials until they have been examined and approved for use by the Architect and authorities having jurisdiction.

3.5 PROTECTION OF FINISHED WORK

- A. Protect adjacent surfaces from damage by material installation.

3.6 CLEANING

- A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

- B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

3.7 FIELD QUALITY CONTROL

- A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
- B. Keep areas of work accessible until inspection by applicable code authorities.
- C. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops".
- D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

End of Section

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Interior sealants and caulking.

1.2 RELATED WORK

- A. Section 07 84 00 - Firestopping: firestopping penetrations
- B. Section 08 80 00 - Glazing Systems: glazing sealants
- C. Section 09 21 16 - Gypsum Board assemblies: acoustical sealants
- D. Division 23 - Mechanical Sections

1.3 REFERENCES

- A. ASTM International (ASTM)
 - 1. C717, Standard Terminology of Building seals and Sealants
 - 2. C793, Standard Test Method for Effects of Accelerated Weathering on Elastomeric Joint Sealants
 - 3. C794, Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
 - 4. C834, Standard Specification for Latex Sealants
 - 5. C920, Standard Specification for Elastomeric Joint Sealants
 - 6. C1193, Standard Guide for Use of Joint Sealants
- B. Sealant, Waterproofing and Restoration Institute (SWRI)
 - 1. The Professional's Guide

1.4 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
 - 2. Manufacturer's installation instructions
- B. Sample: On site sample for Architect's approval of colors.
- C. Certification: Manufacturer's affidavit that materials used in Project contain no asbestos.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: experienced in building sealant installation whose work has resulted in sealant installations with a record of successful performance.
- B. Source Limitations: unless specifically indicated, obtain each type of building sealant through one source from a single manufacturer.

- C. Pre-construction Field Adhesive Testing: Prior to installation of building sealants, field test their adhesion to joint substrates in accordance with manufacturer's instructions. Perform test in locations indicated by Architect. Perform test for each type of building sealant and each substrate as required by Architect. If required by Architect, arrange for tests to be performed with sealant manufacturer's representative present. Follow-up review by Architect and manufacturer may be required to observe sealant performance over time and may result in re-application of sealant or replacement.
- D. Cleaning: Facade sealants that have collected dirt at the time of Substantial Completion shall be cleaned over the entire facade prior to acceptance by the Owner. 11 months after final completion of the building, if the sealant joints show dirt, they shall again be cleaned over the entire façade.

1.6 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of sealants when joint substrates are wet or when ambient temperature conditions are above limits permitted by sealant manufacturers or are below 40 degree F.
- B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions: Do not proceed with installation of sealants until contaminates which may interfere with adhesion are removed from substrates.

1.7 PRE-INSTALLATION CONFERENCE

- A. Refer to Section 01 31 13 – Project Coordination.
- B. In addition, refer to information above concerning Field Adhesive Testing.

1.8 WARRANTY

- A. Warrant the work specified herein for two (2) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.
- B. Defects shall include, but not be limited to:
 - 1. Leaking
 - 2. Cracking, splitting or releasing from substrate
 - 3. Deterioration or color change

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Specifications are based on the products or materials of the named manufacturer, otherwise selection may be made from any manufacturer listed below whose products meet or exceed the specifications. Other manufacturers must have a minimum of five (5) years experience manufacturing the products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.
 - 1. Typical Sealants:
 - a. Bostik

- b. Pecora, Inc.
- c. Sonneborn
- d. Sika
- e. Tremco Incorporated
- 2. Silicone Sealants at Appliances:
 - a. Pecora, Inc.
 - b. General Electric Co.
 - c. Dow Corning

2.2 MATERIALS

- A. Caulking for Exposed Non-Working Interior Locations:
 - 1. Type: Acrylic Latex, conforming to ASTM C834; single component, paintable.
 - 2. Applications: Use for interior wall and ceiling joints, joints between door and window frames and wall surfaces, and other interior non-traffic-bearing joints for which no other type of sealant is indicated.
- B. Sealant for Working Joints:
 - 1. Type: Polyurethane, conforming to ASTM C920, Type M, Grade NS, Class 25; multi-component, non-sagging.
 - 2. Applications: Use for:
 - a. Joints between concrete and other materials.
 - b. Joints between metal frames and other materials.
- C. Acoustical Sealant:
 - 1. As specified in section 09 21 16, Gypsum Board Assemblies
- D. Rubber Sealant:
 - 1. Type: Butyl sealant, conforming to ASTM C920, Type NT, Grade NS, Class 12-1/2; single component, solvent release, non-skinning, non-sagging.
 - 2. Movement Capability: Plus and minus 12-1/2 percent
 - 3. Service Temperature range: -13 to 180 degree F
- E. Sealant at Sanitary Locations:
 - 1. Type: Single component, silicone sealant conforming to ASTM C920, Type S, Grade NS, Class 25, mildew resistant, non-yellowing.
 - 2. Application: Use for joints between plumbing fixtures and floor and wall surfaces, and joints between kitchen and bathroom counter tops and wall surfaces, unless indicated otherwise. Use at all Kitchen appliances.
 - 3. See Section 09 30 13, Ceramic Tile for sealant at tile surfaces.
 - 4. Approved Product/Manufacturer: Sanitary SCS1700 Sealant manufactured by General Electric Company, Pecora Corp., Dow Corning, or Architect approved equal.
- F. Primers, Cleaners, Top Coats: Use only materials listed as suitable in resistance to staining, compatibility and durability before proceeding.
- G. Expanded Polyethylene Joint Filler: Provide flexible, compressible, closed-cell, polyethylene of not less than 10 psi compression deflection (25 percent); except provide higher compression deflection strength as may be necessary to withstand installation forces and provide proper support for sealants, surface water absorption of not more than 0.1 pounds per square foot, as manufactured by Sonneborn, or pre-approved equal.
- H. Sealant Backer Rod: Provide compressible rod stack of polyethylene foam, polyurethane foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other

flexible, permanent, durable, non-absorptive material as recommended by sealant manufacturer for back-up of and compatibility with sealant. Where used with hot-applied sealant, provide heat-resistant type, which will not be deteriorated by sealant application temperature as indicated.

- I. Bond Breaker Tape: Provide polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Temperatures: Do not install sealants when air temperature is under 40 degrees F. Sealants may be warmed to ease installation when recommended by the manufacturer.
- B. Tooling: Tool exposed joints to a slightly concave surface using slicking materials recommended by the manufacturer. The tooling procedure shall press sealant against the sides of the groove. No materials shall be left "feathered" out or smeared on the abutting materials. If necessary, protect adjacent surfaces with tape. Completed joints shall have a uniform professional appearance. Use an anti-tack compound on sealant that does not set up fast enough to avoid dust collection.
- C. Sealant Back-Up: Provide back-up filler where groove depth is too great to fill with sealant. Review joint design with Architect.
- D. Compressive Filler: Seal vertical expansion joints with fillers. Provide compressible filler twice the width of the joint and with a depth of 1-1/2 times the compressed width. Lap ends 2 inch minimum.
- E. Seal ends together in such a manner to allow natural drainage. Install filler by compressing material and sliding into joint. Align filler on one face of the joint before it expands to the full joint width.

End of Section

SECTION 08 11 00 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements including but not limited to:
 - 1. Exterior and interior steel doors and frames.
 - 2. Preparation of doors and frames to receive electronic hardware.
 - 3. Accessories necessary for a complete installation.
- B. Related Work:
 - 1. Section 087100 - Door Hardware.
 - 2. Section 099000 - Field Paint and Coatings.

1.2 SUBMITTALS

- A. Product Data: Technical data for each product indicated, including material descriptions, core descriptions, label compliance, sound and fire resistance ratings, temperature rise ratings and finishes for each type of door and frame specified.
- B. Shop Drawings: Submit door and frame schedule using same reference designations indicated on Drawings.
 - 1. Include opening size(s), handing of doors, frame throat dimensions, details of each frame type, elevations of door design types, details of construction, location and installation requirements of door hardware and reinforcements, hardware group numbers, details of joints and connections, fire label requirements including fire rating time duration, maximum temperature rise requirements, and smoke label requirements.
 - 2. Indicate routing of electrical conduit and dimensions and locations of cutouts in doors and frames to accept electric hardware devices.
- C. Certificate of Compliance for Fire Rated Doors: Provide copies of Certificate of Compliance for fire rated door assemblies, smoke and draft control door assemblies, and temperature rise rated door assemblies.
 - 1. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with applicable requirements of the IBC for steel doors and frames.
 - 2. Accessibility Requirements: Comply with applicable requirements.
 - a. U.S. Architectural and Transportation Barriers Compliance Board Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG) 2010.
 - b. ICC/ANSI A117.1 Accessible and Useable Building and Facilities.
 - c. Texas Accessibility Standards (TAS) 2012.
 - 3. Steel Door and Frame Standard: Comply with applicable provisions of Hollow Metal Manufacturers Association (HMMA) Div. of National Association of Architectural Metal Manufacturers (NAAMM):
 - a. HMMA *Hollow Metal Manual*.
 - b. HMMA 861 *Guide Specifications for Commercial Hollow Metal Doors and Frames*.
 - 4. Fire Rated Door Assemblies: Assemblies complying with NFPA 80 listed and labeled by testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated,

based on testing according to NFPA 252. Provide metal labels permanently fastened on each door and frame assembly within size limitations established by the labeling authority having jurisdiction.

- a. Positive Pressure Rated Door Assemblies: Where indicated provide positive pressure rated fire rated door assemblies. Sizes and configurations as shown on the Drawings. Installed door assemblies shall be in accordance with door manufacturer's certified assemblies.
 - 1) Test Pressure: Test according to NFPA 252 or UL 10C. After 5 minutes into the test, neutral pressure level in furnace shall be established at 40 inches (1000 mm) or less above the sill.
 5. Smoke Control Door Assemblies: Comply with NFPA 105 or UL 1784.
 6. Fire Rated, Borrowed Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire protection ratings indicated, based on testing according to NFPA 257 or UL 9.
- B. Manufacturer Qualifications: Firm having minimum 10 years documented experience in manufacturing steel doors and frames, with sufficient production capacity to produce required units.
- C. Source Limitations: Obtain steel doors and frames from single source from single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palleted, wrapped, or crated to provide protection during transit and site storage. Do not use nonvented plastic. Provide additional protection to prevent damage to factory finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work vertically under cover at site with head up. Place on minimum 4 inch (102 mm) high wood blocking. Provide minimum 1/4 inch (6 mm) space between each stacked door to permit air circulation.
- D. Inspect doors and frames, on delivery, for damage. Tool marks, rust, blemishes, and other damage on exposed surfaces is not acceptable. Remove and replace damaged items directed by Owner. Store doors and frames at building site in dry location and off ground to prevent deterioration.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers: Subject to compliance with requirements, provide doors and frames by one of the following:
 1. Ceco Door Products.
 2. Curries Company.
 3. Steelcraft; a division of Ingersoll-Rand.
- B. Cold Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

- D. Metallic Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot dip galvanized according to ASTM A 153/A 153M, Class B.
- F. Inserts, Bolts, and Fasteners: Hot dip galvanized according to ASTM A 153/A 153M.
- G. Power Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- H. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- I. Mineral Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame spread and smoke developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- J. Glazing: Refer to Section 088000.
- K. Bituminous Coating: Cold applied asphalt mastic, compounded for 15 mil (0.4 mm) dry film thickness per coat. Provide inert type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.2 DOORS

- A. Commercial Steel Doors, Interior: Comply with NAAMM-HMMA 861. Provide flush design doors, 1-3/4 inches (44 mm) thick, of seamless hollow construction, unless otherwise indicated. Construct doors joined at vertical edges by continuous welding full height of the door, with no visible seams on faces or vertical edges, and welds ground and finished flush.
 - 1. Face Construction: Flush design with 0.042 inch (1.06mm) thick cold rolled stretcher leveled steel face sheets and metal components from hot or cold rolled steel sheets. For heavy use doors, provide, fabricate with 0.067 inch (1.7mm) thick cold rolled, stretcher leveled steel face sheets and metal components from hot or cold rolled steel sheets.
 - 2. Steel Stiffened Door Cores: Provide minimum thickness 0.026 inch (0.66 mm), steel vertical stiffeners of same material as face sheets extending full door height, with vertical webs spaced not more than 6 inches (152 mm) apart. Spot weld to face sheets no more than 5 inches (127 mm) o.c. Fill spaces between stiffeners with glass or mineral fiber insulation.
 - a. Fire Door Cores: As required to provide fire protection and temperature rise ratings indicated. Provide continuous mineral fiberboard core permanently bonded to the inside face of the outer face sheet unless otherwise required to provide fire protection and temperature rise ratings indicated.
 - 3. Edge Construction: Continuously welded with no visible seam.
 - 4. Vertical Edges for Single Acting Doors: Bevel edges 1/8 inch in 2 inches (3.2 mm in 51 mm).
 - 5. Top and Bottom Channels: Spot weld metal channel not less than thickness of face sheet to face sheets not more than 6 inches (150 mm) o.c.
 - a. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
 - b. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
 - 6. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of

door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

- B. Hardware Reinforcement: ANSI/NAAMM-HMMA 861; fabricate reinforcing from the same material as door to comply with requirements. Offset reinforcement so that faces of mortised hardware items are flush with door surfaces.
1. Hinges and Pivots: 0.167 inch (4.2 mm) thick by 1-1/2 inches (38 mm) wide by 9 inches (229 mm).
 2. Lock Front, Strike, and Flushbolt Reinforcements: 0.093 inch (2.3 mm) thick by size as required by hardware manufacturer.
 3. Lock Reinforcement Units: 0.067 inch (1.7 mm) thick by size as required by hardware manufacturer.
 4. Closer Reinforcements: 0.093 inch (2.3 mm) thick one piece channel by size as required by hardware manufacturer.
 5. Other Hardware Reinforcements: Required for adequate strength and anchorage; in lieu of reinforcement specified, hardware manufacturers recommended reinforcing units may be used.
 6. Exit Device Reinforcements: 0.250 inch (6.35 mm) thick by 10 inches (245 mm) high by 4 inches (101 mm) wide centered on exit device case body, unless otherwise recommended by exit device manufacturer.
 7. Electrical Requirements: Make provisions for installation of electrical items specified elsewhere; arrange so wiring can be readily removed and replaced.
 - a. Provide cutouts and reinforcements required for steel doors to accept security system components.
 - b. Doors with Electric Hinges and Pivots: Provide with metal conduit or raceway to permit wiring from electric hinge or pivot to other electric door hardware.
 - 1) Hinge Location: Center for doors less than 90 inches (2286 mm) tall or second hinge from door bottom for doors greater than 90 inches (2286 mm); top or bottom electric hinge locations shall not be permitted.

2.3 FRAMES

- A. Commercial Frames, Interior: Comply with NAAMM-HMMA 861. Fabricate interior steel frames, formed to profiles indicated, with full 5/8 inch (16 mm) stops, and of minimum thickness specified. Knock down frames are not permitted.
1. Openings up to and Including 48 Inches (1200 mm) Wide, Interior: Flush design with 0.053 inch (1.30 mm) thick cold rolled stretcher leveled steel face sheets and metal components from hot or cold rolled steel sheets, metallic coated steel sheet with minimum G60 (Z180) coating.
 2. Door Frames for Openings More Than 48 Inches (1219 mm) Wide: Fabricated from 0.067 inch (1.7 mm) thick steel sheet.
 3. Exposed Finish: Primed for field finish.
 4. Construction: Full profile welded; provide frames either saw mitered and full (continuously) welded, or machine mitered and full welded, on back side at frame corners and stops with edges straight and true. Grind welds smooth and flush on exposed surfaces. Provide countersunk, flat or oval head exposed screws and bolts for exposed fasteners unless otherwise indicated.
- B. Hardware Reinforcement: Fabricate reinforcements from same material as frame. Offset reinforcement so faces of mortised hardware items are flush with surface of the frame.
1. Hinges and Pivots: 0.167 inch (4.2 mm) thick by 1-1/4 inches (32 mm) wide by 10 inches (254 mm).
 2. Strike, Surface Mounted Hold Open Arms, and Flushbolt Reinforcements: 0.093 inch (2.3 mm) thick by size as required by hardware manufacturer.
 3. Closer Reinforcements: 0.093 inch (2.3 mm) thick one piece channel by size as required by hardware manufacturer.
 4. Other Hardware Reinforcements: As required for adequate strength and anchorage.

5. Electrical Requirements: Make provisions for installation of electrical items specified elsewhere; arrange so wiring can be readily removed and replaced.
 - a. Provide cutouts and reinforcements required for steel frames to accept security system components.
 - b. Frames with Electric Hinges and Pivots: Provide welded on UL listed back boxes with metal conduit or raceway to permit wiring from electric hinge or pivot to other electric door hardware.
 - 1) Hinge Location: Center for doors less than 90 inches (2286 mm) tall or second hinge from door bottom for doors greater than 90 inches (2286 mm); top or bottom electric hinge locations shall not be permitted.
- C. Jamb Anchors: Locate jamb anchors above hinges and directly opposite on strike jamb required to secure frames to adjacent construction. At metal stud partitions locate additional jamb anchor below the top hinge.
 1. Masonry Type: Adjustable strap and stirrup or T shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
 2. Stud Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
 - a. Three anchors per jamb up to 60 inches (1500 mm) in height.
 - b. Four anchors per jamb from 60 to 90 inches (1500 to 2250 mm) in height.
- D. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor. Extend floor anchors for each jamb and mullion to floor; formed of same material as frame, 0.093 inch (2.3 mm) thick; and punched with two holes to receive fasteners. Where floor fill or setting beds occur support frame by adjustable floor anchors bolted to the structural substrate. Terminate bottom of frames at finish floor surface.
- E. Head Strut Supports: Provide 3/8 inch by 2 inch (9 mm by 50 mm) vertical steel struts extending from top of frame at each jamb to supporting construction above. Bend top of struts to provide flush contact for securing to supporting construction above by bolting, welding, or other suitable anchorage. Provide adjustable wedged or bolted anchorage to frame jamb members to permit height adjustment during installation. Adapt jamb anchors at struts to permit adjustment.
- F. Head Reinforcement: For frames more than 48 inches (1200 mm) wide in masonry wall openings, provide continuous steel channel or angle stiffener, 0.093 inch (2.3 mm) thick for full width of opening, welded to back of frame at head. Do not use head reinforcements as a lintel or load bearing member for masonry.
- G. Spreader Bars: Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions to serve as bracing during shipment and handling and to hold frames in proper position until anchorage and adjacent construction have been completed.
- H. Door Silencer Holes: Drill strike jamb stop to receive three silencers on single doorframes and for two silencers on double doorframes. Insert plastic plugs in holes to keep holes clear during installation.
- I. Plaster Guards and Removable Access Plates: Provide 0.016 inch (0.4mm) thick plaster guards or dust cover boxes of same material as frame, welded to frame at back of hardware cutouts to close off interior of openings and prevent mortar or other materials from obstructing hardware operation. Provide removable access plates in the heads of frames to receive overhead concealed door closers.
- J. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.

1. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 2. Provide loose stops and moldings on inside of steel door and frame work.
 3. Form fixed stops and moldings integral with frame, on the exterior (nonsecured) side of the frame. Provide removable stops and moldings formed of 0.032 inch (0.8mm) thick steel sheets matching steel frames. Secure with countersunk oval head machine screws spaced uniformly not more than 12 inches (300 mm) o.c. Form corners with butted hairline joints.
 4. Coordinate rabbet width between fixed and removable stops with type of glass or panel and type of installation indicated.
- K. Borrowed Lites: Steel frames of metallic coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), full profile welded.

2.4 FABRICATION

- A. Commercial Doors: Fabricate doors and frames rigid, neat in appearance, and free of defects, warp, wave, and buckle. Accurately form metal to sizes and profiles indicated. Accurately machine, file, and fit exposed connections with hairline joints. Weld exposed joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
1. Exposed Fasteners: Provide countersunk flat heads for exposed screws and bolts, unless otherwise indicated.
 2. Hardware Preparation: Prepare doors and frames to receive hardware, including cutouts, reinforcement, mortising, drilling, and tapping, according to final hardware schedule and templates provided by hardware supplier. Secure reinforcement by spot welding.
 - a. Comply with applicable requirements of ANSI A115 Series specifications for door and frame preparation for hardware. Factory reinforce doors and frames to receive surface applied hardware.
 - b. Factory drill and tap for surface applied hardware, except at pushplates and kickplates provide reinforcing only. Locate hardware as indicated on the drawings in accordance with HMMA 831.
- B. Commercial 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. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 2. Provide countersunk, flat or oval head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing:
 - 1) Two anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
 - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.
 - b. Stud Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
 - c. Compression Type: Not less than two anchors in each frame.

- d. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
 4. Head Anchors: Two anchors per head for frames more than 42 inches (1067 mm) wide and mounted in metal stud partitions.
 5. Door Silencers: Except on weather-stripped frames, 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.
 - b. Double Door Frames: Drill stop in head jamb to receive two door silencers.
 6. Terminated Stops: Terminate stops 6 inches (152 mm) above finish floor with a 45 degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded steel filler plate, with welds ground smooth and flush with frame.
 7. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
- C. Fabricate concealed stiffeners and edge channels from either cold or hot rolled steel sheet.
- D. Hardware Preparation: Factory prepare steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface mounted door hardware.
 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- E. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 3. Provide loose stops and moldings on inside of work.
 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.5 FINISH

- A. Clean, treat and prime surfaces of fabricated steel door and frame work, inside and out, whether exposed or concealed in the construction.
- B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
1. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- C. Factory Priming for Field Painted Finish: Apply shop primer immediately after surface preparation and pretreatment. Apply a sufficient number of coats, baked on, to obtain uniformly smooth exposed surfaces. Touch up surfaces having runs, smears, or bare spots.
1. Shop Primer: Fast curing, lead and chromate free, primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for zinc coated steel; compatible with substrate and field applied finish paint system indicated.
 2. Finish Coats: Spray finish coats complying with Section 099000.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the work. Examine roughing in for embedded and built in anchors to verify actual locations before frame installation. Prepare written report listing conditions detrimental to performance of the work. Proceed with installation after correcting unsatisfactory conditions.

3.2 PREPARATION

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

3.3 INSTALLATION

- A. Install steel doors and frames work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Frames: Install steel frames of size and profile indicated. Comply with NAAMM-HMMA 840 for installation, the Architect reviewed shop drawings, and manufacturer's written recommendations and installation instructions. Install frames where indicated. Extend frame anchorages below fills and finishes. Coordinate the installation of built in anchors for wall and partition construction required with work.
 - 1. Welded Frames: Set anchorage devices where required for securing frames to in place concrete or masonry construction. Set anchorage devices opposite each anchor location as specified and anchorage device manufacturer's written instructions. Leave drilled holes rough, not reamed, and free of dust and debris.
 - a. Placing Frames: Set frames accurately in position; plumb; align, and brace securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - 1) Install door silencers in frames before grouting.
 - 2) Remove temporary braces necessary for installation after frames have been set and secured.
 - 3) Verify plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - 4) Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - a. Metal Stud Partitions: Solidly pack mineral fiber insulation inside frames.
 - b. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 - c. In Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 - 3. Installation Tolerances: Adjust steel and stainless steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

- b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Steel Doors: Fit steel doors accurately in frames, within clearances specified. Shim as necessary.
- 1. Non Fire Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
 - b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).
 - c. At Bottom of Door: 5/8 inch (15.8 mm) plus or minus 1/32 inch (0.8 mm).
 - d. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
- D. Hardware: Apply hardware in accordance with hardware manufacturer's instructions and Section 087100. Drill and tap for machine screws as required. Do not use self tapping sheet metal screws. Adjust door installation to provide uniform clearance at head and jambs, and to contact stops uniformly. Adjust hardware items just prior to final inspection. Leave work in complete and proper operating condition.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items just before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames that are warped, bowed, or otherwise unacceptable.
- B. Remove grout and bonding material from steel doors and frames immediately after installation.
- C. Prime Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air drying primer. Refer to Section 099000 for field painting of ferrous metals. Spray paint; do not brush.
- D. Touchup Painting: Refer to Section 099000 for cleaning and touchup painting of abraded areas of paint.
- E. Remove and replace defective work, including doors or frames that are warped, bowed, or otherwise defective.
- F. Institute protective measures required throughout the remainder of the construction period to ensure that steel doors and frames will be without damage or deterioration, at time of substantial completion.

End of Section

SECTION 08 14 00 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED WORK

- A. Section 08 11 13.19 - Hollow Metal Frames
- B. Section 08 71 00 - Finish Hardware

1.2 REFERENCES

- A. ASTM International (ASTM)
 - 1. E2074, Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies
- B. Architectural Woodwork Institute (AWI)
 - 1. Quality Standards
- C. Commercial Standard (CS): 236
- D. Intertek Testing, Services (Warnock Hersey, Inc. (WHI)
 - 1. Certification Listings for Fire Doors
- E. National Fire Protection Association (NFPA)
 - 1. 80, Fire Doors and Windows
 - 2. 252, Standard Method of Fire Tests for Door Assemblies
- F. Underwriters Laboratories (UL)
 - 1. 10 (c), Fire Tests of Door Assemblies - Positive Pressure
 - 2. Listings for Fire Doors

1.3 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
 - 2. Manufacturer's installation instructions.
- B. Shop Drawings:
 - 1. Show or schedule location, size, thickness, elevation, details of construction, location and extent of hardware blocking, fire rating, finish requirements and other pertinent data for each door required.
 - 2. Include schedule of hardware preparation required for each door.
 - 3. Indicate requirements for veneer matching.
- C. Samples:
 - 1. Plastic laminate in colors and patterns for Architect's selection.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with AWI Quality Standards, Custom Grade A.

- B. Fire Rated Door Construction:
 - 1. Conform to ASTM E2074, NFPA 252, or UL 10 (c) as applicable and as required by code authorities having jurisdiction.
 - 2. Fire doors shall bear labels, permanently attached to the hinge stile or to top rail that:
 - a. Allows label to be visible when door is open.
 - b. Are approved by and shows testing laboratory approval for classification specified, scheduled or required. The testing laboratory shall be UL or WHI.

1.5 PRE-INSTALLATION CONFERENCE

- A. Refer to Section 01 31 00 – Project Coordination.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver to site, store, protect, and handle doors in accordance with AWI Quality Standards and manufacturer's instructions. Accept doors on site in manufacturer's standard packaging. HVAC systems shall be operating and balanced prior to arrival of doors. Acceptable humidity shall be no less than 25 percent or greater than 55 percent.
- B. Storage:
 - 1. Store doors in a clean and dry location protected from weather and abuse.
 - 2. Stabilize moisture content prior to installation.
- C. Wear clean white cotton gloves when handling factory finished doors.
- D. Mark each door on the top or in the top hinge with opening numbers corresponding to reviewed shop drawings.

1.7 WARRANTY

- A. Provide for lifetime replacing, including cost of rehangng and refinishing, at no cost to Owner, wood doors exhibiting defects in materials or workmanship including, but not limited to the following:
 - 1. Warp in excess of 1/4 inch as defined by AWI.
 - 2. Warp or twist to a degree that door will not operate properly.
 - 3. Delamination of face veneers.
 - 4. Telegraphing or show through of stiles, rails, or core greater than 0.01 inch in any 3 inch area.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Manufacturers listed below whose products meet or exceed the specifications are approved for use on the Project. Other manufacturers must manufacture products meeting or exceeding the specifications, and comply with requirements of Division 1 regarding substitutions to be considered.
 - 1. Graham.
 - 2. The Maiman Company.
 - 3. Algoma Hardwoods.
 - 4. Construction Specialties.

2.2 DOOR CONSTRUCTION, GENERAL

- A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.
- B. Particleboard-Core Doors:
 - 1. Particleboard: ANSI A208.1.

2.3 DECORATIVE-LAMINATE FACED DOORS

- A. Low-Pressure Decorative Laminate Faces:
 - 1. Low-pressure decorative laminates faces thermally fused to cores under heat and pressure, complying with Laminating Materials Association's Product Standard and Typical Physical Properties of Decorative Overlays. LMA.2003.
 - 2. Color or Wood Grain Pattern: To be selected by architect from manufacturers' standard colors and finishes.
 - 3. Exposed Edges: Impact-resistant polymer edging, minimum 0.040-inch thick, applied to all four edges after faces.
 - a. Polymer Edging Color or Wood Grain Pattern: Same as faces.
 - 4. Provide doors with pilot holes factory-drilled for vertical edge hinges and lock sets.
 - 5. Core: Particleboard type M-2.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Follow manufacturer's printed instructions. Coordinate work with door opening construction, and door and frame hardware installation.
- B. Clearances:
 - 1. Head and Jambs: 1/8 inch maximum.
 - 2. Sill: 1/2 inch typically, except provide 1/4 inch clearance from top surface of carpeting.
- C. Verify that frames comply with indicated requirements for type, size, location and swing characteristics and that the frames are installed plumb, level and parallel. Reject doors with defects that are not repairable.
- D. Coordinate hardware installation for proper door operation. Adjust locks and latches to engage snugly without forcing. Align hardware to function without squeaking, binding, or racking. Mortise as required for automatic door bottoms.
- E. Protect doors from damage and replace doors that are damaged. Verify that tops and bottoms of doors have been sealed prior to installation, as required for warranty.

3.2 CLEANING AND REPAIRING

- A. Clean doors in accordance with manufacturer's instructions.
- B. Touch-up damaged finishes to match undamaged finish in accordance with manufacturer's instructions.

- C. Repair or replace damaged doors at no expense to Owner.

End of Section

SECTION 08 31 00 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements including but not limited to:
 - 1. Access doors and frames.
 - 2. Accessories necessary for a complete installation.

1.2 SUBMITTALS

- A. Product Data: Submit technical data for each type of access door and frame indicated including construction details, materials, individual components and profiles, and finishes.
- B. Coordination Drawings: Drawn to scale and coordinating access door and frame installation for ceiling application, with ceiling support, ceiling mounted items, and concealed work above ceiling.
 - 1. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Accessibility Requirements: Comply with applicable requirements.
 - a. U.S. Architectural and Transportation Barriers Compliance Board Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG) 2010.
 - b. ICC/ANSI A117.1 Accessible and Useable Building and Facilities.
 - c. Texas Accessibility Standards (TAS) 2012.
- B. Source Limitations: Obtain access door(s) and frame(s) through one source from a single manufacturer.
- C. Size and Location Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule.

1.4 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in submittals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - 1. Steel Units:
 - a. J. L. Industries, Inc.
 - b. Karp Associates, Inc.
 - c. Larsen's Manufacturing Company.
 - d. Milcor Limited Partnership.
 - 2. GFRC Units: Glass Reinforced Gypsum Drywall Ceiling Access Door by Chicago Metallic.

- B. Recycled Content of Steel Products: To the extent practical, provide products with an average recycled content of steel products so postconsumer recycled content plus one/half of preconsumer recycled content is not less than 25 percent.
- C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 1. Hot Dip Galvanized Steel: Coat to comply with ASTM A 123/A 123M for steel and iron products and ASTM A 153/A 153M for steel and iron hardware.
- D. Steel Sheet:
 - 1. Hot Rolled: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, and surface defects; pickled and oiled.
 - 2. Cold Rolled: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher leveled standard of flatness.
 - 3. Metallic Coated: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with A60 (ZF180) zinc iron alloy (galvannealed) coating or G60 (Z180) mill phosphatized zinc coating; stretcher leveled standard of flatness.
- E. Drywall Beads: Edge trim formed from 0.0299 inch (0.76mm) zinc coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum panels indicated.
- F. Paint:
 - 1. Shop Primer: Fast curing, lead and chromate free, universal modified alkyd primer complying with performance requirements in FS TT-P-664; selected for resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide sound foundation for field applied topcoats despite prolonged exposure.
 - 2. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

2.2 ACCESS DOORS AND FRAMES

- A. Flush Access Doors and Frames with Exposed Trim:
 - 1. Material: Prime painted steel sheet.
 - 2. Assembly: Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
 - 3. Locations: Wall.
 - 4. Door Size: Indicated on Drawings.
 - 1. Door: Minimum 0.060 inch (1.5mm) thick sheet metal, set flush with exposed face flange of frame.
 - 2. Frame: Minimum 0.060 inch (1.5mm) thick sheet metal with 1 inch (25mm) wide, surface mounted trim.
 - 3. Hinges: Continuous piano.
 - 4. Hardware: Tamper resistant.
- B. Recessed Access Doors and Trimless Frames: Glass reinforced gypsum for drywall ceiling locations.
 - 1. Assembly: Fabricate door to fit flush with frame. Fabricate frame from single piece, 3/4 inch (19 mm) wide, with gypsum board bead for concealed installation.
 - 2. Locations: Ceiling.
 - 3. Door Size: Indicated on Drawings.
 - 4. Door and Frame Materials: 1/8 inch (3.2 mm) thick, high impact plastic with UV stabilizer. White finish with textured exposed surfaces.
 - 5. Hinges: Standard.
 - 6. Hardware: Tamper resistant.

2.3 FABRICATION

- A. Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
 - 1. Exposed Flanges: Nominal 1 inch to 1-1/2 inches (25mm to 38mm) wide around perimeter of frame.
 - 2. Provide mounting holes in frames for attachment of units to metal or framing.
 - 3. Provide mounting holes in frame for attachment of masonry anchors. Furnish adjustable metal masonry anchors.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

2.4 FINISHES

- A. Comply with NAAMM *Metal Finishes Manual for Architectural and Metal Products* for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Steel and Metallic Coated Steel Finishes:
 - 1. Factory Prime: Apply fast curing, lead and chromate free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and conditions affecting performance of the work. Proceed with installation after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING AND CLEANING

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

End of Section

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes furnishing and installing door hardware, thresholds, weatherstripping and seals.
- B. Related Sections include the following:
 - 1. Division 8 Section 08 11 00 "Metal Doors and Frames".
 - 2. Division 8 Section 08 14 00 "Wood Doors".

1.3 PERFORMANCE REQUIREMENTS

- A. Furnish and install each door hardware item to provide proper operation and required function of every unit without binding or failure.
 - 1. Interior Door Opening Force: Adjust hardware operation at interior non-fire-rated doors to provide an opening force not greater than 5 lbs at a point 3" from latch, measured to leading edge of door.
 - 2. Exterior and Fire Rated Door Opening Force: At exterior doors and fire-rated doors, adjust hardware opening force in small increments above the opening force required for interior non-fire-rated doors to close and latch the door.
 - 3. Closer Sweep Adjustment: Adjust closer sweep period so that from a 70 degree open position, door will take at least 3 seconds to move to a point 3" from latch, measured to leading edge of door.

1.4 SUBMITTALS

- A. Submit manufacturer's technical product data for each item of hardware. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into vertical format "hardware sets" indicating complete designations of every item required for each door or opening. Use specification heading numbers with any variations suffixed a, b, etc
- B. Coordinate hardware with doors, frames, and related work to ensure proper size thickness, hand, function, and finish of hardware. If requested by Architect, submit one sample of each type of exposed hardware unit, finished as required, and tagged with full description for coordination with schedule. Submit data and schedule at earliest possible date, particularly where acceptance of schedule must precede fabrication of other work (e. g. hollow metal frames) that is critical to the Project construction schedule.
 - 1. Type, style, function, size and finish of each hardware item.
 - 2. Name and manufacturer of each item.
 - 3. Fastenings and other pertinent information.

4. Hardware set location cross-referenced to both Drawing floor plan and door schedule indications.
5. Explanation of all abbreviations, symbols, and codes in schedule.
6. Mounting locations for hardware.
7. Door and frame sizes and materials.
8. Date of jobsite visit.
9. Coordinate keying instructions, and keying information. Deliver keys and key control box to Owner in person and obtain receipt (No Exceptions).

1.5 QUALITY ASSURANCE

- A. **Supplier Qualifications:** A recognized finish hardware supplier who has been furnishing hardware in the Project's vicinity for a period of not less than 2 years, and who is, or employs an experienced hardware consultant (AHC) who is available, at reasonable times during the course of the Work, for consultation about Project's hardware requirements, to Owner, Architect and Contractor.
- B. **Coordination and Schedules:** Hardware units and usage specified in Part 2 of this Section and scheduled on the Drawings establish quality, quantity, function and finish required for each door opening. Review, coordinate and confirm that hardware specified for each opening is the proper function. In case of controversy, make appropriate notations of proposed changes from specified requirements on supplier's hardware schedule and request written clarification from the Architect prior to proceeding.
- C. **Hardware:** Free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.
- D. **Fire-Rated Openings:** Provide door hardware for fire rated openings that comply with NFPA Standards No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not. All hardware shall comply with standards UBC 702 (1997) and UL 10C.
 1. Where emergency exit devices are required on fire-rated doors (with supplementary marking on doors' UL labels indicating "Fire Door to be equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

1.6 PROJECT CONDITIONS AND COORDINATION:

- A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.
- B. **Coordination:** Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents. Furnish related trades with the following information:
 1. Location of embedded and attached items to concrete.
 2. Location of wall-mounted hardware, including wall stops.
 3. Location of finish floor materials and floor-mounted hardware.

4. Locations for conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.
 5. Manufacturer templates to door and frame fabricators.
- C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation. Do not order hardware until the submittal has been reviewed by the frame and door suppliers for compatibility with their products.
- D. Prior to submittal, carefully inspect existing conditions at each opening to verify finish hardware required to complete Work, including sizes, quantities, existing hardware scheduled for re-use, and sill condition material. If conflict or incompatibility between the specified/scheduled hardware and existing conditions, submit request for direction from Architect. Include date of jobsite visit in the submittal.
1. Submittals prepared without thorough jobsite visit by qualified hardware expert will be rejected as non-compliant.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.
- B. Packaging of door hardware is the responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
- C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).
- E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.8 WARRANTY

- A. Special warranties:
- | | |
|-------------------------|-------------------|
| 1. Door Closers: | Ten year period |
| 2. Exit Devices: | Three year period |
| 3. Locks and Cylinders: | Three year period |

1.9 MAINTENANCE

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

- B. Parts kits: Furnish manufacturer's standard parts kits for locksets, exit devices, and door closers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. General: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws. With each hardware item, furnish machine screws for installation into steel, and provide threaded to the head wood screws for installation into wood; all-purpose threads are not acceptable. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed screws to match the hardware finish. Provide concealed fasteners for hardware units that are exposed when the door is closed, except to the extent no standard units of the type specified are available with concealed fasteners. Provide through bolts for closer installation.

2.2 HARDWARE UNITS AND USAGE

- A. Units specified below establish the design, grade, function, finish, size, and other qualities required for this Project. Provide the following hardware units in the quantities specified and locations indicated on the Door Schedule. Provide US 26D finish unless otherwise specified. Refer to Door Schedule on Drawings for door sizes, fire ratings, hardware function, exit devices, door closers, and other requirements at each door opening
1. Butt Hinges: If called for, provide the following butt hinges produced by Ives, or equivalent butt hinges produced by Hager or Bommer, as approved. Provide 1-1/2 pair per door leaf up to 7'-6" high and one additional hinge per leaf for each additional 2'-6" of door height. Provide 5" hinge height for doors 3'-6" to 4'-0" wide and 6" hinge height for doors over 4'-0" wide.
 - a. Out-Swinging Interior High Frequency Doors: Ives 5BB1HW 4.5 x 4.5 x NRP.
 - b. In-Swinging Interior High Frequency Doors: Ives 5BB1HW 4.5 x 4.5
 - c. Out-Swinging Interior Average Frequency Doors: Ives 5BB1 4.5 x 4.5 NRP.
 - d. In-Swinging Interior Average Frequency Doors: Ives 5BB1 4.5 x 4.5.
 2. Door Closers: Provide only if indicated in Drawings. All closers to have cast iron body with forged arms. Adjust closers to comply with ADA requirements. Provide type of arm recommended by closer manufacturer for door conditions (use, door hand and swing) indicated.
 - a. Closers for fire-rated doors shall be provided with temperature stabilizing fluid that complies with standards UBC 7-2 (1997) and UL 10C.
 - b. Door closer shall have fully hydraulic, full rack and pinion action. Closer shall have 1-1/2-inch in diameter piston.
 - c. Hydraulic fluid shall be of a type requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to minus 30 degrees F.
 - d. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Closers shall have separate adjustment for latch speed, general speed, and back check.
 - e. Provide surface mounted mechanical closers certified to exceed ten million (10,000,000) full load cycles by a recognized independent testing laboratory.
 - f. Provide powder coating certified to exceed 100 hours salt Spray testing by ETL, an independent testing laboratory used by BHMA for ANSI certification.
 - g. Pressure relief valves are not accepted.

- h. Closers to be installed to allow door swing as shown on plans. Doors swinging into exit corridors shall provide for corridor clear width as required by code. Where possible, mount closers on room side of door.
 - i. Door closers meeting this specification: LCN 4040XP Series. NO SUBSTITUTION.
3. Mortise Locks and latches: As scheduled, fastened with through-bolts and threaded chassis hubs.
- a. Chassis: Cold-rolled steel, handing field-changeable.
 - b. Latch bolts: ¾" inch projection.
 - c. Lever Trim: Through-bolt, accessible design, cast lever or metal-filled wrought types as schedule.
 - d. Thumb turns: Accessible design not requiring pinching or twisting motions to operate.
 - e. Deadbolts: 1" throw with a ¼" thick hardened steel, free-turning, saw-resistant roller.
 - f. Strikes: 16 gauge curved steel, bronze or brass with 1" deep box construction, lips of sufficient length to clear trim and project clothing.
 - g. Certifications:
 - i. ANSI A156.13, Grade 1
 - ii. UL listed for 3-hour doors
 - h. Approved Manufacturers: Schlage L9000 Series x 06A Lever Design. NOTE: Match existing trim if different. NO SUBSTITUTION – MUST MATCH EXISTING.
4. Kick Plates, Push, and Pulls: Provide the following at locations designated; Ives or equivalent by Trimco.
- a. Kick Plates shall be 10" high x 2" less than door width x minimum 0.0538" (1.3 mm) thick x B3E, or as otherwise indicated in the Drawings.
 - b. Mop Plates shall be 4" high x 1" less than door width x minimum 0.0538" (1.3 mm) thick x B3E, or as otherwise indicated in the Drawings.
 - c. Push/Pulls: 8200 6" x 16", 8302 6" x 16"; 8190-0; 9190-0.
5. Stops, Flush Bolts, Dust Proof Strikes, & Silencers: Provide the following at locations designated; IVES, or equivalent by Trimco.
- a. Floor Stops: Ives FS436, FS41
 - b. Wall Stops: Ives WS407
 - c. Where a wall or floor stop cannot be used, provide an overhead stop. Acceptable products are as manufactured by Glynn-Johnson. Use a 100 series concealed overhead stop where appearance is a primary consideration or 450 series at interior and 90 series at exterior locations.
 - d. Manual Flush Bolts: 1 set IVES FB458/FB358 x DP-1/DP-2 dustproof strike as required at each inactive leaf of a pair of doors (except equipped with exit devices).
 - e. Silencers: IVES SR 64; (3) per single leaf opening, (2) per double leaf opening.

2.3 KEYING REQUIREMENTS

- A. Key System Requirements: Initiate and conduct meeting(s) with Owner to determine. For estimate use GMK charge. Furnish Owner's written approval of the system. Provide construction key system in accordance with lock manufacturer's standard. Emboss keys "Do Not Duplicate" and key symbol.
- 1. Key System: Match existing system. Confirm all details with Owner before proceeding.
 - 2. Permanent keys: Deliver only to Owner's representative.
 - 3. Key Transcript (bitting list): Supply to Owner upon completion.

4. Provide 3 change keys per lock, including emergency over-ride keys where needed, 5 master keys and 5 grand master keys tagged and organized for Owner's use. Provide 5 construction master keys for contractor's use.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Custom Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect. Reinforce the attachment substrate for secure installation and adjust for proper operation. Provide clean, properly sized mortises and drilled holes for all mortised and surface applied finish hardware

3.2 INSTALLATION

- A. General: Install each hardware item in compliance with the manufacturer's instructions and recommendations.
- B. Do not install surface-mounted items until finishes have been completed on the substrate. Before painter's finish is applied, remove all finish hardware, except prime painted items. After finish coats are dry, permanently replace and readjust finish hardware for proper operation.
- C. Set units level, plumb, and true to line and location
- D. Cut and fit threshold and floor covers to profile of doorframes, with mitered corners and hairline joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for bolts and similar items, if any. Screw thresholds to substrate with No. 10 or larger stainless steel screws

3.3 ADJUSTMENT

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units that cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.
- B. Six month hardware installation survey is to be performed by a certified "AHC" in the employ of the hardware supplier.

3.4 HARDWARE SCHEDULE:

- A. Refer to Drawings.

End of Section

SECTION 08 80 00 - GLASS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Glass

1.2 RELATED WORK

- A. Section 08 11 00 – Steel Doors and Frames

1.3 REFERENCES

- A. American National Standards Institute (ANSI)
 - 1. Z97.1, Safety Performance Specification
 - 2. Z97.1, Safety Glass Code
- B. ASTM International (ASTM)
 - 1. C509, Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material
 - 2. C1036, Standard Specification for Flat Glass
- C. Flat Glass Marketing Association (FGMA)
 - 1. Glazing Sealing Systems Manual
 - 2. Glazing Manual

1.4 SUBMITTALS

- A. Shop Drawings: Complete shop drawings by manufacturer indicating elevations, sections, substrates, fasteners, finishes, hardware and installation details.
- B. Manufacturer's specifications and other data needed to prove compliance with specified requirements, and manufacturer's installation instructions.
- C. Product data: manufacturer's specifications and test reports from an AAMA-accredited laboratory.
- D. Samples: Showing color
 - 1. Samples of each type of glass (12 inches by 12 inches minimum)

1.5 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, comply with pertinent recommendations contained in the above referenced Flat Glass Marketing Association publications.

1.6 PRE-INSTALLATION CONFERENCE

- A. Refer to Section 01 31 13 – Project Coordination.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handle and protect glass in accordance with AAMA CW-10-97 until project completion

1.8 WARRANTY

- A. Warrant the work specified herein for (2) years, against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.
- B. Defects shall include, but not be limited to, the following:
 - 1. Faulty, improper or inadequate attachment or installation.
 - 2. Chipped edges, broken, or scratched glass
 - 3. Distortion or waves

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers listed whose product meet or exceed the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.
 - 1. Glass:
 - a. AGC Flat Glass North America , Kingsport Tenn. (423) 229-7200
 - b. Guardian Industries Corp., Corsicana, TX; (800) 527-2511
 - c. Oldcastle Glass, Houston, TX; (866) 653-2278
 - d. Pilkington, Toledo, OH; (419) 247-4721
 - e. PPG Industries, Inc., Pittsburgh, PA; (412) 434-2858
 - f. Viracon, Owatonna, MN; (800) 533-2080

2.3 MATERIALS

- A. Glazing Materials at Hollow Metal Frames:
 - 1. General: Use glazing compounds and preformed glazing sealants approved for the application and, except as otherwise specified, conforming to Glazing Materials portion of FGMA Glazing Manual.
 - 2. Glazing Tape: DAP #1202 or as approved.
 - 3. Glazing Gaskets: Extruded neoprene, free of porosity, surface defects, dimensional irregularities and conforming to physical properties of ASTM C509.
 - 4. Use of metal sash putty will not be permitted, but compound conforming to FS T-G-410 will be permitted. The use of nonskinning compounds, nonresilient type preformed sealers, and preformed impregnated type gasket will not be permitted.
- B. Glass:
 - 1. General:
 - a. Glass shall meet the requirements of ASTM C1036.
 - b. Safety Glazing: Subject to compliance with requirements, obtain safety glazing products permanently marked on each individual glass lite with certification label of manufacturer acceptable to authorities having

- jurisdiction. Safety glazing shall conform to ANSI Z97.1, Safety Performance Specification, and ANSI Z97.1, Safety Glass Code.
2. Glass Types: (As shown or required)
 - a. Type G-3: 1/4 inch thick glazing quality, clear, tempered float glass.
 - b. Type G-5 Fire Rated Wired Glass (Match Existing): 6 mm (1/4 inch), ceramic, premium clear fire rated glass; 20 minute UL labeled for hose stream and positive pressure. Rated for impact safety in accordance with CPSC 16CFR 1201 Cat. II (400 foot pounds).

PART 3 - EXECUTION

3.1 PREPARATION

- A. Obtain hardware templates from finish hardware supplier.

3.2 SURFACE CONDITIONS

- A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
- B. Clean glazing channels, stops, and rabbets to receive the glazing materials, making free from obstructions and deleterious substances which might impair the work.
 1. Remove protective coatings which fail in adhesion or interfere with bond of sealants.
 2. Comply with manufacturers' instructions for final wiping of surfaces immediately prior to application of primer and glazing compounds or tapes.
 3. Prime surfaces to receive glazing compounds in accordance with manufacturer's recommendations.

3.3 INSTALLATION

- A. Inspect each piece of glass immediately prior to start of installation.
 1. Do not install items which are improperly sized, have damaged edges, or are scratched, abraded, or damaged in any other manner.
 2. Do not remove labels from glass until so directed by the Architect.
 3. Install glass so distortion waves, if present, run in the horizontal direction.
- B. Set glass in a manner which produces the greatest possible degree of uniformity in appearance.
- C. Mask, or otherwise protect, surfaces adjacent to installation or sealants.
- D. Install all glass and gaskets in accordance with manufacturer's printed instructions.

3.4 PROTECTION AND ADJUSTMENTS

- A. Protect glass from breakage after installation by promptly installing streamers or ribbons, suitably attached to the framing and held free from glass. Do not apply warning markings, streamers, ribbons, or other items directly to the glass except as specifically directed by the Architect.
- B. Adjust windows as necessary for smooth and weather tight operation, and leave windows clean and free of construction debris.

END OF SECTION

SECTION 09 21 16 - GYPSUM WALLBOARD SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Metal wall and ceiling framing for gypsum board construction.
- B. Gypsum Wallboard
- C. Cement Tile Backer Board
- D. Moisture Resistant Tile Backer Board
- E. Taped, filled and sanded joint treatment.

1.2 RELATED WORK

- A. Section 05 40 00 - Cold Formed Metal Framing
- B. Section 07 21 00 - Building Insulation
- C. Section 07 84 00 - Firestopping and Fire Safing
- D. Section 07 92 00 - Building Sealants
- E. Section 09 30 13 - Ceramic Tiling
- F. Section 09 91 00 - Painting and Staining

1.3 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
 - 2. Manufacturer's installation instructions.
- B. Certification: Manufacturer's affidavit that materials used contains no asbestos.

1.4 PRE-INSTALLATION CONFERENCE

- A. Refer to Section 01 31 13 – Project Coordination.

1.5 REFERENCES

- A. ASTM International (ASTM)
 - 1. C1396/C1396M, Standard Specification for Gypsum Wallboard
 - 2. C645-08, Standard Specification for Nonstructural Steel Framing Members
 - 3. C754-07, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
 - 4. C840, Standard Specification for Application and Finishing of Gypsum Board
 - 5. 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. to 0.112 in. in Thickness

6. C1002, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
 7. C1047, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
 8. C1177, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
 9. C1280, Standard Specification for Application of Gypsum Sheathing
 10. D3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
- B. Gypsum Association (GA)
1. 216, "Recommended Specification for the Application and Finishing of Gypsumboard"
- C. Federal Specifications (FS)
1. SS-L-30

1.6 WARRANTY

- A. Warrant the work specified for one (1) year against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials or workmanship.
- B. In addition, provide warranty from the manufacturer for the following products:
1. Tile backer board warranty against manufacturing defects for 20 years.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers listed whose products meet or exceed the specifications are approved for use on the Project. Where products are named in the specifications, they are considered basis of specification. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered. All gypsum wallboard must be U.S. produced.
1. Gypsum Wallboard and related products and materials:
 - a. CertainTeed
 - b. G-P Gypsum Corporation (Georgia Pacific)
 - c. James Hardie Building Products, Inc.
 - d. National Gypsum Company (Gold Bond)
 - e. Temple-Inland
 - f. United States Gypsum Company (USG)
 - g. Dietrich Metal Framing
 2. Aluminum Moldings:
 - a. Fry Reglet Corporation
 - b. MM Systems Corporation
 3. Deflection Track and related products and materials:
 - a. Fire Trak Corp.
 - b. The STEEL Network, Inc.
 - c. Dietrich Metal Framing

2.2 MATERIALS

- A. Metal Framing System:
1. Studs:
 - a. Meeting requirements of ASTM C645-08; C-channel, roll-formed from hot-dipped galvanized steel; complying with ASTM A1003 and ASTM A653 G40 or equivalent corrosion resistant coating. Channel type screw studs roll formed galvanized steel, gauge as required by allowable deflection. Provide channel type screw studs roll formed from 20 gauge (I/360) galvanized steel at walls to receive tile.
 - b. Widths shall be as indicated on drawings.
 - c. Section modules for studs shall be $S = 0.135$ for 3-5/8 inch studs, and $S = 0.082$ for 2-1/2 inch studs.
 2. Tracks:
 - a. Meeting requirements of ASTM C645-08; C-channel, roll-formed from hot-dipped galvanized steel; complying with ASTM A1003 and ASTM A653 G40 or equivalent corrosion resistant coating
 - b. Widths shall be as indicated on drawings.
 - c. Deflection Track (DT) (Non-rated walls): Use deflection track at walls extending to structure to allow for movement. Deflection track shall allow for 3/4 inch movement in either direction. Do not fasten studs directly to Deflection Track.
 - d. Deflection Track and Firestop System (At fire rated walls): Contractor shall use a deflection track and firestop system at heads of fire rated partitions. System shall use "Shadowline" deflection track, mineral fiber, sealant, clips, and accessories required to achieve fire ratings shown or required by authorities having jurisdiction. System shall comply with Deflection Track and Firestop System manufactured by Fire Trak Corp., Kimball, MN; (800) 394-9875, Dietrich Metal Framing; SLP-TRK® Slotted Deflection Track by Brady Innovations or equal or comparable products manufactured by The STEEL Network, Inc., Raleigh, NC; (919) 845-1025, or Architect approved equal.
 - e. Channel Bridging and Bracing: U-Channel Assembly; Base metal thickness of .0538 inch (1.37mm) and minimum 1/2 inch wide flanges.
 - f. FLAT STRAP AND BACKING PLATE: Sheet for blocking and bracing in length and width indicated:
 - 1) Subject to compliance with requirements, provide Dietrich Metal Framing: Danback™ Fire Treated Wood Backing Plate
 - 2) Galvanized Sheet Steel.
 3. Comply with applicable reference standards.
- B. Drywall Suspension System (If shown or required): Pre-engineered drywall suspension system specially created to simplify the design and construction of flat drywall ceilings. Approved Product/Manufacturer: USG Drywall Suspension System manufactured by USG Interiors, Inc., or Architect approved equal.
- C. Wall and Ceiling Materials:
1. Gypsum Wallboard:
 - a. Wallboard: 5/8 inch thick, tapered-edged, conforming to ASTM C1396, Type X. Sizes shall be 4 feet-0 inches wide by longest practical length to minimize joints.
 - b. Moisture Resistant: 5/8 inch thick, moisture resistant (MR), green faced, tapered-edged, conforming to ASTM C1396. Sizes shall be 4 feet-0 inches wide by longest practical length to minimize joints. Provide fire rated core where required to maintain fire rating of adjacent assembly.
 2. Cement Tile Backer Board (Wet areas): 1/2 inch thick, "G-P Dens-Shield Tile Guard", Bonsal "Util-A-Crete", "USG Durock", Custom Building Products

- “Wonderboard”, “National Gypsum Permabase”, or Architect approved equal. Use as sheathing at shower areas and restrooms, or as scheduled on walls to receive ceramic tile in other wet areas. Use greatest width by longest practical length to minimize joints. Use joint reinforcement and fasteners in accordance with manufacturer’s printed instructions. For fiber and cement backer boards, provide waterproof membrane behind backer board per TCA W244. Coated glass-mat water-resistant gypsum board does not require waterproofing membrane per TCA W245.
3. Channels: 16 gauge cold formed steel channels with hot dip galvanized finish. Sizes as indicated on drawings. Use for suspended ceilings and elsewhere as indicated.
 4. Furring Channels: Standard 2-3/4 inches wide, 7/8 inch deep galvanized sheet metal furring channel.
 5. Corner Beads: No. 28 gauge galvanized steel, 1-1/4 inch legs. Use at all exterior corners.
 6. Joint Compound: Standard types manufactured by gypsum wallboard manufacturer for intended use. Fire rated type must be used on fireproof systems. Perlite and other additives not permitted.
 7. Laminating Adhesives: Standard type manufactured or recommended by manufacturer of product to be laminated.
 8. Acoustic Sealant: Single component, non-skinning, non-hardening synthetic rubber for use in the acoustical sealing of gypsum board partitions. STC rating as required by drawings in accordance with manufacturers instructions to achieve rating. Approved Products and Manufacturers: Tremco Acoustical Sealant manufactured by Tremco Sealant/Weatherproofing Division, Beachwood, OH; (800) 321-7906, or Architect approved equal.
 9. Ceiling Hanger and Tie Wire: 9-gauge galvanized hanger wire and 16 gauge tie wire.
 10. Screws: One (1) inch and 1-5/8 inch long self drilling, self tapping cadmium plated bugle head type. Comply with applicable reference standards.
 11. Resilient Clips: Standard type for resilient installation in accordance with wallboard manufacturer’s recommendations.
 12. Control Joints: Metal (USG #093 / Dietrich 093 Control Joint) type with 1/4 inch open joint, perforated flanges for floating in place.
 13. Wall Fixture Reinforcement: 6 inches, 14 gauge cold formed steel galvanized channels.
 14. Glass-fiber Mesh Tape: minimum 2 inch wide self-adhering glass-fiber type, 10X10 threads per inch.
 15. Silicone Joint Sealant: ASTM C920, Type S, grade NS, compatible with exterior sheathing tape and sheathing, instructed by tape and sheathing manufacturers for use with glass-fiber mesh sheathing tape and for covering exposed fasteners.
 16. Waterproof membrane under cementitious/fiber tile backer board shall be minimum 15-pound building felt or 4-mil polyethylene film in accordance with ANSI A2.1.8.

PART 3 - EXECUTION

3.1 INTERIOR METAL FRAMING INSTALLATION

- A. Steel Framing Installation Standard: Comply with ASTM C754.
- B. Floor Track: Attach to floor at 24 inches maximum centers with shoot-in pins or concrete nails.

- C. Ceiling Track: Fasten at 24 inch intervals, staggered. Where shown or required to extend above ceiling, brace to the structure at intervals not exceeding 4 feet-0 inches.
- D. Deflection Track (DT): Deflection track shall allow for 3/4 inch movement in either direction. Do not fasten studs directly to Deflection Track. At fire rated walls, Contractor's shall use the specified deflection track with firestop systems.
- E. Drywall Suspension System: Use at gypsum drywall suspended ceilings, where shown or required.
- F. Metal Studs:
 - 1. Single lengths positioned vertically straight and plumb in the runners, spaced 16 inches on center, unless shown otherwise on drawings.
 - 2. Anchor all studs located adjacent to door and window frames, partitions intersections and corners to runner flanges by positive screw engagement through each stud flange and runner flange.
 - 3. Position all studs vertically with the open side facing in the same direction, engaging the floor and ceiling runners.
 - 4. Use positive screw attachments with 3/8 inch or 1/2 inch Type "S" or "S-12" pan head screws through each stud flange and runner flange.
- G. Wall Fixture Reinforcement: Provide solid bridging spanning between wall studs at all wall mounted fixtures, finish hardware, toilet partitions, accessories and equipment.

3.2 GYPSUM WALLBOARD INSTALLATION

- A. Apply all ceiling boards first as described below. Cut boards so that they slip easily into place. Butt all joints loosely. Never force panels into position. Place tapered or wrapped edges next to one another.
- B. Select the maximum practical length to minimize end joints. All end joints shall be neatly fitted and staggered. Joints on opposite sides of partition shall be so arranged as to occur on different studs.
- C. Never place a butt end or a cut edge next to a tapered or rounded edge. Wherever possible, apply boards perpendicular to framing and in lengths that will span ceilings and walls without creating end (butt) joints. If butt joints do occur, stagger and locate them as far from the center of walls and ceilings as possible.
- D. Support all ends and edges of gypsum board on framing, except long edges at right angles to framing and where end joints are to be floated between frame members and back-blocked.
- E. When fastening, apply hand pressure on panel next to fastener being driven to insure panel is in tight contact with framing member.
- F. Install metal corner bead at external corners. Where length of the corner does not exceed standard stock lengths, use a single length.
- G. Install gypsum board 1/2 inch above surface of slab to prevent wicking of moisture.
- H. Install metal trim where indicated.
- I. To insure level surfaces at joints, arrange board application so that the leading edge of each board is attached to the open or unsupported edge of a steel stud flange. To do this, all

studs must be placed so that their flanges point in the same direction. Board application is then planned to advance in the direction opposite to flange direction.

- J. The leading edge of gypsum board shall not be attached to the web edge of a flange.
- K. Fasten wallboard at 12 inches on center except at the edges/joints which shall be at 8 inches on center
- L. Edge-Grip Clips: Position clips on the back of the panels and drive prongs into panel edges. Space clips 16 inches on center Screw-attach clip to framing, furring or wall surface.
- M. Finishing:
 - 1. Apply at least two (2) coats of joint compound over beads, screw heads and trim, and each coat shall be feathered out onto panel faces.
 - 2. Float out and sand joints to make joints invisible when painted with non-texture paint.
- N. Caulk around pipes, ducts, structure or similar items which penetrate drywall systems.
- O. Provide acoustical sealant at walls in accordance with manufacturer's instructions.
- P. Control joints shall be located 30 feet-0 inches on center maximum and along building expansion joints, unless noted otherwise on drawings. Locations shall be reviewed with Architect prior to final placement.

3.3 CEMENT TILE BACKER BOARD INSTALLATION – WET AREAS

- A. Install tile backer on walls vertically or horizontally.
- B. Coated Glass Mat Backer Boards: Install tile backer directly on metal stud framing system in showers and other wet areas in accordance with manufacturer's recommendations and TCA, Methods W245 at walls and B420 for shower installations.
- C. Cementitious/Fiber Backer Boards: Install tile backer on approved waterproof membrane in showers and other wet areas in accordance with manufacturer's recommendations and TCA, Methods W244 at walls and B419 for shower installations.
- D. Finishing:
 - 1. Substrate for tile: Apply clear silicone sealant to corners and board joints. Apply glass mesh joint tape over joints. Embed tape in setting material specified for tile finishes. Seal penetrations with setting material or silicone sealant. Allow joints and penetrations to dry prior to installing tile systems.

3.4 CEILING FRAMING INSTALLATION

- A. Main Runners: 9-gauge hanger wires shall be spaced not over 4 feet-0 inches in the direction of 1-1/2 inch main runner channels and not over 4 feet-0 inches in the direction of right angles to the main runners, and within 6 inches of the ends of main runners and of boundary walls, girders or similar interruptions of ceiling continuity. Do not hang wire supports from metal deck unless directed to do so by Architect or Structural Engineer. Main runners shall be spaced not over 4 feet-0 inches on center.
- B. Cross tees shall be spaced in accordance with manufacturer's recommendations or in conformance with UL Fire Resistance Directory.

- C. Furring Channels: Space 16 inches on center, and saddle-tie with two strands of 16-gauge tie wire to main runners or main support members. Do not let into or come in contact with abutting masonry walls. End splices shall be provided by nesting channels or studs no less than 8 inches and securely wire-tie.
- D. Drywall Suspension System: Install where indicated in accordance with manufacturer's instructions.
- E. Provide control joints in ceiling at maximum 30 feet on center and, if possible, to coincide with expansion joints in the roof above.

3.5 CEILING BOARD INSTALLATION

- A. Apply gypsum board of maximum practical length with the long dimension at right angles to the furring channel and fastened with one (1) inch drywall screws spaced 12 inches on center in the field of the board and along abutting ends.
- B. Align abutting end or edge joints over the web surface of the furring channel. Tie neatly and accurately with end joints staggered.
- C. Install gypsum board ceiling panels in drywall suspension system.

3.6 WORKMANSHIP TOLERANCES

- A. Visual: Correct any nicks, bumps, out-of-level or out - of-plumb areas detectable to the naked eye.
- B. Walls: 3/8 inch maximum deviation from vertical.
- C. Bumps in Boards: Maximum 1/8 inch in 24 inches.
- D. Corners: Maximum out-of-square 1/8 inch in 16 inches.
- E. Float solid between corner beads less than 36 inches apart. Surfaces that appear concave are not acceptable.
- F. Provide "J" mold and continuous 1/4 inch reveal wherever gypsum board directly abutts other material or when end is exposed.
- G. Float Control Joints flush with wall surface so that ceiling wall mold specified separately will align with wall surface flat and straight.

3.11 COMMENCEMENT RESTRICTIONS

- A. Interior gypsum wallboard and ceiling board installation may not commence until all exterior dampproofing and roofing are completed and roof top equipment is fully installed and flashed and exterior wall openings are protected.

End of Section

SECTION 09 30 13 - CERAMIC TILING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Thin set glazed wall and floor tile, base and necessary trim shapes, mortar and grout, expansion joints, sealants, transition strips, and accessories shown or required to complete work.

1.2 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
 - 2. Manufacturer's installation instructions.
- B. Samples:
 - 1. Selection: Submit full range of colors, patterns, textures and finishes available for selection of tile and threshold.
 - 2. Approval:
 - a. Submit samples of selected tile mounted on 12 inch x 12 inch board indicating joint size and grout.
- C. Certifications:
 - 1. Provide Master Grade Certificate as specified in ANSI A137.1.
 - 2. Manufacturer's affidavits that materials used contain no asbestos.

1.3 REFERENCES

- A. American National Standards Institute (ANSI)
 - 1. Installation Specifications:
 - a. A108.5, Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar
 - b. A108.6, Ceramic Tile installed with Chemical-Resistant, Water-Cleanable Tile-Setting and Grouting Epoxy
 - c. A108.10, Installation of Grout in Tilework
 - 2. Material Specifications:
 - a. A118.4, Latex-Portland Cement Mortar
 - b. A118.6, Ceramic Tile Grouts
 - c. A136.1, Organic Adhesives for Installation of Ceramic Tile
 - d. A137.1, Ceramic Tile
- B. American Society for Testing and Materials (ASTM)
 - 1. C144, Standard Specification for Aggregate for Masonry Mortar
 - 2. C150, Standard Specification for Portland Cement
 - 3. C206, Standard Specification for Finishing Hydrated Lime
- C. Tile Council of America, Inc. (TCA)
 - 1. 2010 Handbook for Ceramic Tile Installation

1.4 PRE-INSTALLATION CONFERENCE

- A. Refer to Section 01 31 13 – Project Coordination.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers listed whose product meets or exceed the specifications may be used on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions in order to be considered.
1. Ceramic Tile:
 - a. American Olean Tile Co., Dallas, TX; (214) 398-1411
 2. Tile Setting and Grout Materials: Those manufactured by the approved tile manufacturers named above or any of the following as approved by the tile manufacturer for use with his tile and to suit application.
 - a. ARDEX L.P., Aliquippa, PA; (724) 203-5000
 - b. Custom Building Products, Seal Beach, CA; (562) 598-8808
 - c. Dal-Tile Corp., Dallas, TX; (713) 481-5893
 - d. Laticrete International, Inc., Bethany, CT; (800) 243-4788

2.2 INTERIOR TILES

- A. Ceramic Tile:
1. Field Floor Tile:
 - a. Type/Size: 6 inch x 24 inch porcelain ceramic tile. American Olean TE15 "Terreno".
 - b. Base: Bullnose type to match floor tile type and size.
 - c. Color: Driftwood
 - d. Pattern(s): As indicated on drawings
 2. Shower Floor Tile:
 - a. Type/Size: 2 inch x 2 inch mosaic ceramic tile, with cushion edge, American Olean SC92 "Salcedo".
 - b. Base: Cove type to match floor tile type and size.
 - c. Colors: Universal Blend
 - d. Pattern(s): Factory mounted patterns.
 3. Wall Tile:
 - a. Type/Size: Matte glazed 10 inch by 14 inch ceramic tile, with cushion edge, American Olean SC85 "Durango".
 - b. Base: Cove type to match floor tile type and size.
 - c. Colors: Cream
 - d. Pattern(s): As indicated on drawings
- B. Mortar Adhesive and Grout:
1. Portland Cement: ASTM C150, Type 1
 2. Lime: ASTM C206, Type "S"
 3. Sand: ASTM C144
 4. Water: Potable
 5. Bond Coat: Dry-set mortar conforming to ANSI A118.4
 6. Organic adhesive: Comply with ANSI A136.1. Furnish current Certification of Conformance.
 7. Grout (Typical except at wet areas and restroom floors):

- a. Color as indicated in Drawings.
- C. Epoxy Grout (At wet areas and restroom floors): Use one (1) of the following 100 percent solids epoxy grout in accordance with ANSI A118.3. No substitutions. Color shall be as selected by Architect from manufacturer's full line of available colors:
 - 1. ARDEX L.P., WA Epoxy Grout, Aliquippa, PA (724) 203-5000
 - 2. Polyblend® Tile Grout with 100 percent Solids Epoxy manufactured by Custom Building Products, Seal Beach, CA; (562) 598-8808.
 - 3. LATICRETE® SpectraLOCK PRO Stainless Grout manufactured by Laticrete International, Inc., Bethany, CT; (800) 243-4788.
- D. Crack Isolation Membrane: Provide shower pan waterproofing in accordance with Section 07 13 00.

2.3 THRESHOLDS

- A. White Italian Marble thresholds shall be 1/2 inch thick by 2 inches wide by required length, with double 1/4 inch bevel.

2.4 EXPANSION JOINTS

- A. Expansion Joint Filler: Flexible and compressible, closed-cell type, rounded at surface to contact sealant as instructed by sealant manufacturer to suit intended use.
- B. Silicone compound sealant over filler. ASTM C920, Uses M and A, single component, mildew resistant. Sanded to match grout. Provide at all wall corners, ceilings, control joints and changes in materials, where floor tile abuts perimeter walls, curbs, columns, and pipes; and 24 feet to 36 feet elsewhere.

2.5 MISCELLANEOUS MATERIALS

- A. Cement-based Floor Leveling Material: ARDEX K-15 Self-Leveling Underlayment Concrete manufactured by Ardex Engineered Cements, Aliquippa, PA; (724) 203-5000; or CX Self-Leveling Underlayment manufactured by BASF Chemrex Inc.; or equal. Gypsum-based products are prohibited.
- B. Transition Strips: Of type and size recommended to suit application. Color shall be as selected by Architect from manufacturer's standard colors.

2.6 EXTRA TILE

- A. Deliver one (1) unopened box of each type and color of wall and floor tile to the Owner in accordance with Section 01 77 00, Closeout Procedures.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examination: Examine substrates for expansion joints and defects which may affect the work. Do not start work until defects have been corrected. Ensure that surfaces are:
 - 1. Dry, clean, free of oily or waxy films, free of curing compounds.
 - 2. Firm and level within specified tolerances.
 - 3. Minimum of 40 degrees and rising.

- B. Tile contractor shall examine preparatory work by others and notify Architect of any imperfections which would affect a satisfactory completion of this tile work. Verify that slab is free of cracks, waxy or oily films, and is well cured. Absence of such notification shall constitute acceptance of responsibility by tile contractor.

3.2 INSTALLATION

- A. Align joints (no staggering)
- B. Set interior floor tile and grout in accordance with TCA F113 and shower floor in accordance with TCA B415. Set marble thresholds in accordance with TCA TR611 and manufacturer's instructions.
- C. Set interior wall tile and grout in accordance with TCA W244 on tile backer cement board at wet areas, showers, and restrooms, TCA W243 on tile backer gypsum board at dry areas not exposed to water or moisture, and TCA W202 on concrete masonry unit (CMU) substrates.
- D. Allow minimum of 24 hours after tile is set before grouting.
- E. Lay out tile so that the minimum size tile used is 1/2 size.
- F. Form internal angles square.
- G. Install expansion joints in accordance with TCA publication EJ171.
- H. Slope tile within three (3) foot diameter of a floor drain, unless otherwise noted.
- I. Damp cure grout in accordance with manufacturer's recommendations.

3.3 CLEANING AND PROTECTION

- A. Clean work at completion of installation, remove excess grout from tile surfaces. Clean tile and grout surfaces prior to installation of plumbing fixtures.
- B. Wipe all tile with a clean damp cloth, and buff lightly, leaving tile surfaces clean and ready to use.
- C. Remove grout from adjacent finish surfaces.
- D. Protect finished installation until final acceptance.

End of Section

SECTION 09 51 00 - ACOUSTICAL LAY-IN CEILING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Suspension system (Grid) and accessories required to complete work.
- B. Acoustical lay-in panels.

1.2 RELATED WORK

- A. Section 09 21 16 - Gypsum Wallboard Systems: Wallboard used as fire protection over light fixtures.
- B. Division 23 - Mechanical: Air diffusers and mechanical items penetrating ceiling.
- C. Division 26 - Electrical: Lighting and electrical items penetrating ceiling.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
 - 2. Manufacturer's installation instructions.
- B. Samples:
 - 1. 6 inch by 12 inch sample of each ceiling panel.
 - 2. 12 inch long sample of each type grid and actual accessories.

1.4 PRE-INSTALLATION CONFERENCE

- A. Refer to Section 01 31 13 – Project Coordination.

1.5 REFERENCES

- A. ASTM International (ASTM)
 - 1. A641, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
 - 2. B117, Standard Practice for Operating Salt Spray (Fog) Apparatus
 - 3. C423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
 - 4. C635, Standard Specification for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
 - 5. C636, Standard Practice for Installation of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
 - 6. D3273, Standard Test Method for Resistance to growth of Mold on the surface of Interior ceilings in an Environmental Chamber
 - 7. E84, Test Method for Surface Burning Characteristics of Building Materials
 - 8. E413, Classification for Rating Sound Insulation
 - 9. E1264, Standard Classification for Acoustical Ceiling Products
 - 10. E1414, Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
- B. Federal Specification (FS)

1. SS-S-118B, Sound Controlling (Acoustical) Tiles and Panels
- C. Underwriters Laboratories (UL)
1. Assembly as specified or noted on drawings

1.6 COORDINATION

- A. Coordinate Work of this Section with work under Division 23, Mechanical for location of dampers in diffusers and other mechanical items penetrating ceiling and Division 26, Electrical for location of light fixtures and other electrical items penetrating ceiling.

1.7 WARRANTY

- A. Standard ceiling Panels: warrant ceiling panels to be free from sagging, warping, shrinking, buckling, or delaminating as a result of manufacturing defects for a period of one (1) year from the date of Substantial Completion.
- B. Standard Suspension System: Suspension systems shall be warranted to be free from defects in material or factory workmanship and shall not incur 50 percent red rust as defined by ASTM B117 test procedures for a period of ten (10) years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Specifications are based on products of named manufacturers, which are intended to match existing conditions. Substitutions of other products by different manufacturers will not be accepted unless in the case of unavailability of specified products, in which case a request complying with Division 1 requirements regarding substitutions may be considered.

2.2 MATERIALS

- A. Suspension System (Grid):
1. Type: ASTM C635, intermediate duty; exposed T; components die cut and interlocking.
 2. Materials: Commercial quality cold rolled steel with galvanized coating.
 3. Exposed Grid Surface Width: 15/16 inch.
 4. Grid Finish: White.
 5. Accessories:
 - a. Perimeter moldings.
 - b. White color.
 - c. Non-Rated: Rockfon / Chicago Metallic double web heavy duty non-fire rated ceiling suspension system, 1200 15/16" Exposed Grid with QuickClick end clips.
 6. Hanger Wire:
 - a. Galvanized carbon steel in accordance with ASTM A641, soft temper, pre-stretched, with a yield stress load of at least three (3) times the design load, but not less than 12 gauge in diameter.
- B. Lay-in Panels:
1. Type "A": Standard

- a. Material: high humidity, sag, mold and mildew resistant mineral fiber
- b. Size: 24 inches by 24 inches by 5/8 inch thick.
- c. Edge Detail: Square lay-in, trim edge
- d. Sound: NRC: NRC 0.50 per ASTM C 423. CAC 33 per ASTM C 1414.
- e. Surface Finish: Lightly textured
- f. Flame Spread: Class A per ASTM E1264
- g. Color: Bright white.
- h. Specified Product/Manufacturer: Performa Sand Micro VOC Compliant SHM-157 by CertainTeed Corporation, P.O. Box 860, Valley Forge, PA 19482.

C. Accessories:

1. Shadow Molding: At all locations (whether detailed or not) where an acoustical lay-in ceiling abuts a gypsum board ceiling in the same plane, provide "shadow" molding similar to Chicago Metallic 1461.01.

2.3 EXTRA STOCK

- A. At completion of work, deliver and store at site as directed not less than three (3) unopened cartons of acoustical ceiling materials. One (1) unopened box of suspension system material.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Insure that walls are flat and wall corners square. Commencing work shall be construed as acceptance of preceding work performed by others as suitable to receive Work of this Section.
- B. Insure that wall control joints are flat and will not cause wall mould to misalign at those locations.
- C. Coordinate all locations of cut panels with Architect in field prior to commencing work.
- D. Do not install any ceiling panel until all above plumbing work, ceiling inspections and corrections have been completed.

3.2 SUSPENDED CEILING SYSTEMS

- A. General: Install acoustical ceiling systems to comply with installation standard referenced below, per manufacturer's instructions and CISCA "Ceiling Systems Handbook."
 - 1. Standard for Installation of Ceiling Suspension Systems: Comply with ASTM C636.
- B. Install ceiling systems by skilled workmen in accordance with manufacturer's printed instructions, the approved shop drawings and reflected ceiling plans. Exposed surfaces of acoustical units shall be level and flush, with all joints straight and true. Cutting and fitting around all items protruding through acoustical ceiling shall be done neatly. Edge moldings and runners shall have flush hairline joints, with all corners mitered. Pop rivets for joining members are not permitted.
- C. Typically, unless indicated on the drawings, install system so that panels are centered in the space in both directions to limit small cut pieces to minimum of three (3) inches on any side, or so that light fixtures are centered above work areas. If conflicts arise, notify architect immediately for determination and proper locations.
- D. Install main beam and cross tees in accordance with reflected ceiling plans. Suspend main beams from structure (but not bridging) above by means of 12 gauge galvanized wire, spaced at 4 feet-0 inches on center, both directions, wrapped tightly at least three (3) full turns. Do not hang wire supports from metal deck unless directed to do so by Architect and/or Structural Engineer. Powder actuated devices in metal deck are not permitted. Join cross tees to main beam with a positive interlock. Pop rivets will not be permitted for field splices.
- E. Align beams or tees with angle molding at corners unless authorized by Architect.
- F. At perimeter areas, secure angle molding to vertical surfaces, ends of tees to rest on bottom flange of molding. Attachment of cross tees to wall angles with pop rivets will not be permitted. Hanger wire at 45 degree approximately ten (10) inches long may be used to tie the grid to the wall above the ceiling to prevent eventual disengagement of the two (2) components.
- G. Install lay-in panels with accessories and hold down clips as shown or required.

End of Section

SECTION 09 65 19 - RESILIENT TILE FLOORING AND BASE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Luxury Vinyl Tile (LVT) flooring adhesive attached with accessories in locations shown on drawings.
- B. Resilient base adhesive attached in locations shown on drawings.

1.2 REFERENCES

- A. ASTM International (ASTM)
 - 1. F710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
 - 2. F1066, Vinyl Composition Floor Tile
 - 3. F1861, Standard Specification for Resilient Wall Base
 - 4. F1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

1.3 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
 - 2. Manufacturer's installation instructions.
- B. Samples:
 - 1. Actual samples or color charts showing manufacturer's full range of colors for Architect's selection.
 - 2. 12 inch by 6 inch plank or 12 inch by 4 inch plank in each color selected and 12 inch long piece of base material in each color selected for approval.
- C. Certification: Manufacturer's affidavits that materials used in the Project contain no asbestos.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers named first are basis of Specification. Manufacturers listed, whose product meets or exceeds the specifications are approved for use on the Project with Architect's approval. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.

2.2 MATERIALS - ALL MATERIALS MUST BE ASBESTOS FREE

- A. Luxury Vinyl Tile (LVT):
 - 1. Quality Standard: ASTM F1066.
 - 2. Size: 36 inches by 6 inches by 1/8 inch thick.
 - 3. Patterns and Colors: Palleo
 - 4. Approved Products/Manufacturers: Kardean Designflooring Opus

- B. Luxury Vinyl Tile (LVT):
5. Quality Standard: ASTM F1066.
 6. Size: 36 inches by 4 inches by 1/8 inch thick.
 7. Patterns and Colors: Golden Teak
 8. Approved Products/Manufacturers: Kardean Designflooring Opus
- C. Rubber Base:
1. Quality Standard: ASTM F1861.
 2. Material: Rubber, vulcanized, Type TS, Group I, Styles A and B. Vinyl base and Type TP are not acceptable.
 3. Type: Topset cove; rolls
 4. Thickness: Full 0.125 (1/8) inch.
 5. Color: As selected by Architect.
 6. Height: Four (4) inches, unless indicated otherwise.
 7. Approved Products/Manufacturers: Flexco,
- D. Cement-based Floor Leveling Material: ARDEX K-15 Self-Leveling Underlayment Concrete manufactured by Ardex Engineered Cements, Aliquippa, PA; (724) 203-5000; or CX Self-Leveling Underlayment manufactured by BASF Chemrex Inc.; or equal. Gypsum-based products are prohibited.
- E. Joining and Edge Finish Moldings:
1. Usage: For use at flooring terminations with other flooring.
 - a. Type: Tapered or bullnose edge, as required to provide juncture at edge of adjacent floor surfaces.
 - b. Size: One (1) inch wide by 1/8 inch thick or as applicable to the type of flooring and condition.
 - c. Material: Rubber or vinyl as recommended by flooring manufacturer to suit application.
 - d. Color(s): As selected by Architect from manufacturer's available colors.
 - e. Approved Manufacturers: Burke Flooring, Flexco, Johnsonite, Roppe, Tarkett, or Architect approved equal.
- F. Adhesive:
1. Tile: Clear set type adhesive; same brand as tile or as instructed and approved by tile manufacturer to suit application.
 2. Base: Rubber-based type; same brand as base or as recommended and approved by base manufacturer to suit application.
- G. Other Materials: Provide other materials, not specifically described but required for a complete and proper installation.

2.3 EXTRA STOCK

- A. Deliver to the Owner:
1. Four (4) percent or one (1) unopened carton of each color and pattern of tile selected, whichever is greater.
 2. Four (4) percent or one (1) unopened carton of each color, type, and size base selected, whichever is greater.
 3. One (1) gallon container of each type adhesive used for flooring and base.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Prepare concrete floors to receive flooring in accordance with ASTM F710.
- B. Verify substrates are smooth, level, at required finish elevation, and without more than 1/8 inch in 10 feet-0 inch variation from level or slopes shown on the drawings.
- C. Level substrates by grinding high spots or filling low spots with latex cementitious subfloor filler as required.
- D. Broom clean or vacuum the surfaces to be covered, and inspect the substrates.
- E. Verify substrates are smooth, level, at required finish elevation, and are ready to receive resilient tile flooring and base.
- F. Bring discrepancies to the attention of the Architect and do not proceed until such discrepancies are corrected.
- G. Conduct moisture test in accordance with ASTM F1869 - maximum allowable amount of moisture emission from floor is 3.0 pounds per 1,000 square feet in 24 hour period, and shall not exceed maximum allowable moisture content as allowed by flooring manufacturer.
- H. Starting Work indicates acceptance of existing conditions.

3.3 INSTALLATION

- A. General:
 - 1. Install materials only after finishing operations, including painting, have been completed and after permanent heating and cooling system is operating.
 - 2. Verify that moisture content of concrete slabs, building air temperature, and relative humidity are within the limits recommended by the manufacturers of the materials used.
- B. Installing Resilient Tiles:
 - 1. Place units with adhesive cement in compliance with the manufacturer's recommendations.
 - a. Butt units tightly to vertical surfaces, nosings, edgings, and thresholds.
 - b. Scribe as necessary around obstructions and to produce neat joints.
 - c. Place tiles tightly laid, even, and in straight parallel lines.
 - d. Extend units into toe spaces, door reveals, and in closets and similar spaces.
 - 2. Lay units from center marks established with principal walls, discounting minor offsets, so that units at opposite edges of the room are of equal width.
 - a. Adjust as necessary to avoid use of cut widths less than 3 inches wide at edge of space.
 - b. Lay units square to axes of the room or space.
 - 3. Match units for color and pattern by using materials from cartons in the same sequence as manufactured and packaged.
 - 4. Lay in alternating pattern with grain in all units running 90 degrees from adjacent unit.

5. Place joining and edge finish moldings, including reducer strips tightly butted to units and secured with adhesive, providing at all unprotected edges unless otherwise shown.
- C. Installing Base:
1. Install base where shown on the Drawings in accordance with manufacturer's instructions.
 2. Use factory-preformed exterior corners, and factory preformed or job-mitered interior corners.

3.4 CLEANING AND PROTECTING

- A. Remove excess adhesive and other blemishes from exposed surfaces, using neutral cleaner recommended by the manufacturer of the resilient materials.

End of Section

SECTION 09 91 00 - PAINTING AND STAINING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation and field application of paints and stains on interior substrates where shown or required.
- B. Surface preparation and field application of paints and stains on exterior substrates where shown or required.
- C. Surfaces not included, as applicable to the project, include, but are not limited to the following:
 - 1. Areas above finished ceiling or scheduled "unpainted" on the Finish Schedule of the drawings, except for those items within those spaces scheduled to painted.
 - 2. Exposed concrete, unless noted otherwise.
 - 3. Shop coat of paint on metal, except for damaged shop primer touch-up (unless noted otherwise.
 - 4. Structural steel and related items scheduled to receive sprayed fireproofing or encased in concrete.
 - 5. Aluminum and copper items, unless noted otherwise.
 - 6. Factory finished items other than prime painted to be field paint finished.
 - 7. Glass and glass masonry.
 - 8. Sealants of types which should not be painted and to which paint will not adhere.
 - 9. Plastic laminate items, such as doors, countertops, casework, etc.
 - 10. Acoustical ceiling and grid work, unless noted otherwise.
 - 11. Acoustical panels
 - 12. Piping of copper, aluminum, and stainless steel.
 - 13. Stainless steel items.
 - 14. Ceramic or tile of any kind.
 - 15. Valves and controls.
 - 16. Sprinkler heads.
 - 17. Name plates on equipment.
 - 18. Fire rating labels, including those on fire rated doors and frames.
 - 19. Finish hardware, except that which is factory primed and designated as "BHMA 600", if any, in Finish Hardware Section.
 - 20. Existing construction, unless noted otherwise.
 - 21. Materials not noted to be refinished or to receive a finish, except as noted, including, but not limited to the following:
 - a. Flooring.
 - 22. Color coding of Mechanical Room pipes whether insulated or not: (Unless noted or directed otherwise)

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. D16, Standard Terminology for Paint, Related Coatings, Materials and Applications.

1.3 DEFINITIONS

- A. Conform to definitions of terms in ASTM D16 in interpreting requirements of this Section.

1.4 SUBMITTALS

- A. Material lists. Give the supplier's name, product name, number and generic description of each proposed product and its use. Provide product data sheets if so requested.
- B. Samples. Submit full range of colors, patterns, textures and finishes available for selection, including the following:
 - 1. Color Chips: Provide complete duplicate sets of color chips for color selection.
 - 2. Small Applied Samples: Provide pieces of actual material on which paint will occur with minimum dry mil thickness of specified paint. Provide painted 12 inch x 12 inch actual gypsum wallboard samples with approved textures for Architect's approval. Approved samples will become standard for which all work will be judged.
 - 3. Sheen Samples: Provide full range of varying sheens when sheens are controllable by intermixing.
- C. Installed Samples. Provide large size samples for approval. Approved samples may be left in place as part of the work.
- D. One room and/or area, as selected by the Architect, shall be painted with materials specified or accepted and applied directly from container, unthinned. After acceptance by Architect, room and/or area shall be standard of quality of entire project.
- E. Certification. Furnish a letter certifying that materials submitted are truly equivalent or better than those called out in the finish schedule.

1.5 RESPONSIBILITY OF COORDINATION

- A. Coordinate the work specified herein with the following work:
 - 1. Provide information to preceding trades for proper preparation of substrate.
 - 2. Inspect substrate before proceeding to verify proper preparation.
 - 3. Notify Architect of any item to receive paint which may not be covered by a scheduled finish type. Architect will furnish appropriate specification.

1.6 QUALITY ASSURANCE

- A. Materials:
 - 1. Delivery and Storage: Products shall be delivered to jobsite in unopened containers bearing manufacturer's labels intact and legible at time of use. Storage shall be in designated areas away from excessive heat and open flames and in accordance with manufacturer's recommendations.
 - 2. Quality or Grade:
 - a. Paints and coatings shall be the manufacturer's highest professional quality material of types specified and shall be applied directly from containers in which material is purchased, except where thinning is recommended by

- manufacturer and approved by Architect to suit intended use, i.e. painting acoustical tile or panels without destroying their acoustical properties.
- b. Primers and other undercoat paints shall be those produced by same manufacturer as finish coats.
 - c. Thinners shall be those recommended by paint manufacturer's printed instructions.
3. Equipment:
- a. Spray Equipment: Shall be the type recommended for the application and shall be maintained clean and in proper working order.
 - b. Brushes, Rollers, etc.:
 - 1) Shall be new of the various sizes and types recommended for each application.
 - 2) Shall be properly cleaned and stored in accordance with manufacturer's instructions at the end of each days' use.
 - 3) Shall be replaced as often as necessary to attain the best finish quality in the Work.
4. Application:
- a. Applicator:
 - 1) Shall be person(s) or entity specializing in application of paints and coatings of types specified with minimum five (5) years experience.
 - 2) Shall provide Owner and Architect a notarized certification that paint used is as specified.
 - b. Application:
 - 1) Shall not proceed on surfaces which are not suitable to be painted, until such surfaces have been corrected. Notify Architect in writing of which surfaces need to be corrected and their locations. Surfaces shall be corrected by the responsible trades. Surfaces not suitable for painting shall include, but not be limited to:
 - a) Damaged surfaces.
 - b) Oily, greasy, dusty or excessively soiled surfaces.
 - c) Non-dressed welds which will be exposed to view.
 - d) Lack of touch-up where specified.
 - e) Rusted or excessively deteriorated shop-prime painted surfaces.
 - 2) Number of coats of each of several finishes shall be in accordance with detailed specifications, which will produce first quality finish if properly applied. If number of coats specified fails to produce a finish acceptable to Architect, this Contractor shall apply additional coat or coats at his own expense until acceptable finish is achieved

1.7 PRODUCT HANDLING

- A. Store only approved materials at the jobsite, and store only in a suitable and designated area restricted to the storage of paint materials and related equipment.
- B. Temperature in the storage area shall be between 40 degrees F and 110 degrees F. Open and mix all materials in the storage area.
- C. Use all means necessary to protect materials before, during, and after application and to protect the installed work and materials of all other trades.
- D. Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F and 90 degrees F, unless otherwise permitted by paint manufacturer's printed instructions.

- E. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F and 95 F, unless otherwise permitted by paint manufacturer's printed instructions.
- F. Do not paint in snow, rain, fog or mist, or when relative humidity exceeds 85 percent, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

1.8 EXTRA STOCK

- A. Upon completion of the work of this section, deliver to the Owner, an extra stock equaling ten (10) percent or a minimum of one (1) gallon, whichever is greater, of each color, type, and gloss of paint used in the work, tightly sealing each container and clearly labeling contents and location where used.

1.9 WARRANTY

- A. The undertaking of a painting subcontract will indicate that the subcontractor will warrant the work specified herein for two (2) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.
- B. Defects shall include by not be limited to the following:
 - 1. Discoloring noticeably by yellowing, streaking, blooming, changing color or darkening
 - 2. Mildewing
 - 3. Peeling, cracking, blistering, alligating or releasing from the substrate
 - 4. Chalking or dusting excessively
 - 5. Changing sheen in irregular fashion
 - 6. Softening or becoming tacky
 - 7. Bubbling
- C. In the event of damage, immediately make all repairs and replacements necessary for approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. All paint materials selected for coating systems for each type of surface shall be the product of a single manufacturer and shall, as a system, have flame spread, fuel contribution, and smoke density test results less than 25.
- B. Paint materials listed herein, unless otherwise designated in the "Painting Schedule", are the products of The Sherwin-Williams Company, 101 Prospect Avenue N.W., Cleveland, OH 44115, (800) 321-8194 and require no further approval as to manufacturer or catalogue number.
- C. Similar firstline material of the following manufacturers may be used subject to approval by the Architect for items indicated to be coated:
 - 1. Paints:
 - a. Benjamin Moore & Co.
 - b. Devoe Paint Company

- c. Fuller O'Brien Paints
 - d. Martin-Senour Paints (Div. of Sherwin Williams)
 - e. Monarch Paint Company
 - f. Glidden Professional™ paints (formerly ICI Dulux Paints)
 - g. Pittsburgh Paints, PPG Industries, Inc., Professional & High Performance Coatings
 - h. Porter Paints
 - i. Pratt & Lambert Paints (Div. of Sherwin Williams)
 - j. Kelly-Moore Paint Co.
 - k. Kwal Paint
 - l. Tnemec Company Inc.
 - m. Other manufacturers, specifically listed in Drawings
2. Stains:
- a. Olympic Stains, PPG Industries, Inc., Professional & High Performance Coatings
 - b. Samuel Cabot, Inc.
 - c. The Sherwin-Williams Co.

2.2 MATERIALS

- A. Paint and Coatings: Ready mixed, except for field catalyzed coatings; having good flow and brushing properties and consistent drying or curing behavior, free of sags and streaks.
- B. Accessory Materials: Linseed oil, turpentine, paint thinners and other materials recommended by paint and coatings manufacturer as necessary to achieve finishes specified.
- C. Patching and Surface Preparation: Latex fillers as recommended by paint and coatings manufacturer.

2.3 COLORS

- A. Colors shall be as selected by Architect. Different colors may be selected for each room, and more than one (1) color may be selected in each room.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that site environmental conditions are appropriate and substrates are in proper condition to receive Work of this Section.
- B. Verify that shop applied primers are compatible with specified finish coats.
- C. Measure moisture content of surfaces using an electronic moisture meter. Do not begin application of coatings unless moisture content of surfaces is below the following maximum values:
 1. Gypsum soffits: 12 percent.
 2. Plaster: 12 percent.
 3. Masonry surfaces: 12 percent.
 4. Wood surfaces: 15 percent.
 5. Vertical concrete surfaces: 12 percent.
 6. Horizontal concrete surfaces: 8 percent.

3.2 ITEMS TO RECEIVE PAINT

- A. Generally, all new items that are normally painted in any typical building, including but not limited to the following list:
1. All ferrous metal
 2. All interior wood
 3. All prime coated hardware
 4. All exposed conduit, outlet boxes and electrical cabinets, excluding those located in mechanical rooms.
 5. All exposed pipe, plumbing, and ductwork, including those located in mechanical rooms.
 6. All metal grilles, except aluminum, unless otherwise indicated.
 7. All exposed gypsum board surfaces, including all mechanical rooms.
 8. Miscellaneous other items which normally require painting or are scheduled to be painted.
 9. Consult plans, finish schedule, details and specifications for other trades as all items usually field painted or finish will be considered as part of the Contract.
 10. All exposed mechanical equipment and electrical equipment.
- B. All work where a coat of material has been applied must be inspected and approved by Architect before application of succeeding specified coat, otherwise no credit for coat applied will be given. Notify Architect when a particular coat has been completed for inspection and approval. Apply coats of material in strict accordance with manufacturer's specifications except where requirements of these specifications are in excess of manufacturer's requirements. Paint all sight exposed pipe and plumbing only after all mechanical work and tests have been completed.

3.3 PREPARATION

- A. General: Surface must be clean to insure adhesion. Remove oil and grease with paint thinner. Wash off dirt with warm soapy water and rinse with clean water. Remove rust by wire brushing or sanding.
- B. Wall surfaces must be dry before painting. Verify with moisture meter.
- C. Unfinished Surfaces
1. Wood: Sand smooth and apply one (1) coat of Primer Undercoat. After primer has dried overnight, putty nail holes and cracks, then spot-prime putty with primer. Again, allow the primer to dry over- night, sand lightly and topcoat.
 2. Iron and Steel: Prime with Metal Primer and allow to dry overnight before topcoating.
 3. Galvanized Metal: Prime with galvanized metal primer and allow to dry overnight before topcoating.

3.4 APPLICATION

- A. General: Surfaces to be finished must be clean, dry and free of dirt, oils, loose paint or any other contamination that would adversely affect adhesion, protective properties or appearance of the coating.
- B. Paint Thickness: Provide the following minimum dry film thickness per coat unless noted otherwise:

1. Enamels on Metal: 1 mil
2. Latex Paints: 1 mil
3. Metal Primers: 1.5 mils
4. Undercoats: 1.5 mils
5. Oil Paints: 1.5 mils
6. Epoxy Coating: 2.0 mils

Thickness test: Use observation gauge that measures "V" shape scratch.

- C. Allow all enamels and varnishes to dry 24 hours between coats. If enamel and varnishes are tacky after 24 hours, allow additional time until finish is dry.
- D. Leveling: Apply with proper consistency and quality so paint flows out to a level surface free of brush and roller marks, bubbles, dust, runs, sags, and holidays. Spread evenly.
- E. Appearance: Uniform color, texture and sheen.
- F. Neatness: Paint shall not be smeared, spattered or run over adjoining colors or materials. Cut-on lines shall be straight.
- G. First coat shall be white, unless otherwise specified.

3.5 CLEANING AND PROTECTION

- A. Keep project premises free of painting-related debris. Collect material that may constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Protect work adjacent to painting operations from paint spatters and spills. Immediately remove paint that falls on finished surfaces not scheduled to receive paint, using materials and techniques that will not damage affected surfaces.

3.6 SCHEDULE

- A. The following is a schedule of typical painted items and does not specifically include every item that is to receive paint but should establish type and quality of finish for all items normally included in a complete paint job.

Interior Surfaces:

1. Galvanized Metal:
 - a. Primer: One (1) coat Pro-Cryl Pro Industrial Universal Primer (B66W310)
 - b. Finish: Two (2) coats Pro Industrial 0 VOC Acrylic Semi-Gloss
2. Gypsum Wallboard:
 - a. Primer: One (1) coat ProGreen 200 Latex Primer (B28W600)
 - b. Finish: Two (2) coats ProGreen 200 Latex Egg-Shell (B20W200 Series)
3. Wood: (Painted)
 - a. Primer: ProMar Classic Latex Primer (B28W8111)
 - b. Finish: ProClassic Waterborne Semi-Gloss (B31 Series)
4. Gypsum Wallboard: (Epoxy) – Kitchens, bathrooms, laboratories, etc.
 - a. Primer: One (1) coat Pro Green 200 Latex Primer (B28W600)
 - b. Finish: Two (2) coats Water-Based Catalyzed Epoxy (B70/B60)

End of Section

SECTION 10 26 00 - WALL PROTECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Furnish and install impact-resistant wall covering at stairs and where shown on drawings.

1.2 RELATED WORK

- A. Section 09 21 16 - Gypsum Wallboard Systems
- B. Section 09 65 19 - Resilient Tile Flooring and Base: Resilient base.
- C. Section 09 91 00 - Painting and Staining: Wall finishes.

1.3 REFERENCES

- A. Publications listed herein are part of this specification to the extent referenced. The criteria established in the specifications shall take precedence over the standards referenced herein. (Examples of reference standards are given below.)
 - 1. ASTM International (ASTM):
 - a. D 256, Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
 - b. E 84, Standard Test Method for Surface Burning Characteristics of Building Materials

1.4 SYSTEM DESCRIPTION

- A. Wall Protection systems shall be for interior applications.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Furnish assemblies from one (1) manufacturer with a minimum of ten (10) years of experience in the fabrication of wall protection systems.
- B. Installer: Firm with not less than three (3) years of successful experience in the installation of systems similar to those required by this project and acceptable to the manufacturer of the system.

1.6 SUBMITTALS

- A. Submit manufacturer's specifications and technical data, including Material Safety Data Sheets, installation instructions, as required, and catalog cuts and templates where required to explain construction and to provide for incorporation into the project.
- B. Submit certificates, copies of independent test reports or research reports showing compliance with specified performance requirements.
- C. Submit shop drawings showing complete fabrication details for wall protection, including required anchorage to surrounding construction.
- D. Submit three (3) 6 inch samples of the specified system.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver wall protection systems to the jobsite in new, clean, unopened crates of sufficient size and strength to protect materials during transit.
- B. Store components in original containers in a clean, dry location.

1.8 WARRANTY

- A. Submit manufacturer's warranty that materials furnished will perform as specified for a period of not less than five (5) years when installed in accordance with manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Specifications are based on Pawling Flush Mounted Corner Guards CG-10 manufactured by Pawling Corporation, 32 Nelson Hill Rd., P.O. Box 200, Wassaic, New York 12592; (800) 431-3456. These specifications are intended to match existing conditions. Substitutions of other products by different manufacturers will not be accepted unless in the case of unavailability of specified products, in which case a request complying with Division 1 requirements regarding substitutions may be considered.

2.2 MATERIALS

- A. Dimensions
 1. Leg Length: 3" (76.2mm).
 2. Height: Top of wall base to underside of ceiling
 2. Angle: 90°.
 3. Profile: High-impact vinyl acrylic extrusion locked in place, nominal 0.100" (2.5mm) thick. Class A fire rating, tested in accordance with ASTM E 84.
 3. Extrusion: CG-10: textured finish.
 4. Retainer: Continuous retainer along entire length of Corner Guard, nominal 0.070" (1.8mm) thick.
 - a. 6063-T6 aluminum.
 5. End Caps: Injection-molded unit of color and texture similar to that of Corner Guard.
- B. Accessories and other materials required for complete installation to manufacturer's instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installer shall examine conditions under which work is to be performed and shall notify the General Contractor of unsatisfactory conditions in writing.
- B. Examine areas and conditions in which wall surface protection components and wall protection systems will be installed.
- C. Complete finishing operations, including painting, before beginning installation of wall surface protection system materials.
- D. Wall surfaces to receive impact-resistant wall protection shall be dry and free from dirt, grease, loose paint, and scale.

- E. Do not proceed with installations until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 PREPARATION

- A. Properly prepare substrate and clean to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. Install wall surface protection units plumb, level, and true to line without distortions in accordance with manufacturer's instructions.
- B. Do not use materials with chips, cracks, voids stains, or other defects that might be visible in the finished work.
- C. Install installation accessories in accordance with manufacturer's instructions.
- D. Manufacturer shall provide location drawings identifying placement of materials, and shall use a mark system for correlating materials to drawings.
- E. Work shall be aligned, as required, flush with adjacent surfaces.
- F. Work shall be rigidly anchored to the substrate.

3.4 CLEANING AND PROTECTION

- A. Clean wall covering and accessories in accordance with manufacturer's instructions.
- B. Remove excess adhesive using methods and materials recommended by the manufacturer.
- C. Advise the Contractor of procedures required to protect the installation from damage by the work of other sections.
- D. Finished units shall be without damage. Units damaged during shipping or construction shall be repaired by the Contractor at the expense of the party damaging the material, in accordance with the contract requirements.

End of Section

SECTION 10 28 13 - LIGATURE RESISTANT TOILET ROOM ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Ligature resistant toilet accessories and shower accessories.

1.2 RELATED SECTIONS

- A. Section 09 21 16 - Gypsum Board Assemblies
- B. Section 09 30 13 - Ceramic Tile

1.3 OWNER FURNISHED CONTRACTOR INSTALLED ITEMS

- A. Contractor shall furnish and install other items specified or shown on drawings.

1.4 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's specifications and technical data.
 - 2. Manufacturer's installation instructions.
 - 3. Manufacturer's operation and maintenance instructions of units specified.
 - 4. Provide schedule of materials and installation locations.
- B. Shop drawings: Indicate size, material and finish. Show locations, installation procedures. Include details of joints, attachments, fasteners, clearances, and mounting heights.

1.5 MINIMUM COMPLIANCE STANDARDS

- A. Comply with ANSI A117.1 and Texas Accessibility Standards (TAS) and with referenced standards specified with each product or material.

1.6 QUALITY STANDARDS

- A. Design, finish and keying of items shall be the same.
- B. Furnish items from one (1) manufacturer only unless otherwise specified or directed by Architect.

1.7 PRE-INSTALLATION CONFERENCE

- A. Refer to Section 01 31 13 – Project Coordination

1.8 COORDINATION

- A. Coordinate the Work with placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.9 WARRANTY

- A. Warrant the work specified herein for three (3) years, or provide manufacturer's standard warranty for specified products, against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials and workmanship.
- B. Defects shall include, but not be limited to:
 - 1. Delamination or deterioration of finish
 - 2. Noisy, rough or difficult operation
 - 3. Failure to meet specified quality assurance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers listed whose products meet or exceeds the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.
 - 1. Odd Ball Industries Mfg. Co., Inc.
 - 2. Cascade Specialty Hardware
 - 3. Whitehall Manufacturing
 - 4. Brey-Krause Manufacturing Co.

2.2 COMPONENTS

- 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. Stainless Steel:
 - 1. Stainless Steel Sheet: ASTM A666 Type 302 or 304.
 - 2. Stainless Steel Tubing: ASTM A269, stainless steel.
 - 3. Finish: No. 4 satin, unless otherwise specified
 - 4. Thickness: 22 US Stainless gauge minimum
- C. Tamper Resistant Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof.
- E. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.
- F. Backing: concealed backing to comply with local codes and as required for substrate conditions; or manufacturer's standard mounting kits.

2.3 FINISHING

- A. Stainless Steel: No. 4 satin brushed, typical on all accessories, unless otherwise noted.
- B. Back paint components where contact is made with building finishes to prevent electrolysis.

PART 3 - EXECUTION

3.1 MOUNTING LOCATIONS

- A. Comply with ADA and TAS requirements. Refer to drawings. When not shown, submit supplier's recommendations for locations and mounting height before proceeding.
- B. Contractor shall be responsible for supplying all opening, blocking, and other components necessary for installation of all toilet accessories.
- C. Use approved theft-resistant type fasteners.

3.2 SCHEDULE

- A. TA-1 - Soap Dispensers: NOT USED
- B. TA-2 - Mirrors:
 - 1. Mounting: Surface.
 - 2. Model No.: SP-8 with mirror guard, as manufactured by Oddball Industries Mfg. Co., Inc.
 - 3. Size: 18 inches by 24 inches, unless shown otherwise.
 - 4. Location: All toilet room lavatories.
- C. TA-3 – Recessed Toilet Paper Dispensers:
 - 1. Mounting: Recessed.
 - 2. Model No.: 1845FA, Ligature Resistant Auto-Release Paper Holder (stainless steel), as manufactured by Whitehall Manufacturing.
 - 3. Locations: All water closets.
- D. TA-4 – Recessed Paper Towel Dispensers:
 - 1. Model No.: B-359, as manufactured by Bobrick. Mount without exposed fasteners.
 - 2. Locations: All lavatories, as indicated in Drawings.
- E. TA-5 - Grab Bars: (At Typical Accessible Toilet Stalls)
 - 1. Size/Finish: 1-1/2 inch diameter extruded 6063-T52 aluminum, in lengths indicated in Drawings.
 - 2. Clearance: 1-1/2 inch between rail and wall.
 - 3. Model No.: Safebar with self-draining end caps, as manufactured by Cascade Specialty Hardware.
 - 4. Mounting: Surface-mounted. Attach with tamper-resistant fasteners. Mount parallel to floor.
 - 5. Location: Accessible water closets, and/or as indicated in Drawings.
- F. TA-6 - Sanitary Napkin Dispensers: NOT USED
- G. TA-7 - Sanitary Napkin Disposal: NOT USED
- H. TA-8 Mop and Broom Holder: NOT USED
- I. TA-9 - Grab Bars: (At Accessible Shower)
 - 1. Size/Finish: 1-1/2 inch diameter extruded 6063-T52 aluminum, in lengths indicated in Drawings.
 - 2. Clearance: 1-1/2 inch between rail and wall.
 - 3. Model No.: Safebar with self-draining end caps, as manufactured by Cascade Specialty Hardware.

4. Mounting: Surface-mounted. Attach with tamper-resistant fasteners. Mount parallel to floor.
 5. Location: Accessible shower stalls, and/or as indicated in Drawings.
- J. TA-10 - Folding Benches: Adult Height: NOT USED
- K. TA-11 - Clothes Hook:
1. Mounting: Surface, Front Mount (stainless steel).
 2. Model No.: WH1830-SLPT-SS, as manufactured by Whitehall Manufacturing.
 3. Locations: All shower locations and backs of toilet room doors, coordinate with Owner in field.
- L. TA-12 - Shower Curtains, Track and Hooks:
1. Tracks: Plastic track with all necessary hardware including breakaway carriers, as manufactured by Standard Textile. Tracks to be installed with tamper proof screws.
 2. Curtains: CM768104 Bezel 10/Spa (42 inches x 72 inches or as required by locations indicated in Drawings).
 3. Hooks: Not applicable: track system utilized.
 4. Mounting/Locations: All shower stalls and restroom doors, as indicated in Drawings.
- M. TA-13 - Electric Hand Dryers: NOT USED
- N. TA-14 - Paper Towel Dispenser/Trash Receptacle Combination: NOT USED
- O. TA-15 - Grab Bars: (At Additional/Alternate Accessible Toilet Stalls): NOT USED
- P. TA-16 - Diaper Changing Stations: NOT USED
- Q. TA-17 - Trash Receptacle: NOT USED

End of Section

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SECTION 21 05 53 - IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Stencils.
 - 5. Valve tags.
 - 6. Warning tags.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Brady Corporation.
 - 2. Marking Services, Inc.
 - 3. Seton Identification Products.

2.2 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
 2. Letter Color: Black.
 3. Background Color: Background to contrast with letter color.
 4. Maximum Temperature: Able to withstand temperatures up to 160°F.
 5. Minimum Label Size: Length and width vary for required label content, but not less than 4 inches wide by 1-1/2 inches high.
 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 7. Fasteners: Stainless-steel rivets or self-tapping screws.
 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.3 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: Background to contrast with letter color.
- D. Maximum Temperature: Able to withstand temperatures up to 160°F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.4 STENCILS FOR PIPING

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.
1. Stencil Material: Brass.
 2. Paint: Standardized colors for the entire natural gas piping system painted per Division 09 painting specification. Paint material is based on colors and model numbers manufactured by Glidden unless otherwise indicated. Subject to compliance with requirements, provided named color or comparable product as approved. Use the following colors for banding of all piping and conduit:

SYSTEM	COLOR
Fire-Suppression	Red

3. Standardized Sizes: Tags shall be at least 1-1/2 inches in diameter, with depressed block characters 1/4 inch high. Titles shall be lettered on bands. Uppercase letters and Arabic numerals shall be used. Where pipes or conduits are too small or not readily accessible for such application securely fasten a brass identification tag at appropriate locations. Identification of the material contained in piping and conduits in accordance with the table below:

BAND AND LETTER SIZE ALL DIMENSIONS IN INCHES		
Outside Diameter of Pipe Covering	Width of Color Band	Size of Letters and Numerals
1/2 to 1-1/4	8	1/2
1-1/2 to 2	8	3/4
2-1/4 to 3-1/4	10	1
3-1/2 to 6	12	1-1/4
8 to 10	24	2-1/2
Over 10	32	3-1/2

4. Pipe Identification: Identify pipe at wall penetrations, machine or tank connections, and at not over 50 foot intervals. Marker identification should be visible from the floor. Mark each pipe circuit with stencil. Stencil shall include flow arrow and identification marks as follows:

SERVICE	MARK
Fire	Fire

2.5 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4 inch letters for piping system abbreviation and 1/2-inch numbers.
1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 2. Fasteners: Brass S-hook.
- B. Valve Schedules: For each piping system, on 8-1/2 by 11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
 - 1. Size: 3 inches by 5-1/4 inches minimum.
 - 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.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Equipment to be identified with plastic nameplates includes but is not limited to sprinkler alarm valve assemblies, backflow preventers, etc.
- B. Identify valves with tags.

3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of equipment.
- B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Division 09 painting sections – All pipe identification shall be stenciled legibly on pipe.
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

3.5 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units.
- B. List tagged valves in a valve schedule in aluminum frame with clear plastic shield. Install at location as directed by Owner's Representative.

3.6 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

SECTION 21 13 00 - FIRE SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for providing a complete building fire protection sprinkler system.

1.2 SYSTEM DESCRIPTIONS

- A. Types: The types of fire protection systems shall include, but not limited to, the following:
 - 1. Complete sprinkler system in accordance with NFPA 13, and the requirements of the State Fire Marshall.
 - 2. The entire building shall be protected with a wet-pipe sprinkler system as specified in Section 21 13 13, Wet-Pipe Sprinkler System.
- B. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Qualification Data: For qualified Installer and professional engineer.
- E. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- F. Welding certificates.
- G. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- H. Field quality-control reports.
- I. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
 - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.
- B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
 - 1. NFPA 13, "Installation of Sprinkler Systems."
 - 2. NFPA 13R, "Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height."
 - 3. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS

- A. Pipe: Aboveground including crawl space, provide minimum schedule 40 steel pipe conforming to ASTM A53 or ASTM A795, Type E Grade A. Comply with applicable governing regulations and industry standards. Underground pipe and fittings including crawl space upstream of double check valve assembly shall be same as specified for domestic water for pipe sizes over 4 inch. Refer to specifications section 22 11 16.
- B. Piping shall be domestically manufactured by one of the manufacturers listed in the latest edition of the American Petroleum Institute (API) approved manufacturers listing.
- C. Threaded Fittings: Class 150 malleable iron, ANSI B16.3, for pipe sizes 2-inch and less.
- D. Malleable Iron Threaded Unions: ANSI B16.3, select for proper piping fabrication and service requirements including style, end connections, and metal-to-metal seats (iron, bronze, or brass), plain or galvanized as specified.
- E. Threaded Pipe Plugs: ANSI B16.14.
- F. Steel Flanges/Fittings: ANSI B16.5, including bolting, gasketing, and butt weld end connections. Fittings same thickness as pipe.
- G. Forged Steel Socket-welding and Threaded Fittings: ANSI B16.11, rated to match schedule of connected pipe.
- H. Wrought Steel Butt-welding Fittings: ANSI B16.9, except ANSI B16.28 for short radius elbows and returns; rated to match connected pipe.

- I. Flanged Fittings: Comply with ANSI B16.5 for bolt-hole dimensioning, materials, and flange thickness.
- J. Flange Bolts: Bolts shall be carbon steel ASTM A307 Grade A hexagon head bolts and hexagonal nuts. Where one or both flanges are cast iron, furnish Grade B bolts. Cap screws utilized with flanged butterfly valves shall be ASTM A307 Grade B with hexagon heads.
- K. Flange Bolt Thread Lubricant: Lubricant shall be an anti-seize compound designed for temperatures up to 1000°F and shall be Crane Anti-Seize Thread Compound or approved equal.
- L. Miscellaneous Piping Materials/Products:
 - 1. Welding Materials: Comply with ASME Boiler and Pressure Vessels Code, Section 11, Part C, for welding materials.
 - 2. Brazing Materials: American Welding Society, AWS A5.B, Classification B Cup-5.
 - 3. Gaskets for Flanged Joints: 1/16 inch thick for pipe size 10 inches and smaller and 1/8 inch thick for all pipe size 12 inches and larger. Ring-type shall be used between raised face flanges and full face-type between flat face flanges with punched bolt holes and pipe opening. Gaskets shall be Garlock Style 3400 compressed non-asbestos or equal.
 - 4. Dielectric Unions: Provide dielectric unions at all pipe connections between ferrous and nonferrous piping. Unions shall be "Delvin" as made by Pipeline Seal and Insulator Company or "EPCO" as made by Epco Sales, Inc. and shall have nylon insulation.
- M. Use mechanical couplings may only be used for pipe sizes over 2-inch, to engage and lock grooved or pipe ends and to allow for some angular deflection, contraction and expansion.
 - 1. Couplings shall be positive lock type and shall consist of ASTM A536 ductile iron housing, c-shaped composition sealing gasket and carbon steel bolts conforming to ASTM A183.
 - 2. Gasket Material for wet systems shall be EPDM.
 - 3. Gasket material for dry pipe systems shall be silicone.
 - 4. All couplings shall be UL listed and FM approved.
 - 5. Provide only full flow (no-fabricated) fittings. Snap joint couplings, outlet couplings, cut-in style couplings, reducing couplings, mechanical-T style couplings, pressfit couplings, and plain end type couplings are not allowed.
 - 6. When mechanical couplings are used, ONLY grooved type fittings and pipe shall be used, no plain end fittings or pipe. Grooved couplings and fittings shall be manufactured by Victaulic, "Firelock" or approved equivalent.
- N. Water Flow Switches: Viking Model C-1 or approved equal water flow switch with adjustable retard feature. Switch shall be double-pole double-throw type and shall be rated at least 7 amperes at 125/250 volts.
- O. Valve Supervisory Switches:
 - 1. Provide on each valve, controlling or shutting-off sprinkler system where shown on drawings or/and on all valves required by NFPA 13, or any portion thereof.
 - 2. Provide UL listed unit, with either one single pole double throw switch or two single pole, double throw switches as required. Switch shall be compatible with installed valve for standard mounting. Manufactured by Potter Roemer No. 6220, or approved equal.

- P. Sight Flow Connection: Provide acrylic sight flow connection in all test lines, conforming to NFPA 13.
- Q. Pressure Gauges: Potter-Roemer Fig. No. 6240 or approved equal 3-1/2 inch diameter polished brass case, 1/4 inch NPT male connection, glass enclosed, 0-300 psi dial pressure gauges with isolation valves.
- R. Refer to specifications section 22 05 29 for hangers and supports. As a minimum all hangers and supports shall comply with NFPA13.
- S. Fire Valve Cabinet (FV-1): Potter-Roemer Fig. No. 18210, recessed fire valve cabinet consisting of 20 gauge steel cabinet with continuous hinge, recoatable white polyester finish. With cabinet provide Potter Roemer No. 4060-D, UL Listed and FM approved polished chrome plated 2-1/2" cast-brass angle valve with iron handwheel, female inlet by 2-1/2" male hose thread outlet, 300 pound rating, with female hose thread cap with pin lugs and chain

PART 3 - EXECUTION

3.1 INSTALLATION OF FIRE PROTECTION PIPING SYSTEMS

- A. General: piping system materials, components and installation shall be in accordance with NFPA 13 and as specified.
- B. Standpipe, riser and all other piping shall be Schedule 40 black steel pipe. Copper piping shall not be used.
- C. Underground fire line piping from the fire water source shall be as specified herein with asphaltic outside coating.
- D. Sprinkler system piping shall in general be as specified for fire standpipe piping. The use of thin wall sprinkler piping will not be acceptable.
- E. Fittings 2 inches and smaller for Schedule 40 pipe shall be malleable iron threaded fittings. Fittings for piping over 2 inches shall be standard welded fittings or mechanical grooved type couplings may be used as specified.
- F. Piping and joints shall be full bore reamed, for all joint types.
- G. Slag shall be removed and cleaned at all welded joints.

3.2 PIPING INSTALLATION

- A. Piping shall be concealed, except in mechanical equipment rooms, stairwells, or where otherwise indicated on the Drawings. Install all piping parallel to or at right angles to the column lines of the building wherever possible.
- B. Grade piping to eliminate traps and pockets and for drainage per NFPA 13. Where air pockets or water traps cannot be avoided, provide hose bibbs for drainage.
- C. No fire protection piping is allowed in electrical rooms. It shall be the responsibility of the Fire Protection Contractor to coordinate electrical equipment locations with the Electrical Contractor and design the fire protection piping system such that no piping is routed over electrical equipment.

- D. Changes in direction, branches, offsets etc., shall be made with standard pipe fittings. Holes in the main for branches shall be made with a hole cutting machine and a standard "Weld-O-Let" or 'Thread-O-Let' fitting used. Burning holes in the fire protection System Piping will cause that section of the piping to be cut out and replaced at the Contractor's expense.
- E. Pipe shall be reamed to full pipe diameter before joining:
 - 1. Screwed joints shall be made with standard pipe thread and an approved compound applied to the male thread only.
 - 2. Welded joints shall be made in accordance with the procedure outlined in the ANSI piping code.
 - 3. Valves and specialties shall be screwed or flanged joints.
 - 4. Grooved joints shall be made in accordance with manufacturers recommendations with UL listed and FM approved couplings or weld-o-let connections to pipe mains shall be full bore.
 - 5. Slag, etc. shall be removed.
- F. Install unions or flanges at equipment connections and as indicated on the Drawings.
- G. Cold-springing piping will not be permitted. Install piping with adequate support to prevent strain on the equipment and to allow for piping system expansion and contraction.
- H. Welded joints on pipe runs shall be made with continuous welds and with pipe ends beveled before fabrication. Piping shall be carefully aligned prior to welding and no metal shall project within the pipe.
- I. Piping shall be sized as required by applicable codes and as indicated on the Drawings.
- J. Provide all test and drain lines as required by Section 8.15.2.4, Section 8.15.2.5 & Section 8.15.2.6 of NFPA 13:
 - 1. Pressure gauges, signs, and other such standard appurtenances shall be furnished as required for a complete installation in accordance with NFPA 13.
 - 2. Provide nameplate data sign at the zone controlling valve to identify the system as a hydraulically designed system indicating the location and basis for design in accordance with Section 6.7.4 and Section 24.5 of NFPA 13.
- K. Install sprinkler piping so that it can be thoroughly drained, and where practicable shall be arranged to drain at the zone drain valve. The zone drain valve shall be capable of a full discharge test without allowing water to flow onto the floor. All drips and drains shall conform to Section 8.16.2.6 of NFPA No. 13.
- L. Field changes in the piping layout or pipe sizes shall not be made without the prior approval of the Engineer.
- M. Fire protection piping within the crawl space shall be insulated with 1 inch thick Foamglass type insulation with metal jacket, as specified for hydronic piping.

3.3 TESTS AND INSPECTIONS

- A. Inspections, examinations and tests required by the authorities or agencies specified shall be arranged and paid for by the Fire Protection Subcontractor, as necessary, to obtain complete and final acceptance of the system as installed. The certificates of inspection shall be in quadruplicate, and shall be delivered to the Engineer for review and distribution.

- B. Fire protection piping systems shall be hydrostatically tested by the Contractor upon completion of the installation as required by Section 10.10.2.2 of NFPA 13 in the presence of the Owners Representative.
 - 1. The fire protection piping systems shall be hydrostatically tested at 200 psi for 2 hours without loss of pressure.
 - 2. When hydrostatic and alarm tests have been completed and all necessary corrections made, a material and test certification shall be provided in accordance with Section 10.10 of NFPA 13.
 - 3. Final inspection shall include full flow testing through the inspectors test connection.
 - 4. Actuation of the flow switch shall occur within one minute of opening of the inspector's test valve.
 - 5. Final tests may be witnessed by the Engineer or Owner's Representative.
- C. Sprinkler system zone control assemblies shall be tested to demonstrate proper operation of the flow switch and valve supervisory switch.
- D. Arrange and pay for all tests and inspections required by authorities having jurisdiction.
- E. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

3.4 PERIODIC INSPECTION SERVICE

- A. After completion of the fire protection system installation and at the beginning of the guarantee period, the Automatic Sprinkler Subcontractor shall execute the National Automatic Sprinkler and Fire Control Association, Inc., Standard Form of "Inspection Agreement", without change in the Contract amount, calling for four inspections of the fire protection system during the warranty period.
- B. During the warranty period, inspections shall be in accordance with the Inspection Agreement, plus the following maintenance to be performed during the course of the fourth inspection:
 - 1. Operation of all control valves.
 - 2. Lubrication of operating stems of all interior valves.
 - 3. Operation of all alarms, supervisory switches, air compressors, alarm trip switches, flow switches, and similar items.
 - 4. Cleaning of alarm valves.
 - 5. Lubrication of Fire Department valve hose connections.
 - 6. The standard form of the National Automatic Sprinkler and Fire Control Association, Inc., "Report of Inspection", shall be filled out in triplicate after each inspection and the copies sent to the Architect.

3.5 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53, Electrical Identification.

3.6 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers with paint other than factory finish.

END OF SECTION

SECTION 21 13 13 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes labor and materials for the installation of a hydraulically calculated automatic, wet-pipe sprinkler system(s) in areas as specified, and as shown on the Drawings, complete in all respects and ready for operation.
 - 1. Work includes the design of a wet-pipe automatic sprinkler system, complete and ready for operation.
 - 2. Design and installation of the sprinkler system shall be such that no parts interfere with general construction, doors, windows, heating, plumbing, air conditioning systems or electrical equipment.
- B. System components for each zone shall include, but not be limited to:
 - 1. Zone control valve and test/drain assembly.
 - 2. Drain valve.
 - 3. Waterflow switches.
 - 4. Valve supervisory switches.
 - 5. Piping.
 - 6. Sprinkler heads.

1.2 SYSTEM DESCRIPTION

- A. The wet-pipe sprinkler system shall be fixed water type fire protection sprinkler system with a pressurized water supply to fusible sprinkler heads for control of fire.
- B. The sprinkler system shall be designed to meet the more stringent of the requirements of NFPA 13 and FM Global requirements.
- C. All sprinkler heads in general shall be in a straight line, parallel to the lines of the building and shall be located in the approximate center of ceiling tiles.
 - 1. Sprinkler head quantities, where shown, are the minimum, which must be provided. If additional heads are required to meet NFPA 13, the location of additional heads must be approved by the Architect.
 - 2. Contractor shall submit Sprinkler Head locations to the Architect for location and type approval prior to completing the sprinkler system design, unless otherwise instructed, in writing, by the Architect.
- D. Work shall be installed in accordance with the Drawings, Specifications and FM Global. Devices and equipment shall be listed by Underwriters' Laboratories, Inc. or Factory Mutual-approved, individually and as a system, as applicable.
- E. Sprinkler heads shall be spaced, located, and positioned as shown on the Architectural reflected ceiling plans, where shown, as specified and as required to suit the building partition layout according to Sections 8.5 and Section 8.6 of NFPA 13.
- F. Piping sizes and configurations shall be on the basis of hydraulic calculations. Where head layouts shown on the Drawings or requirements specified are more stringent than NFPA requirements, the more stringent requirements shall apply.

- G. Zone the wet-pipe sprinkler system with a maximum 52,000 sq. ft. area limitation per zone.
- H. Coordinate the location of sprinkler heads and piping such that it does not interfere with the installed ceiling configuration or other building construction and equipment.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Provide total hydraulically designed sprinkler system with plans, elevations, sections, details, and related attachments including Wiring Diagrams for power, signal, and control wiring.
- C. All submittals shall be provided to FM Global and A/E for review and approval prior to any work.
- D. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Qualification Data: For qualified Installer and Professional Engineer.
- F. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, FM Global, including hydraulic calculations if applicable.
- G. Welding certificates.
- H. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- I. Field quality-control reports.
- J. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
 - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.
- B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- D. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
 - 1. NFPA 13, "Installation of Sprinkler Systems."
 - 2. NFPA 13R, "Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height."
 - 3. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

PART 2 - PRODUCTS

2.1 SPRINKLERS

- A. Manufacturers: Design of Sprinkler heads is based on model numbers manufactured by Viking Corporation unless otherwise indicated. Subject to compliance with requirements, provide named product or approved equivalent.
- B. Unless otherwise specified, sprinkler heads shall be a quick response type with standard (155°F) temperature rated fusible link, 1/2 inch orifice and a 5.6 K factor.
 - 1. Heads located within the air streams of heat emitting equipment and serving Elevator Machine Rooms, Elevator Shafts and Boiler Rooms shall have a intermediate (200°F) temperature rated fusible link.
 - 2. Install corrosion-resistant sprinkler heads where they are exposed to weather, moisture, or corrosive vapors.
 - 3. Heads installed where they might receive mechanical injury or are less than 7 feet above the floor level shall be protected with approved guards in accordance with Section 6.2.8 of NFPA 13.
 - 4. Sprinklers in areas with suspended ceilings shall have pipe and fittings located above the suspended ceiling.
 - 5. Sprinkler heads in common areas shall be white quick response type concealed style heads, similar to Reliable Model F4FR, Viking Horizon Mirage Model VK404, or approved equivalent. Sprinkler heads in Patient Rooms and Exam Rooms shall be pendant type, quick response, 165 F temperature rating, UL listed, institutional style, secure retaining flange, 5.6K factor, with chrome plated finish, Reliable Model XL Inst Pendant or approved equal shall be provided.
- C. Sprinkler heads shall be UL Listed and FM approved.
- D. Provide metal cabinet containing a stock of spare sprinkler heads of all types and ratings installed.
 - 1. Locate cabinet where temperature will not exceed 100°F.
 - 2. Location shall be approved by the Owner.
 - 3. Number of spare sprinklers shall conform to Section 6.2.9 of NFPA 13.
 - 4. Provide a sprinkler wrench in the cabinet, for each different type sprinkler head.
- E. Sprinklers shall not be provided in electrical rooms.
- F. The use of extended coverage type heads is not allowed.
- G. The use of UL listed flexible type head assemblies are permitted.

2.2 VALVE SUPERVISORY SWITCHES

- A. Contractor shall furnish and install supervisory switches. Coordinate wiring of switches with Division 26 Electrical Sections.

2.3 WATERFLOW SWITCHES

- A. Provide Viking VSR-F or equivalent waterflow switches, with adjustable retard feature in the supply pipe to each zone for remote alarm. Switch shall be double-pole single-throw type and shall be rated at least 7 amperes at 125/250 volts.
- B. Waterflow pressure switches shall be furnished and installed by this Contractor and wired under provisions of Division 26 Electrical Sections. Coordinate wiring of flow switches with Division 26 Electrical Sections.

2.4 BUILDING FIRE ALARM SYSTEM INTERFACE

- A. Each zone control assembly shall provide an alarm signal output to the Building Fire Alarm System whenever there is waterflow in the zone. Coordinate with Division 28 Electronic Safety and Security Sections.
- B. Each valve which controls the flow of sprinkler system water shall be monitored by the Building Fire Alarm System. Coordinate with Division 28 Electronic Safety and Security Sections.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.
- C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- G. Install sprinkler piping with drains for complete system drainage.
- H. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- I. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
- J. Install alarm devices in piping systems.

- K. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.
- L. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.
- M. Fill sprinkler system piping with water.
- N. Sprinklers in suspended ceilings shall be provided with arm over supply line. Refer to detail on plumbing drawings.
- O. Individual sprinkler head piping shall not connect to cross-main from the bottom or side of cross-main.

3.2 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.
- I. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

- K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- M. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- N. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
 - 1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
 - 2. Alarm Valves: Include bypass check valve and retarding chamber drain-line connection.

3.4 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.
- B. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.
- C. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

3.5 ESCUTCHEON INSTALLATION

- A. Install escutcheons for penetrations of walls, ceilings, and floors.

3.6 SLEEVE INSTALLATION

- A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.
- B. Sleeves are not required for core-drilled holes.
- C. Permanent sleeves are not required for holes formed by removable PE sleeves.

- D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.
- E. Install sleeves in new partitions, slabs, and walls as they are built.
- F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 07 Section, Joint Sealants.
- G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 07 Section, Joint Sealants.
- H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals.
- I. Seal space outside of sleeves in concrete slabs and walls with grout.
- J. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestop materials and installations in Division 07 Section, Penetration Firestopping.

3.7 SLEEVE SEAL INSTALLATION

- A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.
- B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.8 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53, Electrical Identification.

3.9 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Start and run excess-pressure pumps.
 - 6. Coordinate with fire-alarm tests. Operate as required.

7. Verify that equipment hose threads are same as local fire-department equipment.
 8. Sprinkler system zone control assemblies shall be tested to demonstrate proper operation of the flow switch and valve supervisory switch.
 9. Arrange & pay for all tests and inspections required by authorities having jurisdiction.
- C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.10 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers with paint other than factory finish.

3.11 PERIODIC INSPECTION SERVICE

- A. Refer to Section 21 13 00 for requirements. Provide periodic inspections service after completion and Owner acceptance.
- B. This agreement shall be executed at no cost to the Owner and shall include four inspections of the entire sprinkler system during the warranty period, each with a NASFCA "Report of Inspection to the Owner". The final inspection shall include operation and lubrication of all valves, cleaning of all alarm valves and operational testing of all system Electrical and alarm components.

3.12 TRAINING

- A. The installation contractor shall provide a minimum of 4 hours of training for the Owner in operation and maintenance of the wet-pipe sprinkler system

END OF SECTION

SECTION 22 05 00 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the common work results requirements for Division 22, Plumbing. Applicable provisions of this Section apply to all Sections of Division 22.

1.2 GENERAL

- A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work. Determine exact locations from field measurements and provide coordination drawings.
- B. Prior to starting work, Contractor shall provide 1/4 inch scale coordination drawings for all areas of the buildings for approval by Architect/Engineer.
 - 1. Drawings shall show all equipment, ductwork, cable trays, fire protection systems, coil pull spaces, chilled water, heating water, and condensate piping and trap, electrical conduit, electrical control panels, etc. installed to verify space allocation and coordination of trades.
 - 2. Provide plan and elevation views detailing installation.
 - 3. Do not proceed with construction of plumbing systems until Drawings have been approved by Architect, Engineer, and Owner.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than plumbing and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and plumbing equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 CODE REQUIREMENTS AND PERMITS

- A. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.
- B. Resolve code violations discovered in contract documents with Engineer prior to award of Contract. After award of Contract, make correction or addition necessary for compliance with applicable codes at no additional cost to Owner.

- C. Obtain and pay for all permits and inspections.

1.5 SUBMITTALS

- A. Material and Equipment List: Within 30 days after award of the contract and before orders are placed or shop drawings are submitted, submit a list of equipment and principal materials specified. Give names of manufacturers, catalog and model numbers, and such other supplementary information as necessary for identification.
- B. Material and Equipment Shop Drawings: Submit all detailed shop drawings, descriptive literature, physical data, and performance data at one time for review for items of equipment and for principal materials proposed for installation. Include identifying symbols and equipment numbers used in plans and specifications, with reference to specification paragraphs, and drawing numbers of all equipment and material submitted.
- C. Final Submittal: In addition to number of copies of shop drawings and other data required for review submittals, maintain a separate file of final approved copies of such material. Deliver approved copies in a hard-back binder for the Owner's use. Incorporate changes and revisions made throughout construction period. Delivery of approved copies is a condition of final acceptance for the project.
- D. Contractor's Check: Shop drawings will be submitted only by the Contractor. Indicate by signed stamp that the drawings have been checked, that the work shown on the drawings is in accordance with contract requirements and that dimensions and relationship with work of other trades have been checked. If drawings are submitted for approval that have not been checked and signed by the Contractor, they will be returned for checking before being considered by the Architect/Engineer.

1.6 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. The Contractor shall furnish five copies of commercially available standard operation and maintenance data, including operating instructions, maintenance instructions and parts listings. Detailed requirements for these items are as follows:
 - 1. Information required for the preparation of O&M manuals may be furnished in the form of manufacturers' standard brochures, schematics, and other printed instructions. Clearly distinguish between information which applies to the equipment and information which does not apply. Data shall include as a minimum the following items:
 - a. Recommended procedures and frequencies for preventive maintenance, inspection, adjustment, lubrication, cleaning, etc.
 - b. Special tools and equipment required for testing and maintenance.
 - c. Parts lists reflecting the true manufacturer's name, part number, and nomenclature.
 - d. Recommended spares by part number and nomenclature and spare stocking levels.
 - e. Integrated mechanical and electrical system schematics and diagrams to permit operation and troubleshooting after acceptance of the system.
 - f. Troubleshooting, checkout, repair, and replacement procurement procedures.
 - g. Operating instructions including start-up and shutdown procedures.
 - h. Safety considerations including load limits, speed, temperature, and pressure.
- B. Provide O&M manuals for all plumbing equipment. Coordinate O&M manuals with Division 01.

- C. Upon completion of work, and at time designated by the Architect/Engineer, provide services of a competent representative of the Contractor for a period of at least 40 hours to instruct the Owner's Representative in the operation and maintenance of the entire system.

1.7 PROJECT RECORD DOCUMENTS

- A. Preparation:
 - 1. Maintain at the job site a separate set of white prints of the contract drawings for the sole purpose of recording the "as-built" changes and diagrams of those portions of work in which actual construction is significantly at variance with the contract drawings.
 - 2. Mark the drawings with a colored pencil.
 - 3. Prepare, as the work progresses and upon completion of work, drawings clearly indicating locations of various lines, valves, ductwork, traps, equipment, and other pertinent items, as installed
 - 4. Include flow-line elevation of sewer lines.
 - 5. Record underground and underslab piping installed, dimensioning exact location and elevation of such piping.
 - 6. Coordinate requirements for Project Record Documents with Division 01.
- B. Deliver: At conclusion of project, obtain without cost to Owner, reproducibles of original mechanical drawings and transfer as-built changes to these. Delivery of as-built prints and reproducibles is a condition of final acceptance.

1.8 GUARANTEE

- A. Guarantee work for 1 year from the date of final acceptance of the project, and during that period make good any faults or imperfections that may arise due to defects or omissions in materials or workmanship. Coordinate requirements for Warranty with Division 01.

1.9 SERVICE

- A. Perform service work required during the guarantee period including lubrication of bearings. Perform service monthly, and provide the Owner with a written report. Cleaning of air filters and pipe strainers is not included.

1.10 REFERENCE SPECIFICATIONS AND STANDARDS

- A. Materials which are specified by reference to Federal Specifications; ASTM, ASME, ANSI, or AWWA Specifications; Federal Standards; or other standard specifications must comply with latest editions (except where specified otherwise in individual sections), revisions, amendments or supplements in effect on date bids are received.
 - 1. Requirements in reference specifications and standards are minimum for all equipment, material and work.
 - 2. In instances where capacities, size or other feature of equipment, devices or materials exceed these minimums, meet listed or shown capacities.

1.11 CUTTING AND PATCHING

- A. General: Cut and patch walls, floors, etc., resulting from work or by failure to provide proper openings or recesses in new construction.

- B. Methods of Cutting:
 - 1. Openings cut through concrete and masonry shall be made with masonry saws and/or core drills and at such locations acceptable to the Architect/Engineer.
 - 2. Impact-type equipment shall not be used except where specifically acceptable to the Architect/Engineer.
 - 3. Openings in precast concrete slabs for pipes, conduits, outlet boxes, etc., shall be core drilled to exact size.
- C. Restoration:
 - 1. All openings shall be restored to "as-new" condition under the appropriate Specification Section for the materials involved, and shall match remaining surrounding materials and/or finishes.
- D. Masonry:
 - 1. Where openings are cut through masonry walls, provide and install lintels or other structural supports to protect the remaining masonry.
 - 2. Adequate supports shall be provided during the cutting operation to prevent any damage to the masonry occasioned by the operation.
 - 3. All structural members, supports, etc., shall be of the proper size and shape, and shall be installed in a manner acceptable to the Architect/Engineer.
- E. Special Note: No cutting, boring, or excavating which will weaken the structure shall be undertaken.

1.12 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Furnish new and unused materials, pipes, pipe fittings, and equipment of domestic manufacturer where available. Where two or more units of same type or class of equipment are required, provide units of a single manufacturer.

2.2 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers are listed in individual Sections of Division 22. Manufacturer's names and catalog numbers specified under Sections of Division 22 are used to establish standards of design, performance, quality and serviceability and not to limit competition.

Equipment of similar design, equal to that specified, manufactured by a manufacturer named in the acceptable manufacturer's list will be accepted upon approval.

B. Substitutions:

1. If the Contractor desires to substitute a material or method as an equal to the specified item, he shall request permission from the Architect/ Engineer, in writing, and shall include such literature, samples, etc., deemed necessary to establish the equal quality of his proposal.
2. If the Architect/Engineer deems it necessary in order to establish the equality between two or more products, he may require laboratory testing at the Contractor's expense in order to obtain information upon which to base a decision.
3. The Architect/Engineer will not give approval to material salesmen or subcontractors and only in writing to the successful Contractor after the project has been awarded.
4. For each proposed substitution product, clearly show how the proposed product meets the requirements of the specifications, including performance.
5. No substitution will be considered unless it is presented in writing within that number of days after Notice to Proceed equal to 15 percent of the contract time.
6. Proposers of substitute products shall present samples, literature, test and performance data, record of other installations, names of Owners, architects, engineers, contractors and subcontractors as references, statement of current financial condition, and other technical information applicable to their products, to aid in determining the worth of the substitute product offered in relation to the material and work specified from the standpoint of the Owner's best interest.
7. Substitute materials and products shall be used only if approved in writing by the Architect/Engineer in advance.
8. Approval of substitute materials offered shall not be a basis for contingent extra charges because of changes in other work or related work, such as roughing-in, electrical, structural, or architectural, which may result from the substitution.
9. For any Contractor initiated substitutions or changes, Contractor shall be responsible for achieving results equal to or better than the product or design originally specified.

2.3 FLAME SPREAD PROPERTIES OF MATERIALS

- A. Materials and adhesives incorporated in this project shall conform to NFPA Standard 255, "Method of Test of Surface Burning Characteristics of Building Materials" and NFPA 90. The classification shall not exceed a flame spread rating of 25 for all materials, adhesives, finishes, etc., specified for each system, and shall not exceed a smoke developed rating of 50.

2.4 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.5 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

- B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8 inch Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.
- E. Welding Filler Metals: Comply with AWS D10.12.

2.6 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180°F.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
- E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225°F.
- F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225°F.

2.7 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
- B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
- C. Pressure Plates: Stainless steel. Include two for each sealing element.
- D. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.8 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239 inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with set screws.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D 1785, Schedule 40.
- G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.9 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - 1. Finish: Polished chrome-plated.

2.10 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, non-corrosive, non-gaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

2.11 WALL ACCESS PANELS FOR VALVES

- A. Provide 10" x 10" 16 gauge prime coated wall access panel with keyed lockable cylinder door (vandal proof), concealed pivoting rod hinged door, recessed, manufactured by Elmdor No. DW10"x10", or approved equal. Final paint finish of door to match door color. Refer to Architectural drawings and specifications.

PART 3 - EXECUTION

3.1 PLUMBING DEMOLITION

- A. Refer to Division 01 Section, Cutting and Patching, and Division 02 Section, Selective Structure Demolition, for general demolition requirements and procedures.
- B. All demolition/disconnects of plumbing equipment shall be performed by individuals licensed in the applicable trade.
- C. Disconnect, demolish, and remove plumbing systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- D. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors.
- M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

- N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1 inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1 inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section, Penetration Firestopping, for materials.
- Q. Verify final equipment locations for roughing-in.
- R. Refer to equipment specifications in other Sections for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
 - 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 5. PVC Nonpressure Piping: Join according to ASTM D 2855.
 - 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
- L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End Pipe and Fittings: Use butt fusion.
 - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.
- M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

- C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.6 OBSTRUCTIONS

- A. Drawings indicate certain information pertaining to surface and subsurface obstructions which has been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.
- B. Before any cutting or trenching operations are begun, verify with Owner's Representative, utility companies and other interested parties that all available information has been provided. Verify locations given.
- C. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.
- D. Assume total responsibility for and repair any damage to existing utilities or construction.

3.7 OPENINGS

- A. Framed, cast or masonry openings for ductwork, equipment and piping are specified under other divisions. However, drawings and layout work for exact size and location of all such openings are included under this Division.

3.8 PROTECTION

- A. Adequately protect work, equipment, fixtures and materials from damage during storing, installation, start-up and testing.
- B. Cover all equipment stored exposed to elements with waterproof tarps. Provide adequate ventilation. At work completion, all work must be clean and in like new condition.
- C. Storage of all mechanical equipment and piping materials shall be in strict accordance with manufacturers written installation instructions.
- D. Provide factory installed pipe caps for all pipes to be installed on the project.

3.9 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
 - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18 inch centers around the full perimeter of the base.
 - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section, Cast-in-Place Concrete.

3.10 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section, Metal Fabrications, for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.11 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.12 GROUTING

- A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

3.13 LUBRICATION AND OIL

- A. Provide a complete charge of correct lubricant and/or oil for each item of equipment requiring lubrication.

3.14 TEMPORARY CONDITIONING OF BUILDING SPACES FOR COMPLETION OF CONSTRUCTION

- A. All equipment utilized will be checked out by a factory representative, serviced, lubricated, checked for rotation, pressure, amp draw and vibration isolation, adjusted and certified. Record of this service must be provided monthly to the Owner. Submit appropriate reports to the University prior to submitting a written request for service.
- B. All equipment operated shall be serviced on a regular basis by the Contractor.
- C. Prior to final inspection, clean all equipment inside and out to a like new condition, remove temporary filters, install new permanent filters in preparation for final inspection by Owner.
- D. All warranties will be commenced at the time of final acceptance.

3.15 OPERATING TESTS

- A. After all plumbing systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequence and operation throughout the range of operation witnessed by Owner's Representative.
- B. Prove operations of control systems and all safeties, and alarms. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual Sections.
- C. Functional Performance Testing is part of the Commissioning Process. Functional performance testing shall be performed by the Contractor and witnessed and documented by the Commissioning Agent. Refer to Section 019113, General Commissioning, for functional performance testing and commissioning requirements.

3.16 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. The Contractor shall furnish five copies of commercially available standard operation and maintenance data, including operating instructions, maintenance instructions and parts listings. Detailed requirements for these items are as follows:
 - 1. Information required for the preparation of O&M manuals may be furnished in the form of manufacturers' standard brochures, schematics, and other printed instructions. Clearly distinguish between information which applies to the equipment and information which does not apply. Data shall include as a minimum the following items:
 - 2. Recommended procedures and frequencies for preventive maintenance; inspection, adjustment, lubrication, cleaning, etc.
 - 3. Special tools and equipment required for testing and maintenance.
 - 4. Parts lists reflecting the true manufacturer's name, part number and nomenclature.
 - 5. Recommended spares by part number and nomenclature and spare stocking levels.
 - 6. Integrated mechanical and electrical system schematics and diagrams to permit operation and troubleshooting after acceptance of the system.
 - 7. Troubleshooting, checkout, repair and replacement procurement procedures.
 - 8. Operating instructions including start up and shutdown procedures.
 - 9. Safety considerations including load limits, speed, temperature and pressure.

10. Provide O&M manuals for all plumbing equipment. Coordinate requirements for O&M Manuals with Division 01.

3.17 OPERATING INSTRUCTIONS

- A. Upon completion of work, and at time designated by the Owner's Representative, provide services of a competent representative of the Contractor for a period of at least 40 hours to instruct the Owner's Representative in the operation and maintenance of the entire system. The training sessions will be video taped for instructing future technicians.
- B. Training of the Owner's operation and maintenance personnel is required in cooperation with the Owner's Representative. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. The instruction shall be scheduled in coordination with the Owner's Representative after submission and approval of formal training plans. Refer to Section 019113, General Commissioning, for contractor training requirements.
- C. Coordinate requirements for training with Division 01.

END OF SECTION

SECTION 22 05 26 - PIPE AND PIPE FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes requirements for pipe and pipe fittings for all piping systems. This Section applies to all Plumbing Sections of Division 22 which employ pipe and pipe fittings. Fabricate and erect all piping in accordance with ASME/ANSI B31.9 except as otherwise indicated.

1.2 RELATED SECTIONS

- A. Division 07, Thermal and moisture protection for firestopping requirements.
- B. Division 09, Finishes for painting requirements.
- C. Section 22 05 00, Common Work Results for Plumbing
- D. Section 22 05 53, Identification for Plumbing Piping and Equipment.
- E. Section 22 11 16, Domestic Water Piping.
- F. Section 22 11 19, Domestic Water Piping Specialties.

1.3 SUBMITTALS

- A. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 paragraphs where titles below introduce lists or manufacturers, the following requirements apply to product selection:
 - 1. Acceptable Manufacturers: Subject to compliance with requirements, provide products by the manufacturer specified.

2.2 PIPE AND FITTINGS

- A. The particular type of pipe and fittings for each system is specified in the Section for that system. All piping and fittings shall be of U.S. Manufacturer. All pipe shall be shipped capped. Shipped and store on job site with ends capped from the factory.

2.3 JOINTS

- A. Screwed: Make screwed joints using machine-cut ANSI taper pipe threads. Apply a suitable joint compound, such as Teflon tape, to the male threads only. Ream the pipe to full inside diameter after cutting. All-thread nipples are not permitted.
- B. Dissimilar Metals: Make joints between copper and steel pipe and equipment along with steel pipe and ductile iron pipe using insulating unions such as Crane Company No. 1259; EPCO as manufactured by EPCO Sales, Inc.; or an approved equal.
- C. Solder Joints:
1. Prior to making joints, cut pipe square and ream to full diameter. Clean exterior of pipe and socket. Apply a thin coat of suitable fluxing compound to both pipe and socket, and fit parts together immediately.
 2. Heat assembled joint only as required to cause the solder to flow. Run the joint full, slightly beaded on the outside, and wipe to remove excess solder.
 3. Utilize lead free solder. Use silver brazing alloy or Sil-Fos on refrigerant piping and on underground piping.
- D. Welded Joints:
1. Make welded joints as recommended by the standards of the American Welding Society.
 2. Ensure complete penetration of deposited metal with base metal.
 3. Provide filler metal suitable for use with base metal.
 4. Keep inside of fittings free from globules of weld metal.
 5. Do not use mitered joints.
 6. Use standard weld elbow fittings for changes of direction or cut a standard elbow for odd angles.
- E. Flanged Joints:
1. Prior to installation of bolts, accurately center and align flanged joints to prevent mechanical prestressing of flanges, pipe and equipment. Align bolt holes to straddle the vertical, horizontal or north-south centerline. Do not exceed 3/64 inch per foot inclination of the flange face from true alignment.
 2. Use flat-face companion flanges only with flat-faced fittings, valves or equipment. Otherwise, use raised-face flanges.
 3. Install proper gaskets, suitable for intended service and factory cut to proper dimensions. Red rubber gaskets are not acceptable. Garlock gaskets or EPDM shall be used. Apply non-stick clean surface lubricant coating to both sides of gaskets.
 4. Use ANSI nuts and bolts, galvanized or black to match flange material. Use Coreten or galvanized steel nuts and bolts underground. Tighten bolts progressively to prevent unbalanced stress. Draw bolts tight to ensure proper seating of gaskets. Use anti-seize compound on all bolts above and below grade. Bolt threads not to protrude more than 2 threads past nut.
 5. Use carbon steel flanges conforming to ANSI B16.5 with materials conforming to ASTM A 105, Grade II or ASTM A 108, Grade II. Use welding neck type flanges at all fittings and on all pipe.
 6. Flanges for ductile iron pipe are specified in Sections using that pipe.
 7. Keep flange covers on equipment and shop-fabricated piping until ready to install in system.
- F. No Hub: Install according to manufacturer's recommendations, using recommended tools.

- G. Bell and Spigot: Use neoprene compression gaskets for sanitary and storm.
- H. Push-on Joints (Ductile Iron Pipe): Restrained joints and gaskets for ductile iron pipe are specified in Sections using that pipe.

2.4 UNIONS

- A. Use 150-pound standard (300-pound WOG) malleable iron, ground joint unions with bronze seat. Provide flanged union joints on piping larger than 2-1/2 inches.

2.5 BRANCH CONNECTIONS

- A. For Pipe 2 inches and smaller, use threaded fittings for steel pipe. For threaded piping, use straight size of reducing tee.
- B. For 2-1/2 Inches through 14 Inches: For welded piping, when branch size is the same as and one size smaller than header size, use welding tee. Use Weld-O-Let when branch is two or more sizes smaller than header. For threaded branch connections, use thread-o-let welded to header.

2.6 GASKETS

- A. Provide gaskets between flanges of all flanged joints. Inside diameter of gaskets shall conform to nominal pipe size. Gaskets shall be ring type between raised face flanges and full face between flat face flanges with punched bolt holes and pipe opening.
- B. Gaskets shall be cut from 1/8 inch thick non-metallic, non-asbestos gasket material suitable for operating temperatures from -150°F to +750°F. Garlock or equal. For pipe smaller than 6 inches, use 1/16-inch-thick gasket.

2.7 FLOOR AND CEILING PLATES

- A. Provide chrome-plated floor and ceiling plates around pipes exposed to view and passing through walls, floors, partitions, or ceilings in finished areas. Size plates to fit pipe or insulation and securely lock in place.

2.8 GAUGES AND THERMOMETERS

- A. General: Provide gauges and thermometers for monitoring plumbing systems as shown on the Drawings and as specified.
- B. Gauges:
 - 1. Gauges shall be Ashcroft, Trerice, Weksler, Moeller, or U.S. with 4-1/2 inch dial face, phenol case, stainless steel movement with Grade A phosphor bronze bourdon tube and micrometer-type calibration adjustment screw.
 - 2. Accuracy shall be 1/2 of 1 percent of full scale.
 - 3. Provide a Crane No. 222H or needle valve with snubbers at the pumps.
 - 4. Provide liquid filled gauges at pumps.
 - 5. Gradation shall be one pound or less.

- C. Thermometers:
1. Thermometers shall be Weksler, Marshall Town, or Ashcroft with 5 inch dial, all stainless steel construction bi-metal type with accuracy of +1 percent of scale range.
 2. Minimum of 2-1/2 inch straight or angle form stem as best suited for reading.
 3. Stem length shall be sized to provide most accurate reading for pipe diameter.
- D. Thermometer Wells:
1. Brass or stainless steel thermometer wells with pressure and temperature ratings suitable for their application.
 2. Wells for insulated piping shall have a 2-1/2 inch lagging protrusion.
 3. Locate thermometer wells so the sensing bulb will give a true and correct reading.
 4. Install thermometer so as not to cause undue restriction in small piping.
 5. Where wells are located in pipelines 1-1/2 inches and smaller, provide a section of pipe of such diameter that the net area of the pipeline will not be reduced by the thermometer well.
 6. All wells shall be filled with silicon and complete with caps and chains.
- E. Range and Gradations:
1. Select gauges and thermometers to give range and gradations best suited for quantities to be measured.
 2. Generally, select gauges and thermometers so that normal operating pressures and temperatures are not more than 2/3 nor less than 1/2 of the range; scale division shall be 1°F for chilled water and 2°F or less for hot water.
 3. Typical ranges for domestic cold water and airside thermometers shall be 0°F to 100°F and for domestic hot water shall be 30°F to 240°F.
 4. Chilled water range shall be 25°F to 125°F; hot water range shall be 20°F to 240°F.
- F. Gauge Locations: Provide pressure gauges at the following locations:
1. Suction side of each pump (except sump pumps and sewage ejectors).
 2. Discharge side of each pump (except sump pumps and sewage ejectors).
 3. At the main domestic service entry.
 4. At the main fire water service entry.
 5. At the top of each standpipe.
 6. At the top of the main domestic water risers.
- G. Thermometer Locations. Provide thermometers and thermometer wells at the following locations:
1. On each hot water circulating loop return line from the building (locate near circulating pump).
 2. On each incoming cold water supply to each domestic water heater.
 3. On the outlet hot water from the domestic water heater.
 4. As shown on the Drawings.

PART 3 - EXECUTION

3.1 PIPE FABRICATION AND INSTALLATION

- A. Make piping layout and installation in the most advantageous manner possible with respect to headroom, valve access, opening and equipment clearance, and clearance for other work.
- B. Give particular attention to piping in the vicinity of equipment. Preserve the maximum access to various equipment parts for maintenance. Install piping plumb and parallel with building walls.
- C. Do not cut or weaken any structural member.
- D. Cut all pipes accurately to measurement determined at the site. After cutting pipe, ream it to remove burrs.
- E. Install piping neatly, free from unnecessary traps and pockets. Work into place without springing or forcing. Use fittings to make all changes in direction. Field bending and mitering are prohibited. Make all connections to equipment using flanged joints or unions. Make reducing connections with reducing fittings only.
- F. All water piping installed above ground or below ground and in trenches, including preinsulated piping, must be installed by a licensed Mechanical Contractor at building rates. The wage rates for building trades apply only to the extent of work required to be installed by licensed Plumbing or Mechanical Contractors.

3.2 WELDING

- A. Weld and fabricate piping in accordance with ANSI Standard B31.9, latest edition, Code for Pressure Piping. Machine beveling in shop is preferred. Field beveling may be done by flame cutting to recognized standards.
- B. Align piping and equipment so that no part is offset more than 1/16 inch. Set all fittings and joints square and true, and preserve alignment during welding operation. Use of alignment rods inside pipe is prohibited.
- C. Do not permit any weld to project within the pipe so as to restrict it. Tack welds, if used, must be of the same material and made by the same procedure as the completed weld. Otherwise, remove tack welds during welding operation.
- D. Do not split, bend, flatten or otherwise damage piping before, during or after installation.
- E. Remove dirt, scale, and other foreign matter from inside piping before tying in sections, fittings, valves or equipment.

3.3 OFFSETS AND FITTINGS

- A. Because of the small scale of Drawings, the indication of all offsets and fittings is not possible. Carefully investigate the structural and finish conditions affecting the work and take such steps as may be required to meet such conditions.

- B. Install all piping close to walls, ceilings, and columns so piping will occupy the minimum space. Provide proper space for covering and removal of pipe, special clearances, and for offsets and fittings.

3.4 SECURING AND SUPPORTING

- A. Support piping adequately to maintain line and grade, with due provision for expansion and contraction:
 - 1. Use approved, clevis-type, split ring or trapeze-type hangers properly connected to structural members of the building.
 - 2. Do not support piping from other piping.
 - 3. All hangers and support rods must be cadmium plated.
 - 4. Hangers located in the crawl space to be hot dipped galvanized.
- B. Where uninsulated (bare) copper pipe is supported by clevis type hangers, riser clamps, the hanger shall be plastic coated or copper.
- C. Where uninsulated (bare) copper pipe is clamped to a dissimilar metal, such as steel, the copper pipe shall be installed with a felt isolator or Vibra Cushion No. B1999 manufactured by B-Line or approved equal.
- D. Isolation tape wrap is only acceptable where a clamp or support does not occur and where pipe is in connect with a building element.
- E. Place hangers not more than 6 feet apart on 1/2 inch and 3/4 inch pipes, or 10 feet apart on larger pipes unless noted otherwise on plans. Place hangers not more than 6 feet apart for all sizes of polyvinyl chloride pipe. Refer to manufacturer's recommendations for supporting polypropylene piping. For copper piping, place hangers as follows:
 - 1. For sizes up to 1 inch – maximum 5 feet - 0 inches O.C.
 - 2. For sizes 1-1/4 inch to 1-1/2 inch – maximum 7 feet - 0 inches O.C.
 - 3. For sizes 2 inches to 3 inches and larger – maximum 9 feet - 0 inches O.C.
- F. Support vertical risers as detailed on drawings at every floor:
 - 1. All water piping 2 inches or smaller shall be supported with galvanized steel strap pipe clamps of approved designed and sizes, properly supported at every floor.
 - 2. Support piping assemblies in chases adequately enough to be rigid and self-supporting before the chase is closed.
 - 3. Provide adequate structural support for piping penetrating chase walls to fixtures.
- G. Where insulation occurs, design hangers to protect insulation from damage. Pipe saddles and insulation shields, where required, are specified in the appropriate insulation Section.
- H. Perforated bar hangers, straps, wires or chains are not permitted.

3.5 PIPE SUPPORTS

- A. Provide fabricated cadmium plated steel framing members and appurtenances for interior pipe supports as shown:
 - 1. Mult-A-Frame, Unistrut and Power-Strut pipe support systems also are acceptable.

2. Support piping from precast and pan joist structure as detailed on Drawings.
 3. Powder actuated anchors are not permitted.
 4. Sleeves penetrating beams must be submitted through Structural Engineer.
- B. Framing channel type support systems shall be 12-gauge cold-formed carbon steel conforming to ASTM A570 GR33:
1. Fittings for framing channel system shall be punch pressed electro-galvanized carbon steel conforming to ASTM A575, A576, A635 and A36.
 2. Bolts and nuts shall have unified coarse screw threads with standard 1/2 inch nuts, conforming to ASTM A576 GR1015 AND ASTM A307.
 3. Components shall have a pre-galvanized zinc coating conforming to ASTM A525, except where indicated.

3.6 PIPE SLEEVES

- A. Fit with sleeves all pipes passing through gyp board, masonry, and concrete construction:
1. Provide 22 gauge wall sleeves for pipes passing through gyp board walls.
 2. Fabricate floor sleeves of schedule 40 weight galvanized steel pipe and masonry wall sleeves of 40 gauge galvanized steel.
 3. Size sleeve for minimum clearance between pipe or insulation and sleeve.
 4. All sleeves in wet lab areas to have a welded waterstop.
 5. All sleeves shall be hot dipped galvanized after fabrication.
- B. Extend each sleeve through the floor or wall. Cut the sleeve flush with each surface, except that in exposed locations, extend floor sleeves 2 inches above finished floor line.
- C. Seal all sleeves water and airtight. Seal annular space between pipes and sleeves with compound with flame and smoke spread rating of minimum 25/50 in accordance with ASTM E 84 test.
- D. Sleeves below grades in outside walls are detailed on drawings. Except as shown otherwise, provide Thunderline Link-Seal or approved equivalent with stainless steel nuts and bolts, with cast iron pressure plate.

3.7 ISOLATION VALVES

- A. Provide piping systems with line size shutoff valves located at the risers, at main branch connections at each floor and at branch takeoffs serving all equipment, and at other locations as indicated and required for isolation of piping or equipment.

3.8 DRAIN VALVES AND VENTS

- A. Install drain valves at all low points and at base of all risers of water piping systems so that these systems can be entirely drained. Install a 2 inch drain for 2-inch pipes and larger. Install a line size drain valve for pipes smaller than 2 inches. Provide hose adapter and cap on all drain lines.
- B. Provide automatic vents with isolation valves or manual vents at locations as indicated on drawings and all high points in piping systems.

3.9 CLEANING OF PIPING SYSTEMS

- A. Cleaning of piping system must be performed by an independent agency specializing in this type of work:
 - 1. The agency must have a minimum of 5 years experience with at least three projects of similar size.
 - 2. Submit project names for review.
- B. Minimum velocity of 10 feet per second must be maintained in the pipes during flushing period:
 - 1. Do not use building pumps for circulating water.
 - 2. Provide temporary pumps as required to achieve minimum velocities.
 - 3. Remove flow meters from building piping during flushing operation.
 - 4. Provide means (instrumentation) during flushing period to prove to the Owner that the minimum velocities are maintained in the pipes.
- C. Submit a detailed plan for the Engineer's and Owner's review and approval describing in full detail the individual steps associated with this process before any piping is installed:
 - 1. Plan must include a drawing indicating GPM's required to provide minimum velocity required in the piping, phasing of systems being cleaned, locations of drains or other temporary connections required for cleaning system, and cutsheet of temporary pump proposed.
- D. Clean piping systems thoroughly. Purge pipe of construction debris and contamination before placing the systems in service. Provide temporary connections and valves as required for cleaning, purging and circulating.
- E. Install temporary strainers in front of pumps, tanks, water still, solenoid valves, control valves, and other equipment where permanent strainers are not indicated. Keep these strainers in service until the equipment has been tested, then remove either entire strainer or straining element only. Fit strainers with a line size blowoff valve.
- F. Circulate a chemical cleaner in closed loop water piping systems to remove mill scale, grease, oil, and silt:
 - 1. Circulate Betz Entec 323 detergent with Betz Entec 234 anti-foam compound.
 - 2. Circulate for 48 hours, flush system and replace with clean water.
 - 3. Dispose of circulated water with chemicals as per local code requirements.
 - 4. Submit all chemicals to Owner and Engineer prior to cleaning for approval.
 - 5. Provide inhibitor in system after cleaning to prevent rusting.
 - 6. Match chemicals presently used in other systems used by Owner.
- G. Domestic Water Piping:
 - 1. All potable water piping and tanks shall, after successful pressure testing, be thoroughly flushed with clear water and then sterilized.
 - 2. Sterilization shall be with either liquid chlorine or chlorine gas of adequate volume to give a concentration of 50 ppm based upon the volume of the system being treated.
 - 3. The solution will be allowed to stand for a period of 24 hours.
 - 4. A minimum residual chlorine level of 5 ppm shall remain in each system for a minimum of 24 hours.
 - 5. After sterilization, all piping shall be thoroughly flushed.

6. The above are minimum requirements and all sterilization procedures shall be in strict accordance with all local codes and authorities having jurisdiction.
 7. Under no circumstances shall the Contractor permit the use of any portion of the domestic water system until it has been properly sterilized and certified by the authorities having jurisdiction.
- H. Special requirements, if any, are specified in the Sections for each type of piping.
- I. After systems have been flushed, cleaned and sterilized; as required by specifications, provide written certification from the cleaning contractor that the systems are clean and ready for use.

3.10 LEAK TESTS

- A. All piping systems shall demonstrate leak tightness. This requirement shall be met by a water hydrostatic leak test or a pneumatic leak test, whichever is called for under specific piping Sections.
- B. Piping Systems:
1. Test Preparation: Expansion joints shall be provided with temporary restraint, for the additional pressure load under test or shall be isolated from the test. Equipment and valves which are not rated for the pressure test shall be either disconnected from the piping or isolated by a blind flange or similar means.
 2. Test Pressure" The water hydrostatic test pressure shall be 1.5 times the design pressure. The pressure test shall be maintained for sufficient time to inspect all joints, with a minimum time of four hours.
 3. Special requirements, if any, for each system are specified in the Section for that system.

3.11 CONNECTIONS TO EQUIPMENT FURNISHED BY OTHERS

- A. Provide service connections to items of equipment furnished by others:
1. Detailed shop drawings of equipment will be furnished indicating the exact number and location of rough-in points.
 2. Such final shop drawings may indicate adjustments in total number and exact location of rough-in points, and in equipment dimensions.
 3. Making adjustments to field conditions is considered a part of the work required.
- B. Roughing-In:
1. When roughing-in, extend service piping to various items of equipment.
 2. Temporarily terminate at proper points as indicated on detailed equipment shop drawings or as directed.
 3. Do not use contract drawings accompanying these specifications for rough-in locations but only for pipe sizing and general routing.
- C. Stop Valves:
1. Provide stop valves for each service at rough-in locations, except for drains.
 2. Stop valve locations are subject to approval, and in all cases must be accessible from the same room in which the furniture or equipment is located.

3.12 TEMPORARY CONDITIONING OF BUILDING SPACES FOR COMPLETION OF CONSTRUCTION

- A. Refer to Specification 22 05 00, Common Work Results for Plumbing, for requirements that must be completed prior to requesting the Owner to provide chilled water or hot water from the building distribution system.

3.13 PAINTING

- A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Steel pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Metal framing systems.
 - 4. Thermal-hanger shield inserts.
 - 5. Fastener systems.
 - 6. Equipment supports.
- B. Division 03 Section, Concrete, for concrete requirements.
- C. Division 05 Section, Metal Fabrications, for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
- D. Division 09 Section, Painting, for painting requirements.
- E. Section 22 05 00, Common Work Results for Plumbing.

1.2 DEFINITIONS

- A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel pipe hangers and supports.
 - 2. Thermal-hanger shield inserts.
 - 3. Powder-actuated fastener systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze pipe hangers. Include Product Data for components.
 - 2. Metal framing systems. Include Product Data for components.
 - 3. Equipment supports.
- C. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to 3.1, Hanger and Support Applications, of this Section for where to use specific hanger and support types.
- B. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.
- C. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- D. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
- C. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.4 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100-psig minimum, compressive-strength insulation insert encased in sheet metal shield.
- B. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier with vapor barrier.
- C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.
- D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.7 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- B. Concrete: Provide 3,000 psi concrete. Reinforce slab with No. 4 rebar on 12 inch center each way centered in slab unless indicated otherwise on Drawings.
- C. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.

3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
 5. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
 6. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
 7. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
 8. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120°F to 450°F piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
 3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
- L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
1. 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.
 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
1. Install powder-actuated 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.
 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. 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.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.
- M. Insulated Piping: Comply with the following:
 - 1. Attach clamps and spacers to piping:
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
 - 5. Pipes NPS 8 and Larger: Include wood inserts.
 - 6. Insert Material: Length at least as long as protective shield.
 - 7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. 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.

3.5 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

- A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Stencils.
 - 5. Valve tags.
 - 6. Warning tags.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Brady Corporation.
 - 2. Marking Services, Inc.
 - 3. Seton Identification Products.

2.2 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 2. Minimum Label Size: Length and width vary for required label content, but not less than 1-1/2 inch X 3/4 inch.
 3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 4. Fasteners: Stainless-steel rivets or self-tapping screws.
 5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
 2. Letter Color: Black.
 3. Background Color: Background to contrast with letter color.
 4. Maximum Temperature: Able to withstand temperatures up to 160°F.
 5. Minimum Label Size: Length and width vary for required label content, but not less than 4 inches wide X 1-1/2 inches high.
 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 7. Fasteners: Stainless-steel rivets or self-tapping screws.
 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Section number and title where equipment is specified.
- D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2 by 11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.3 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: Background to contrast with letter color.
- D. Maximum Temperature: Able to withstand temperatures up to 160°F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.4 STENCILS

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.
 - 1. Stencil Material: Brass.
 - 2. Paint: Standardized colors for the entire natural gas piping system painted per Division 09 painting specification. Paint material is based on colors and model numbers manufactured by Glidden unless otherwise indicated. Subject to compliance with requirements, provided named color or comparable product as approved. Use the following colors for banding of all piping and conduit:

SYSTEM	COLOR
Domestic Water, Cold, Hot or Hot Water Return	Blue, comparable to ICI/Glidden #1330
Electric Conduit	Yellow, comparable to ICI/Glidden #9400
Drain Lines (other than Acid Waste)	Black, comparable to ICI/Glidden #1484

- 3. Standardized Sizes: Tags shall be at least 1-1/2 inches in diameter, with depressed block characters 1/4 inch high. Titles shall be lettered on bands. Uppercase letters and Arabic numerals shall be used. Where pipes or conduits are too small or not readily accessible for such application securely fasten a brass identification tag at appropriate locations. Identification of the material contained in piping and conduits in accordance with the table below:

BAND AND LETTER SIZE ALL DIMENSIONS IN INCHES		
Outside Diameter of Pipe Covering	Width of Color Band	Size of Letters and Numerals
1/2 to 1-1/4	8	1/2
1-1/2 to 2	8	3/4
2-1/4 to 3-1/4	10	1
3-1/2 to 6	12	1-1/4
8 to 10	24	2-1/2
Over 10	32	3-1/2

- 4. Pipe Identification: Identify pipe at wall penetrations, machine or tank connections, and at not over 50 foot intervals. Marker identification shall be legible and should be visible from the floor. Mark each pipe circuit with stencil. Stencil shall include flow arrow and identification marks as follows:

SERVICE	MARK
Domestic Water Supply	Dom-W-S
Domestic Hot Water Supply	Dom-HW-S
Domestic Hot Water Return	Dom-HW-R
Domestic 140 Hot Water Supply	Dom-140HW-S
Domestic 140 Hot Water Return	Dom-140HW-R
Non-Potable Makeup Water	Non-Potable-W
Storm Sewer	Storm
Overflow Drain	Overflow
Sanitary Sewer	San
Sanitary Vent	San-V

2.5 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4 inch letters for piping system abbreviation and 1/2 inch numbers.
1. Tag Material: Brass, 0.032 inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 2. Fasteners: Brass S-hook.
- B. Valve Schedules: For each piping system, on 8-1/2 X 11 inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
1. Size: 3 X 5-1/4 inches minimum.
 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.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Equipment to be identified with plastic nameplates includes but is not limited to water heaters, filters, plumbing equipment, tanks, and water treatment devices.
- B. Identify small devices, such as in-line pumps with metal tags.
- C. Identify valves with tags.

3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Division 09 painting sections
- B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles, complying with ASME A13.1, on each piping system.
 - 1. Identification Paint: Use for contrasting background.
 - 2. Stencil Paint: Use for pipe marking.
- C. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

3.5 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units.
- B. List tagged valves in a valve schedule in aluminum frame with clear plastic shield. Install at location as directed by Owner's Representative.

3.6 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

SECTION 22 07 19 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section Includes:
 - 1. Insulation Materials:
 - a. Fiberglass insulation.
 - 2. Sealant, adhesives and finishes.
 - 3. Jackets:
 - a. PVC jackets.
 - b. Canvas or glass jackets.
 - c. Stainless steel jackets.
 - d. Aluminum jackets.

- B. Related Sections include the following:
 - 1. Section 22 07 16, Plumbing Equipment Insulation.
 - 2. Section 22 05 00, Common Work Results For Plumbing.
 - 3. Section 22 05 29, Hangers and Supports for Plumbing Piping and Equipment.

1.2 REFERENCES

- A. ASHRAE 90.1 – Energy-Efficient design of New Buildings Except Low-Rise Residential Buildings; 2004.
- B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2004.
- C. ASTM C 195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2000.
- D. ASTM C 449/C 449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2000.
- E. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation, 2006.
- F. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials, 2005.
- G. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association, 2006.
- H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc., 2003.

1.3 SUBMITTALS

- A. Product Data: Provide product description, thermal characteristics, list of materials and thicknesses for equipment scheduled.
- B. Shop Drawings:
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.

2. Detail attachment and covering of heat tracing inside insulation.
 3. Detail insulation application at pipe expansion joints for each type of insulation.
 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 5. Detail removable insulation at piping specialties, equipment connections, and access panels.
 6. Detail application of field-applied jackets.
 7. Detail application at linkages of control devices.
 8. Detail field application for each equipment type.
- C. Samples: Submit samples of each type of insulation to display the material, quality, and application method.
1. Obtain approval of sample application before proceeding with work.
- D. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.
- E. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
1. Surface Burning Characteristics: Flame spread/smoke developed index of 25/50 maximum when tested in accordance with ASTM E 94, NFPA 255, or UL 723.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified with minimum 5 years experience.
- C. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years of experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 - PRODUCTS

2.1 INSULATION

- A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CertainTeed Corp.
 - 2. Johns Manville.
 - 3. Knauff Insulation.
 - 4. Owens Corning.
- B. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- C. Type A: Fiberglass Insulation to comply with ANSI/ASTM C 547 with k factor of 0.23 BTU/ft²/F/hr/inch at 74 °F.
 - 1. Minimum 5-pound density insulation.
 - 2. Factory applied.
 - 3. Service reinforced vapor barrier jacket with integral laminated aluminum vapor barrier.

2.2 SEALANT, ADHESIVE, AND FINISH

- A. Acceptable Manufacturer: Subject to compliance with requirements, provide products manufactured by Childers Products, Division of ITW unless otherwise specified.
- B. Fiberglass – Low Temperature (below 100°F):
 - 1. Sealant: Childers CP-76 elastomeric sealant at valve covers, anchors, and hangers.
 - 2. Adhesive: Childers CP-82 adhesive to seal longitudinal laps of the vapor barrier jacket and to adhere butt joint covers.
 - 3. Finish: Childers CP-30 low odor No. 10 glass cloth.
- C. Fiberglass – High Temperature (above 100°F):
 - 1. Adhesive: Childers CP-82 adhesive to seal longitudinal laps of the vapor barrier jacket and to adhere butt joint covers.
 - 2. Finish: Childers CP-10 with No. 10 glass cloth.
 - 3. Cement: Ryder One Coat on insulated fittings, flanges, and valves.
 - 4. Piping: Childers CP-53 to prime cement prior to applying coating.

2.3 JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. Canvas or Glass Jackets: UL listed cotton fabric, 6 ounce/square yard or low odor glass cloth, Childers CP-30 or approved equal.
- C. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.
 - 1. Piping: Prefabricated jacket of ASTM B 209 aluminum, 0.020 inches thick with factory applied 2 mil moisture barrier for finishing interior insulated pipe.
 - 2. Valves, Fittings, and Flanges: ASTM B 209 aluminum covers, 0.020 inches thick providing complete coverage of all valves, fittings, and flanges.

3. Straps and Seals: 1 inch x 0.010 inch ASTM B 209 aluminum strapping and seals for applying aluminum jacket and covers to provide weather-tight covering of all insulation including caps, flanges, and end of lines.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install materials in accordance with manufacturer's instructions.
- B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.
- C. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.
- D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- E. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- F. Install multiple layers of insulation with longitudinal and end seams staggered.
- G. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- H. Keep insulation materials dry during application and finishing.
- I. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- J. Install insulation with least number of joints practical.
- K. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 1. Install insulation continuously through hangers and around anchor attachments.
 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- L. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- M. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3 inch wide strips of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- N. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- O. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- P. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- Q. For above ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Manholes.
 5. Handholes.
 6. Cleanouts.

3.3 PIPING INSTALLATION

- A. Complete pressure testing of piping systems prior to application of insulation.
- B. Fiberglass Pipes: Butt insulation joints firmly together. Seal longitudinal laps and butt strips with sealant.
- C. Fiberglass Low Temperature (below 100°F): Where piping is interrupted by fittings, flanges, valves or hangers, and at intervals not to exceed 25 feet on straight runs, form an isolating seal between the vapor barrier jacket and the bare pipe by liberal application

of the sealant to the exposed joint faces carried continuously down to and along 4 inches of pipe and up to and along 2 inches of the jacket.

3.4 VALVES, FLANGES, AND FITTINGS

- A. Fiberglass – Low Temperature (below 100°F):
 - 1. Insulate valves, flanges, and fittings with pre-molded fitting secured with wire. Thickness of insulation shall be equal to that adjoining piping and shall match density or greater.
 - 2. Finish with 1/4-inch layer of Benjamin Foster 30-35 reinforced with glass fabric.
- B. Fiberglass – High Temperature (above 100°F):
 - 1. Omit insulation at screwed unions and at valves smaller than 1-1/2 inches.
 - 2. On concealed (other than mechanical and pump rooms) piping, insulate fittings and valves 2-1/2 inches IPS and larger, with pre-molded or gored fitting covers. Thickness of insulation shall be equal to that of adjoining pipe. Finish with coating reinforced with white 10 inch x 10 inch glass fabric.
 - 3. On concealed piping, insulate fittings and valves 2 inches IPS and smaller with mineral wool and insulating cement to a thickness equal to or greater than adjoining straight pipe. At Contractor's option, provide molded or mitered fittings, finished with coating reinforced with glass fabric.
 - 4. In exposed (mechanical, pump and equipment rooms) area, insulate all fittings, flanges and valves with molded or mitered fitting covers. Thickness of insulation shall be equal to that of adjoining pipe. Finish with coating reinforced with white glass fabric.

3.5 CONTROL VALVE COVERS - LOW TEMPERATURE SERVICE ONLY

- A. Fabricate special covers, complete with troweled-on vapor seal, shaped to accommodate the valve stem. Insulation thickness shall be same thickness as adjoining pipe.
- B. Seal covers to valve insulation proper with adhesive so that the seal may be broken with a knife blade without damage to either part. Arrange so that cover can be removed and replaced as necessary for operation of the valve. Finish valve cover with glass cloth and two coats of finish.

3.6 SHIELDS AND HANGERS

- A. When the insulation is jacketed in stainless steel, install a length of 40-pound roofing felt 1/2 inch longer than the insulation shield between shield and jacket.
- B. Where piping hangers or anchors must be in direct contact with pipe, seal off the pipe insulation on both sides of the hanger by carrying the vapor seal down to the bare pipe.
 - 1. Apply insulation around the hanger ring or anchor and pipe and carry vapor barrier upward and outward along the hanger rod or anchor members to a point not less than 12 inches from the adjacent pipe.
 - 2. Draw wire loops tight over the vapor barrier jacket, with ends of wire bent down. Take care to avoid puncturing the vapor seal.
 - 3. Finish insulation as specified for flanges, and seal over adjacent vapor barrier jacket.

3.7 ALUMINUM JACKET

- A. Apply aluminum jacket and covers according to manufacturer's recommendations, using aluminum strapping and seals to provide completely weathertight covering. Completely encapsulate insulation on all piping, valves, flanges, reducers, etc.
- B. Provide aluminum jacket for all piping in mechanical rooms within 84-inches of finished floor.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. All insulation applications will be considered defective Work if inspection reveals noncompliance with requirements.

3.9 INSULATION SCHEDULE

- A. Provide insulation with thickness and conductivity values in compliance with ASHRAE Standard 90.1, but not less than thicknesses scheduled below:

SERVICE	TYPE	PIPE SIZES	INSULATION THICKNESS- INCHES
AHU and Freezer Condensate Drains	A	All Sizes	1
All horizontal Storm and Overflow Drain Piping, including drain bodies including throat of downspouts. Downspouts not to be Insulated.	A	All sizes	1
All Domestic Cold Water and Domestic Hot Water serving single fixtures (dom. cold water only in exterior walls and crawl space)	A		1/2
Domestic Hot Water Supply and Return	A	1-1/2" and smaller	1
Domestic Hot Water Supply and Return	A	2" and larger	1-1/2
Drinking Fountain Drains	A	All sizes	1
Floor Drain Bodies and Lines receiving AHU Condensate and serving Ice Machines (minimum of 10' of pipe from ice machine drain). Insulate entire condensate drainage system.	A	All sizes	1
Domestic Cold Water and Makeup Water (in exterior walls and crawl spaces)	A	All sizes	1
Sanitary Waste P-traps located in Crawl Space (including piping upstream of p-trap located underside of first floor slab extending to a minimum of 6 feet downstream of p-trap) and grease waste system except for crawl space.	A	All sizes	1
Grease Waste in Crawl Space.	A	4" & smaller	1 1/2

SERVICE	TYPE	PIPE SIZES	INSULATION THICKNESS- INCHES
		Over 4"	2

END OF SECTION

SECTION 22 11 16 - DOMESTIC WATER PIPING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes requirements for furnishing and installing domestic hot and cold water piping, including hot water return within buildings.

1.2 RELATED SECTIONS

- A. Section 22 05 53, Identification for Plumbing Piping and Equipment.
- B. Section 22 05 00, Common Work Results For Plumbing
- C. Section 22 07 19, Plumbing Piping Insulation.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14 for plastic, potable domestic water piping and components.
- C. Comply with NSF 61 for potable domestic water piping and components.
- D. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements provide indicated products by manufacturers listed.
 - 1. Valves:
 - a. Nibco
 - b. Apollo
 - c. Stockham
 - 2. Vacuum Breakers and Backflow Preventers:
 - a. Watts.
 - b. Febco.
 - c. Wilkins.
 - d. Flomatic.

2.2 PIPING AND FITTINGS

- A. Provide seamless, ASTM B 88, Type L copper water tube with ANSI B16.22 wrought copper fittings with socket ends. Lead-free solder for all solder joints, Alloy Grade E in accordance with ASTM B32, similar to Engelhard Silvacore 100. Joints may also be Viega Pro-Press joining method with a non-toxic synthetic rubber elastomer seal (EPDM O-RINGS) with the fitting socket. The fitting shall be pressed under substantial pressure by RIDGID power tool forming a joint rated for 200 psi and tested for 600 psi, approved by IAPMO IGC 137-99/PS 117-2000 & ANSI/NSF 61, fitting material shall conform to ANSI/ASM B16.22 & B16.18, approved by International Plumbing Code. Joints for pipe fittings 2" and larger may be grooved type joints. Grooved End Fittings: All grooved end fittings shall be ANSI B16.18 cast bronze or ANSI B16.22 wrought copper, with copper-tube dimensioned grooved ends. (Flaring of tube or fitting ends to accommodate alternate sized couplings is not permitted.) Couplings shall consist of two ductile iron housing segments cast with offsetting angle-pattern bolt pads, pressure responsive grade EHP gasket, and zinc-electroplated steel bolts and nuts. Couplings shall be installation-ready, for direct stab installation without field disassembly. Victaulic Style 607. Flange Adapter Victaulic Style 641 roll grooved copper-tube dimensioned fittings sized 2" and larger.
- B. Unions: ANSI B16.22 Class 150, 300-pound water-oil-gas service wrought solder joint fitting such as Nibco 633/733 union C x C, or approved equal.
1. Flange joints larger than 2 inches shall be brass.
 2. Provide dielectric isolating unions or connections between metallic piping of dissimilar metal.
 3. Dielectric waterway fittings with grooved and/or threaded ends, as manufactured by Victaulic Company, Series 47, for sizes 1/2" through 8

2.3 VALVES

- A. Comply with requirements in Section 22 11 19, Domestic Water Piping Specialties, for balancing valves, drain valves, backflow preventers, and vacuum breakers.
- B. Ball Valves (pipe sizes through 2 inches): 600 psi WOG, cast brass body, ASTM B584 Alloy 844, two piece reinforced Teflon seats, full port, blowout proof stem, quarter turn handle with chrome plated brass ball and bronze stem with threaded ends, manufactured by Nibco No. T-585-70.
- C. Check Valves:
1. 2 inches and smaller: Class 125, horizontal swing bronze disc, with bodies and caps conforming to ASTM B 62 cast bronze material, threaded ends, manufactured by Nibco No. T-413-Y or approved equal.
 2. 2-1/2 inches and larger: Class 125, iron body, bronze mounted, with body and cap conforming to ASTM A 126, Class B cast iron, horizontal swing bronze disc, manufactured by Nibco No. F-918-B, or approved equal.
- D. Butterfly Valves (2-1/2 inch and larger): Class 150, ductile iron body conforming to ASTM A-395, fully lugged, drilled body, lever operated, blow out proof type 316 stainless steel disc and stem, EPDM seat, suitable for bi-directional dead end service with downstream flange removed, minimum 175 psi bubble tight shut-off, manufactured by Nibco No. LD-2000, or approved equal. For grooved systems Victaulic Series 608 is acceptable.

2.4 AIR RELIEF VENTS

- A. Float operated, constructed of cast iron with stainless steel float and trim and isolating valve:
 - 1. 1/2 inch, rated at 300 psi at 150°F.
 - 2. Vents shall be designed to eliminate air from the system automatically without permitting the passage of water.
 - 3. Minimum 3/4 inch system connection (inlet), minimum 1/2 inch drain connection (outlet), 1/4 inch drilled, tapped and plugged test connection.
 - 4. Manufactured by Clark-Reliance, Model No. 6-V, or approved equal.

2.5 GROUT

- A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 CONNECTION

- A. Install unions downstream of all threaded valves and in all locations that supply serviceable equipment.
- B. Screwed Joints: Make joint with clean, full cut standard pipe threads. Ream after cutting and threading. Use heavy duty Teflon sealing compound or Teflon tape as threaded seal. Sealing compound shall be AGA and NSF certified, non-toxic, non-drying, anti-seize, and classified by UL.
- C. Use anti-seize compound on all bolts for flanges.
- D. Pro-Press type connections shall be made in accordance with manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fittings alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the manufacturer's approved tool.
- E. Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be of an elastomer grade suitable for the intended service, and shall be molded and produced by the coupling manufacturer. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. (A distributor's representative is not considered qualified to conduct the training or jobsite visit(s).)

3.2 INSTALLATION

- A. Install overhead valves orientated with the valve handle rotated to the side of the valve, not on the top side of the valve.
- B. Provide wall access panels where valves are indicated to be concealed in chases. Refer to plumbing drawings for locations.

3.3 DRAINAGE

- A. Install water piping systems with uniform horizontal grade of 1/8 inch per 10 feet, minimum, to low points to provide complete drainage of the system. Where constant pitch cannot be maintained for long runs, establish intermediate low points and rise to new level. Grade branches to drain to mains or risers. Unless otherwise indicated, terminate low points of risers with drain valve piped to nearest hub or floor drain.

3.4 IDENTIFICATION

- A. Identify system components. Comply with requirements in Section 22 05 53, Identification for Plumbing Piping and Equipment, for identification materials and installation.
- B. Label pressure piping with system operating pressure.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Piping Inspections:
 - 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - 2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 - 3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- C. Piping Tests:
 - 1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - 2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
 - 3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - 4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate

- test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
 6. Prepare reports for tests and for corrective action required.
- D. Domestic water piping will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.6 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- B. Prepare and submit reports of purging and disinfecting activities.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION

SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes requirements for furnishing and installing sanitary waste, soil and condensate drainage system piping and associated vent piping within buildings and underground laterals within 5 feet of building.

1.2 RELATED WORK

- A. Section 22 05 00, Common Work Results for Plumbing.
- B. Section 22 66 53, Laboratory Chemical Waste and Vent Piping, for chemical-waste and vent piping systems.
- C. Section 22 05 53, Identification for Plumbing Piping and Equipment.
- D. Section 22 05 29, Hangers and Supports for Plumbing and Equipment.

1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.4 SUBMITTALS

- A. Field quality-control inspection and test reports.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; and "NSF-drain" for plastic drain piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. General: All cast iron pipe shall be service weight cast iron marked with collective trade mark of CISPI. Manufactured by Charlotte, Tyler or AB & I.
- B. Underground Piping: Type 1 Schedule 40 PVC pipe with DWV pattern, fittings with solvent cement joints. Conforming to ASTM D2665.
- C. Above Grade Piping, including Crawl Space:
 - 1. Service weight cast iron no-hub soil pipe and DWV pattern fittings.
 - 2. CISPI 310, type 304 stainless steel heavy-duty 4-band no-hub couplings for pipe sizes 4 inches and less.

3. 6-band no-hub couplings for pipe sizes over 4 inches with neoprene gaskets.
 4. Couplings manufactured by Mi-Fab Mi-Xhub, Anaco "Husky" 2000, or Mission "HW".
- D. Piping through Wall Sleeves: Provide section of ductile iron piping, as detailed, in wall penetrations.
- E. The p-trap for the floor drains receiving condensate shall be schedule 40 PVC.

2.2 VENT PIPE AND FITTINGS

- A. Cast iron soil pipe and fittings, same as Above Slab Piping indicated above.
- B. Provide heavy duty type 304 stainless steel minimum 4-band no-hub couplings, conforming to C.I.S.P.I. 310 as specified for drainage piping.
- C. Pipe shall conform to ASTM A 74, ASTM A 53 or ASTM B 306, where applicable.
- D. Underground Vent Pipe and Fittings: Provide same as specified for below ground drainage pipe and fittings.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Sanitary sewer piping outside the building is specified in Section 22 13 16, Sanitary Waste and Vent Piping.
- B. Basic piping installation requirements are specified in Section 22 05 00, Common Work Results for Plumbing.
- C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Section 22 05 00, Common Work Results for Plumbing.
- D. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Section 22 05 00, Common Work Results for Plumbing.
- E. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- F. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

- G. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

3.2 VENT PIPING

- A. Vent Connections: Make vent connections to vent stacks with inverted wye fittings. Extend full-size vents through roof to at least 6 inches above roof.
- B. Flashing: Provide flashing as recommended by roofing material manufacturer and detailed by Architect/Engineer.
- C. Cleanouts:
 - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
 - 2. Install cleanouts the same size as the soil waste lines in which the cleanouts are placed. No cleanout should be larger than 4 inches in diameter.
 - 3. Where cleanouts occur in pipe chases, bring cleanouts through walls and install covers. Where cleanouts occur in floor slabs, set flush.
 - 4. Provide cleanouts where soil lines change every direction, every 50 feet on long runs, at end of each continuous waste line, and at the base of each riser.
- D. Floor Drains: Locate floor drains 1/2 inch below finish floor elevation unless shown otherwise.

3.3 UNDERGROUND PIPING INSTALLATION

- A. Pipe Grading: Lay and maintain all pipes at required lines and grades during the course of work to comply with Drawings.
- B. Trench:
 - 1. Excavate trench to depth required.
 - 2. Properly brace and dewater trench and keep it free of water during installation, testing of pipe, and backfilling.
 - 3. Do not discharge water onto a street or freeway without prior approval from Owner's Representative.
- C. Excavation:
 - 1. Trench shall be at least 18 inches wider than the maximum diameter of the pipe or largest bell and laid in the center of the trench.
 - 2. Excavate trench to a depth sufficient to provide for pipe cushions or supports as specified with a minimum backfill cover of 30 inches.
 - 3. Increase trench width as required and piling left in place until sufficient compacted backfill is in place.
 - 4. Properly sheet and brace all open trenches to render them secure and remove all such sheeting and bracing before completing the backfill.
 - 5. Comply with local regulations or, in the absence thereof, with the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc.

6. The quantity of excavation required to install sheeting and the installation and removal of sheetings and bracings will not be regarded as Extra Work. All costs incurred for this excavation and the installation of sheeting shall be included in the Contract Price.
- D. Grading:
1. Upon Completion of excavation and prior to the laying of the pipe, the trench bottom shall be brought up to the required elevation with a pipe cushion as per Division 31, except where the cushion has been eliminated by the Engineer.
 2. Pipe cushions shall be select material deposited in the trench and shall be compacted, leveled off, and shaped to obtain a smooth compacted bed along the laying length of the pipe. Pipe cushion shall be as follows:
 - a. Stable, Firm Semidry Trench: Piping shall be laid on bedding of washed sand with minimum 3 inches thick all around pipe and covering pipe.
 - b. Undisturbed earth, in a constant uniformly sloped trench shall be under the sand bed.
 - c. Laying space for hubs or mechanical joints shall be hand cut to 6 inches either side of the joint and stabilized sand poured and wet in to even with the natural earth trench bottom.
 - d. The leakproof integrity test of the piping system shall be inspected by the Owner's Representative prior to covering the piping.
 - e. Failure to notify the Owner's Representative for inspection prior to covering the piping will result in the piping being uncovered and the test being performed again.
 - f. Where the slope of the trench is found to belly down along the line of piping, before joining, the pipe shall be removed from the trench and the belly converted to uniform slope by adding stabilized bank sand, wet down and slightly mounded to the center of the trench. The section of piping will then be "rolled" into place so with support uniform along it's entire length.
 - g. Where the slope of the trench is found to arch up along the line of piping, before joining, the pipe shall be removed from the trench and the arch converted to uniform slope by cutting the arch out. The section of piping will then be reset into place with support uniform along its entire length.
 3. Wet Clay (Black Gumbo): Lay piping in a constant, uniformly sloped trench. After shaping, the trench shall receive 6 inch minimum clean bedding sand, which shall be uniformly distributed on the trench bottom.
 - a. Hand remove laying space for the hubs or mechanical joints and place the piping on the setting bed with the weight of the piping distributed evenly on the setting bed over its entire length.
 - b. The leakproof integrity test of the piping system shall be inspected by the Owner's Representative prior to covering the piping by the Engineer's agent. Failure to notify the Owner's Representative for inspection prior to covering the piping will result in the piping being uncovered and the test performed again.
 4. Rock: Where rock is encountered, the excavate trench to a minimum of 6 inches below the pipe elevation and backfill with bedding sand to provide a uniform layer for pipe support. Backfill shall be as indicated for Wet Clay- Black Gumbo.
- E. Special Considerations: Where there are expansive soil conditions on the site, special precautions shall be taken to prevent pushing and breakage of underground piping. Precautions shall be in accordance with local installation techniques and may include carton forms or special pipe bedding.

- F. Backfill: Backfill trenches only after piping has been inspected, tested, and approved by the Owner Representative.
1. Place backfill material in the trench either by hand or approved mechanical methods. The compaction of backfill material shall be accompanied by tamping with hand tools or approved pneumatic tampers, by using vibratory compactors, by puddling, or by any combination of the three
 2. The method of compaction shall be approved and all compaction shall be done to the satisfaction of the Architect.
 3. Backfill completely around pipe, including 18 inches above the pipe, with suitable bank sand, tamped in 4 inch layers under, around, and over pipe. Water down backfill as required.
 4. The remainder of the backfill for pipes shall be select backfill material tamped at intervals of no more than 12 inch depths, to attain a 95 percent Proctor Compaction Density:
 - a. All materials to be used as select material backfill shall be approved by the Architect.
 - b. If, in the opinion of the Architect, the excavated material does not meet the requirements of select material, the Contractor shall be required to screen the material prior to use as select material backfill.
 - c. Material used in the upper portion of the backfill or subgrade shall not contain stone, rock, or other material larger than 6 inches in longest dimension. No wood, vegetable matter, or other material, which in the opinion of the Architect is unsuitable, shall be included in the backfill.
 - d. The upper 24 inches of backfill may be water jetted, if desired. Bring backfill up to finish grade identified on the Architectural Drawings, including additional backfill required to offset settlement during consolidation. When removal of unsuitable, excavated material creates a shortage of backfill material, the Contractor shall, at no change in Contract amount, furnish material as specified in this Section in the amount required to complete the backfill.
- G. Existing Surfaces: Restore existing streets, driveways and sidewalks damaged during the excavation work to acceptable condition, subject to approval by the Architect.
- H. Safety: Provide street and sidewalk excavations with approved barricades, warning lights, and cover plates as required by the City. Refer Division 1 for additional requirements.

3.4 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Section 22 05 00, Common Work Results for Plumbing.
- B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
 2. Hubless Joints: Make with rubber gasket and sleeve or clamp.
- C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.
- D. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.5 VALVE INSTALLATION

- A. Shutoff Valves: Install shutoff valve on each sewage pump discharge.

1. Use gate or full-port ball valve for piping NPS 2 and smaller.
 2. Use gate valve for piping NPS 2-1/2 and larger.
- B. Check Valves: Install swing check valve, downstream from shutoff valve, on each sewage pump discharge.
- C. Backwater Valves: Install backwater valves in piping subject to sewage backflow.
1. Horizontal Piping: Horizontal backwater valves. Use normally closed type, unless otherwise indicated.
 2. Floor Drains: Drain outlet backwater valves, unless drain has integral backwater valve.
 3. Install backwater valves in accessible locations.
 4. Backwater valves are specified in Section 22 13 19, Sanitary Waste Piping Specialties.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Seismic-restraint devices are specified in Section 22 05 48, Vibration Isolation for Plumbing Piping and Equipment.
- B. Pipe hangers and supports are specified in Section 22 05 29, Hangers and Supports for Plumbing Piping and Equipment. Install the following:
1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Install supports according to Section 22 05 29, Hangers and Supports for Plumbing Piping and Equipment.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2: 60 inches with 3/8 inch rod.
 2. NPS 3: 60 inches with 1/2 inch rod.
 3. NPS 4 and NPS 5: 60 inches with 5/8 inch rod.
 4. NPS 6: 60 inches with 3/4 inch rod.
 5. Spacing for 10 foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4: 84 inches with 3/8 inch rod.
 2. NPS 1-1/2: 108 inches with 3/8 inch rod.
 3. NPS 2: 10 feet with 3/8 inch rod.

4. NPS 2-1/2: 11 feet with 1/2 inch rod.
 5. NPS 3: 12 feet with 1/2 inch rod.
 6. NPS 4 and NPS 5: 12 feet with 5/8 inch rod.
 7. NPS 6: 12 feet with 3/4 inch rod.
- I. Install supports for vertical steel piping every 15 feet.
- J. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4: 72 inches with 3/8 inch rod.
 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8 inch rod.
 3. NPS 2-1/2: 108 inches with 1/2 inch rod.
 4. NPS 3 to NPS 5: 10 feet with 1/2 inch rod.
 5. NPS 6: 10 feet with 5/8 inch rod.
- K. Install supports for vertical copper tubing every 10 feet.
- L. Install hangers for ABS and PVC piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2: 48 inches with 3/8 inch rod.
 2. NPS 3: 48 inches with 1/2 inch rod.
 3. NPS 4 and NPS 5: 48 inches with 5/8 inch rod.
 4. NPS 6: 48 inches with 3/4 inch rod.
- M. Install supports for vertical ABS and PVC piping every 48 inches.
- N. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

3.8 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
1. Test pipe before backfilling and connecting to sewers by maintaining not less than 10 feet of hydrostatic head for 4 hours without a leak.
 2. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 3. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction.

1. After all sections of soil, waste, and vent piping are installed, but before fixtures are connected, test system by plugging all outlets and filling vertical sections with water to maintain not less than 10 feet of hydrostatic head for 4 hours without any drop in water level for all sections of piping. Provide wyes as required to facilitate plugging.
2. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
3. Prepare reports for tests and required corrective action.

3.9 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.10 PROTECTION

- A. Exposed ABS and PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION

SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following sanitary drainage piping specialties:
 - 1. Drains.
 - 2. Hydrants.
 - 3. Cleanouts.

1.2 RELATED WORK

- A. Section 22 05 00, Common Work Results For Plumbing.
- B. Section 22 14 23.13, Roof Drainage Piping Systems.
- C. Section 22 13 16, Sanitary Waste and Vent Piping.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories.

1.4 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Josam Company; Josam Div.
 - 2. MIFAB, Inc.
 - 3. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - 4. Tyler Pipe; Wade Div.
 - 5. Watts Drainage Products Inc.
 - 6. Zurn Plumbing Products Group; Specification Drainage Operation.

2.2 CLEANOUTS

- A. Location:
 - 1. Provide drainage lines with properly specified cleanouts.
 - 2. Locate cleanouts in runs not more than 90 feet on centers or as required by local authority having jurisdiction.
 - 3. Provide cleanouts at the base of each soil or waste stack and wherever necessary to make accessible all parts of the drainage soil or waste systems, whether or not indicated on drawings.
 - 4. Extend cleanouts within chases to near wall and provide wall access cover compatible with wall construction.

5. Provide cleanouts of required size, with flashing flange where installed with membrane waterproofing.
- B. Finished Floors and Concrete Floors: Jay R. Smith 4020, adjustable duracoated, cast iron cleanout with tapered bronze plug and round nickel-bronze top and frame, with clamping collar. Provide carpet marker type for carpet floors.
- C. Finished and Unfinished Walls. Jay R. Smith 4430-NB-U, duracoated, cast iron cleanout with cast bronze plug and a minimum 6" x 6" nickel bronze frame and secured stainless steel cover with vandal-proof screws.
- D. Exposed Piping. Jay R. Smith 4400, duracoated, cast iron calk ferrule and cast bronze plug.
- E. Outside Area. Jay R. Smith 4220, duracoated, cast iron cleanout with taper thread bronze plug, adjustable housing, and heavy-duty tractor-type cover with vandal-proof screws, cast flush in a 16 inch x 16 inch x 6 inch thick concrete pad in nonsurfaced areas.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Section 22 05 00, Common Work Results for Plumbing, for piping joining materials, joint construction, and basic installation requirements.
- B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 4. Locate at base of each vertical soil and waste stack.
- C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 1. Position floor drains for easy access and maintenance.
 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
 - b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
 - c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.

4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- F. Install deep-seal traps on floor drains and other waste outlets, if indicated.
- G. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
 1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 2. Size: Same as floor drain inlet.
- H. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- I. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- J. Strictly follow grease interceptor manufacturers installation recommendations and guidelines.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each grease interceptor.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 22 05 53, Identification for Plumbing Piping and Equipment.

3.4 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

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SECTION 26 00 00 - BASIC ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. General Requirements specifically applicable to Division 26.
- B. The Contractor shall be responsible for:
 - 1. The work included consists of furnishing all materials, supplies, equipment and tools, and performing all labor and services necessary for installation of completely functional power, lighting, fire alarm and signaling systems. Complete systems in accordance with the intent of Contract Documents.
 - 2. Coordinating the details of facility equipment and construction for all Specification Divisions, which affect the work covered under this Division.
 - 3. Furnishing and installing all incidental items not actually shown or specified, but which are required by good practice to provide complete functional systems.
 - 4. Temporary power service and lighting for construction. Coordinating all shutdown dates and schedules with Owner's Representative and obtain all work-permits required by Owner.
- C. Intent of Drawings:
 - 1. The Drawings are necessarily diagrammatic by their nature, and are not intended to show every connection in detail or every device or raceway in its exact location, unless specifically dimensioned. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the work in order to avoid interference between the various phases of work. The Contractor shall be responsible for the proper routing of raceway, subject to prior review by the Owner and Engineer. Work shall be organized and laid out so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. All work shall be installed parallel or perpendicular to the lines of the building unless otherwise noted.
 - 2. The intent of the Drawings is to establish the type of systems and functions, but not to set forth each item essential to the functioning of the system. The drawings and specifications are cooperative, and work or materials called for in one and not mentioned in the other shall be provided. Review pertinent drawings and adjust the work to conditions shown. In case of doubt as to work intended, or where discrepancies occur between drawings, specifications, and actual conditions, immediately notify the Architect/Engineer and the Owner's Representative, and propose a resolution.

1.2 RELATED WORK

- A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total general requirements for the project electrical systems and equipment.
 - 1. Division 01 Sections included in the project specifications.
 - 2. The contract.

1.3 DESIGN CRITERIA

- A. Equipment and devices to be installed outdoors or in enclosures where the temperatures are not controlled shall be capable of continuous operation under such conditions per manufacturer's requirements.

- B. Compliance by the Contractor with the provisions of this Specification does not relieve him of the responsibilities of furnishing equipment and materials of proper design, mechanically and electrically suited to meet operating guarantees at the specified service conditions.
- C. Electrical components shall be UL listed and labeled.

1.4 REFERENCE CODES AND STANDARDS, REGULATORY REQUIREMENTS

- A. Standards of the following organizations as well as those listed in Division 01, may be referenced in the specification. Unless noted otherwise, references are to standards or codes current at the time of bidding.
 - 1. Association of Edison Illuminating Companies (AEIC)
 - 2. American National Standards Institute (ANSI)
 - 3. Institute of Electrical and Electronics Engineers (IEEE)
 - 4. Insulated Cable Engineers Association (ICEA)
 - 5. National Electrical Code (NEC)
 - 6. National Electrical Manufacturers Association (NEMA)
 - 7. Electrical Safety in the Workplace
 - 8. National Fire Protection Association (NFPA)
 - 9. Underwriter's Laboratories (UL)
 - 10. ASHRAE/IES 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings
- B. Work, materials and equipment must comply with the latest rules and regulations of the following.
 - 1. National Electrical Code (NEC)
 - 2. Electrical Safety in the Workplace
 - 3. Occupational Safety and Health Act (OSHA)
 - 4. American with Disability Act (ADA)
 - 5. American Society for Testing and Materials (ASTM)
 - 6. University of Texas (UT) System
 - 7. Applicable state and federal codes, ordinances and regulations
- C. Discrepancies. The drawings and specifications are intended to comply with listed codes, ordinances, regulations and standards. Where discrepancies occur, immediately notify the Owner's representative in writing and ask for an interpretation. Should installed materials or workmanship fail to comply, the Contractor is responsible for correcting the improper installation. Additionally, where sizes, capacities, or other such features are required in excess of minimum code or standards requirements, provide those specified or shown.
- D. Contractor shall obtain permits and arrange inspections required by codes applicable to this Section and shall submit written evidence to the Owner and Engineer that the required permits, inspections and code requirements have been secured.

1.5 SUBMITTALS

- A. Submit the following in addition to and in accordance with the requirements of Division 01 for submittal requirement.
 - 1. Include inspection and permit certificates and certificates of final inspection and acceptance from the authority having jurisdiction.
 - 2. Manufacturer's standardized schematic diagrams and catalog cuts shall not be acceptable unless applicable portions of it are clearly indicated and non-applicable portions clearly deleted or crossed out.

3. All schematic, connection and/or interconnection diagrams in accordance with the latest edition of NEMA.
 4. Provide submittals as required by individual specification Section.
- B. Provide the following with each submittal:
1. Catalog cuts with manufacturer's name clearly indicated. Applicable portions shall be circled and non-applicable portions shall be crossed out.
 2. Line-by-line specification review by equipment manufacturer and contractor with any exceptions explicitly defined.
- C. Equipment Layout Drawing: 1/8-inch scale minimum drawings indicating electrical equipment locations. Dimensions for housekeeping pads should be indicated on these drawings. Indicate routing of conduit 2 inches and over on these drawings.
- D. Within the specified time window after award of contract, submit list of equipment and materials to be furnished.
1. Itemize equipment and material by specification Section number; include manufacturer and identifying model or catalog numbers.
 2. Replace rejected items with an acceptable item within 2 weeks after notification of rejection.
 3. If a satisfactory replacement is not submitted within a two-week period, owner will notify contractor as to equipment manufacturer or type and make or material to be furnished. Provide designated items at no additional cost to owner.
- E. As-Built Record Drawings: The Contractor shall maintain a master set of As-Built Record Drawings that show changes and any other deviations from the drawings. The markups must be made as the changes are done. At the conclusion of the job, these As-Built Record Drawings shall be transferred to AutoCad or Revit electronic files, as directed by Division 1, in a format acceptable to the Owner, and shall be complete and delivered to the Owner's Representative prior to final acceptance. Refer to Division 1, Project Administration, for other requirements.

1.6 SAFETY

- A. The Contractor shall follow the safety procedures in addition to, and in accordance with, the requirements of Project Safety Manual (PSM).
1. The Contractors shall be responsible for training all personnel under their employ in areas concerning safe work habits and construction safety. The Contractor shall continually inform personnel on hazards particular to this project and update the information as the project progresses.
 2. The Contractor shall secure all electrical rooms, to limit access, prior to energizing any high voltage (2.4KV or higher) switchgear and shall control access during the project after energization. The Contractor shall post and maintain warning and caution signage in areas where work is on going near energized equipment. The Contractor shall cover all energized live parts when work is not being done in the equipment. This includes lunch and breaks.
 3. The Contractor shall strictly enforce OSHA lock out/tag out procedures. Initial infractions shall result in a warning; a second infraction shall result in the removal of the workman and his foreman from the site. Continued infractions shall result in removal of the Contractor from the site.

1.7 SHORING AND EQUIPMENT SUPPORTS

- A. The Contractor shall provide all permanent and temporary shoring, anchoring, and bracing required to make all parts absolutely stable and rigid; even when such shoring, anchoring, and bracing are not explicitly called for.

- B. The Contractor shall adequately support all freestanding panels, motor control centers, enclosures, and other equipment. This shall include bolting to the floor or solid structural steel to prevent tipping. Install free-standing electrical equipment on 4" thick concrete housekeeping pads that are provided by others. Under no condition shall equipment be fastened to non-rigid building steel (i.e., removable platform steel gratings, handrails, etc.).
- C. The Contractor shall provide racks and supports, independently mounted at structure, to support electrical equipment and systems supplied and installed under this contract. At no time shall the Contractor mount or suspend equipment from other disciplines' supports.

1.8 TEMPORARY POWER REQUIREMENTS

- A. Provide power distribution system sufficient to accommodate construction operations requiring power, use of power tools, electrical heating, lighting, and start-up/testing of permanent electric-powered equipment prior to its permanent connection to electrical system. Provide proper overload protection. Ground fault circuit interrupters (GFCI) are to be used on all 120-volt, single-phase, 15 and 20 amp receptacle outlets where portable tools and equipment are used. Ground fault circuit interrupters shall be tested weekly by the Contractor.
- B. Temporary power feeders shall originate from a distribution panel. The conductors shall be multi-conductor cord or cable per NEC for hard and extra-hard service multi-conductor cord.
- C. Branch circuits shall originate in an approved receptacle or panelboard. The conductors shall be multi-conductor cord or cable per NEC for hard and extra-hard service multi-conductor cord. Each branch circuit shall have a separate equipment grounding conductor.
- D. All receptacles shall be of the grounding type and electrically connected to the grounding conductor.
- E. Provide temporary lighting by factory-assembled lighting strings or by manually-assembled units. All lamps for general lighting shall be protected from accidental contact or breakage. Protection shall be provided by installing the lights a minimum of 7 feet from the work surface or by lamp holders with guards. Branch circuits supplying temporary lighting shall not supply any other load. Provide sufficient temporary lighting to ensure proper workmanship by combined use of day lighting, general lighting, and portable plug-in task lighting. Comply with OSHA required foot-candle levels and submit plan for approval by the owner.
- F. For temporary wiring over 600 volts, suitable fencing, barriers, or other effective means shall be provided to prevent access of anyone other than authorized and qualified personnel.
- G. Temporary power cords shall be kept off the ground or floor. The Contractor shall provide temporary supports as required to keep temporary cords off the ground or floor.

1.9 SUBSTITUTION OF MATERIALS AND EQUIPMENT:

- A. Refer to Uniform General Conditions and Supplementary General Conditions for substitution of materials and equipment.

- B. The intent of the Drawings and/or Specifications is neither to limit products to any particular manufacturer nor to discriminate against an "APPROVED EQUAL" product as produced by another manufacturer. Some proprietary products are mentioned to set a definite standard for acceptance and to serve as a reference in comparison with other products. When a manufacturer's name appears in these Specifications, it is not to be construed that the manufacturer is unconditionally acceptable as a provider of equipment for this project. The successful manufacturer or supplier shall meet all of the provisions of the appropriate specification(s).
- C. The specified products have been used in preparing the Drawings and Specifications and thus establish minimum qualities with which substitutes must at least equal to be considered acceptable. The burden of proof of equality rests with the Contractor. The decision of the designer is final.
- D. When requested by the Architect/Engineer, the Contractor shall provide a sample of the proposed substitute item. In some cases, samples of both the specified item and the proposed item shall be provided for comparison purposes.
- E. Timeliness: The burden of timeliness in the complete cycle of submittal data, shop Drawings, and sample processing is on the Contractor. The Contractor shall allow a minimum of six (6) weeks time frame for review of each submission by the office of the design discipline involved after receipt of such submissions by that design discipline. The Contractor is responsible for allowing sufficient time in the construction schedule to cover the aforementioned cycles of data processing, including time for all resubmittal cycles on unacceptable materials, equipment, etc. covered by the data submitted. Construction delays and/or lack of timeliness in the above regard are the responsibility of the Contractor and will not be considered in any request for scheduled construction time extensions and/or additional costs to the Owner.
- F. All equipment installed on this project shall have local representation; local factory authorized service, and a local stock of repair parts.
- G. Acceptance of materials and equipment will be based on manufacturer's published data and will be tentative subject to the submission of complete shop Drawings indicating compliance with the contract documents and that adequate and acceptable clearances for entry, servicing, and maintenance will exist. Acceptance of materials and equipment under this provision shall not be construed as authorizing any deviations from the Specifications, unless the attention of the Architect/Engineer has been directed in writing to the specific deviations. Data submitted shall not contain unrelated information unless all pertinent information is properly identified.
- H. Certification: The Contractor shall carefully examine all data forwarded for approval and shall sign a certificate to the effect that the data has been carefully checked and found to be correct with respect to dimensions and available space and that the equipment complies with all requirements of the Specifications.
- I. Physical Size of Equipment: Space is critical; therefore, equipment of larger sizes than shown, even though of specified manufacturer, will not be acceptable unless it can be demonstrated that ample space exists for proper installation, operation, and maintenance.
- J. Should a substitution be accepted, and should the substitute material prove defective, or otherwise unsatisfactory for the service intended within the guarantee period, this material or equipment shall be replaced with the material or equipment specified at no additional cost to the Owner.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and Equipment: Labeled and/or listed as acceptable to the authority having jurisdiction as suitable for the use intended. Materials shall be of a standard industrial quality if no specifications or specific model numbers are given.
- B. Where two or more units of the same class of material are required, provide products of a single manufacturer. Component parts of materials or equipment need not be products of the same manufacturer.
- C. All materials shall be new and unused.
- D. Provide non-metallic material in corrosive areas or as otherwise specified.

PART 3 – EXECUTION

3.1 WORKMANSHIP

- A. Install work in compliance with NEC latest edition.
- B. Install material and equipment in accordance with manufacturers' instructions. Provide calibrated torque wrenches and screwdrivers and tighten all terminals, lugs, and bus joints using the same.
- C. Comply with startup procedures as defined by Construction Manager and Owner.
- D. Arrange electrical work in a neat, well-organized manner. Do not block future connection points of electrical service. Install all electrical work parallel or perpendicular to building lines unless noted otherwise, properly supported with purpose-designed apparatus, in a neat manner.
- E. Apply, install, connect, erect, use, clean, adjust, and condition materials and equipment as recommended by the manufacturers in their published literature.
- F. Make opening through masonry and concrete by core drilling in acceptable locations. Restore openings to original condition to match remaining surrounding materials.

3.2 SERVICE CONTINUITY

- A. Maintain continuity of electric service to all functioning portions of process or buildings during the hours of normal use. Phase construction work to accommodate Owner's occupancy requirements.
- B. Arrange temporary outages for cutover work with the Owner. Keep the outages to a minimum number and minimum length of time.
- C. All service outages shall be requested in writing a minimum of two weeks prior to the date. Owner reserves the right to postpone shutdowns up to 24 hours prior to the shutdown at no additional cost. Outage requests shall include a schedule of the work to be performed and the time requirements.
- D. The Contractor shall obtain all appropriate Owner permits for working in equipment.

3.3 HAZARDOUS LOCATIONS

- A. Equipment, wiring, devices, and other components located within hazardous areas to be of appropriate type per NFPA requirements.
- B. Ground exposed non-current carrying parts of entire electrical system in hazardous areas, in accordance with NEC and as instructed by Owner.

3.4 SLEEVES AND SEALS

- A. Provide sealing and/or fire stopping where electrical equipment passes through walls, ceilings, and floors. Seals shall be watertight and/or fire rated as applicable.

3.5 CONSTRUCTION REVIEW

- A. The Engineer or Owner's representative will review and observe installation work to insure compliance by the Contractor with requirements of the Contract Documents.
- B. Review, observation, assistance, and actions by the Engineer or Owner's representative shall not be construed as undertaking supervisory control of the work or of methods and means employed by the Contractor. The review and observation activities shall not relieve the Contractor from the responsibilities of these Contract Documents.
- C. The fact that the Engineer or Owner's Representative do not make early discovery of faulty or omitted work shall not bar the Engineer or Owner's Representative from subsequently rejecting this work and insisting that the Contractor make the necessary corrections.
- D. Regardless of when discovery and rejection are made, and regardless of when the Contractor is ordered to correct such work, the Contractor shall have no claim against the Engineer or Owner's Representative for an increase in the Contract price, or for any payment on account of increased cost, damage, or loss.

3.6 WARRANTY

- A. Provide warranties in accordance with the requirements of Uniform General and Supplementary Conditions (UGC).

END OF SECTION

SECTION 26 00 00.01 - ELECTRICAL DEMOLITION

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 RELATED WORK

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

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

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

PART 3 – EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal. Provide temporary wiring and connections to maintain remaining systems in service during demolition and/or modification. Owner reserves the right up to 24 hours prior to any scheduled event to delay or suspend shutdowns or outages to more convenient times at no additional cost.

- B. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. No work shall begin without proper permits and authorizations. Disable system only to make switchovers and connections. Obtain permission from Owner at least (2) weeks before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.
- C. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Notify Owner at least (2) weeks before partially or completely disabling system. Minimize outage duration. Provisions for manual fire watch shall be provided in areas where services are interrupted. Make temporary connections to maintain service in areas adjacent to work area.
- D. Existing Information Technology Systems: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Notify Owner at least (2) weeks before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

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

with care all equipment to be relocated or reused. Repair or replacement of equipment damaged by the Contractor is the responsibility of the Contractor.

3.4 CLEANING AND REPAIR

- A. The Contractor shall follow Owner's clean work policy and shall include the removal of trash and demolished material from the building or work area at the end of the each day and removal from the site once a week.
- B. The Contractor shall be responsible for repairing adjacent construction and finishes damaged during demolition and/or modification. The Contractor shall be responsible for the removal of ceiling tiles required in the demolition work. The Contractor shall be responsible for the replacement of damaged tiles and reinstallation of the ceiling prior to final acceptance.
- C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts, and broken electrical parts.

3.5 DISPOSITION OF MATERIAL AND EQUIPMENT

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

END OF SECTION

SECTION 26 05 00 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Hinged cover enclosures and cabinets
- B. Contactors
- C. Control relays
- D. Push buttons, and selector switches
- E. Terminal blocks and accessories
- F. Penetration sealing systems (fire stops)
- G. Electrical/control portion of HVAC work covered by Division 23 pertaining basic electrical materials and methods shall follow the requirement set forth by this specification.

1.2 APPLICABLE CODES AND STANDARDS

- A. NFPA 70, National Electrical Code (latest edition)
- B. American National Standard, National Electrical Safety Code, (latest edition)
- C. Applicable publications of NEMA, ANSI, IEEE, and ICEA
- D. Underwriters Laboratories, Inc. Standards (UL)
- E. Federal, city, state, and local codes and regulations having jurisdiction
- F. OSHA requirements
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
- H. NEMA WD 1 – General-Purpose Wiring Devices
- I. UL 98 - Enclosed Switches

1.3 INTENT

- A. This Section is not, and shall not be interpreted to be, a complete listing of all materials or equipment that is Contractor furnished and erected. It is intended to clarify and further define the Contractor scope of work, procurement, and responsibilities for those incidental materials that are not specified by other specifications, but important to a complete and operational system.
- B. The Contractor shall furnish all equipment and materials, whether or not specified in other Sections of specification and on drawings, for installation and connection required to place equipment into satisfactory operating service. The Contractor shall review the Drawings and specifications for clarification of his responsibility in the handling and

installation of equipment and material. Where applicable, and not in contradiction with the Drawings and specifications, the Contractor shall install and connect the equipment in accordance with the manufacturer's recommendations and instructions.

- C. All materials and equipment shall be of types and manufacturer specified wherever practical. Should materials or equipment so specified be unattainable, the Contractor shall submit the description and manufacturer's literature, reason for substitution request and shall secure the approval of the Engineer before substitution of other material or equipment is purchased. This Section establishes performance requirements and the quality of equipment acceptable for use and shall in no way be construed to limit procurement from other manufacturer.

1.4 SUBMITTALS

- A. Provide submittals in addition and in accordance with Section 26 00 00, Basic Electrical Requirements, and Division 01 for submittal requirement.
- B. Submit manufacturer's literature and specification data sheets for each type of basic material, which is applicable to the project.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide factory-wrapped waterproof flexible barrier material for covering materials, where applicable, to protect against physical damage in transit. Damaged materials shall be removed from project site.
- B. In their factory-furnished coverings, store materials in a clean, dry indoor space, which provides protection against the weather.

PART 2 – PRODUCTS

2.1 ENCLOSURES AND CABINETS

- A. Enclosures and cabinets for all Contractor furnished electrical equipment and devices shall be suitable for the location and environmental conditions and shall be of the NEMA type as shown in Table 26 05 00-1. Exceptions shall be specifically designated on the Drawings.

Table 26 05 00-1

Enclosures

Location	Environment	Enclosure Type
Indoor Utility	Dry, subject to dust, falling dirt and dripping non-corrosive liquids	NEMA 12
Indoor	Clean, Dry	NEMA 1
Indoor	Wet, subject to hose-directed water	NEMA 4
Outdoor	Subject to falling rain, sleet, and external ice formation	NEMA 3R
Indoor or Outdoor	Subject to corrosion, windblown dust and rain, splashing water and hose-directed water	NEMA 4X

- B. Enclosures shall have the following properties:
 - 1. Hinged Cover Enclosures: NEMA 250.
 - a. Type 1: Steel.
 - b. Type 4: Steel with gasket door, rain tight.
 - c. Type 4X: Stainless steel, (polycarbonate or fiberglass reinforced polyester (FRP) in corrosive areas).
 - d. Type 12: Steel with gasketed door, dust-tight.
- C. Finish: Exterior, manufacturer's standard gray enamel finish; interior, white enamel finish.
- D. Covers: Continuous hinge, held closed by flush latch operable by hasp and staple for padlock. Where required for NEMA ratings, gaskets shall be neoprene rubber.
- E. Interior Panel for Mounting Terminal Blocks or Electrical Components: 14-gauge steel, white enamel finish.
- F. Provide protective pocket inside front cover with schematic diagram, connection diagram, and layout drawing of control wiring and components within enclosure.
- G. Forced Ventilation: Where indicated, provide 115V single-phase fan motor, filtered with air plenum, finger guard, and stainless steel grille. Washable aluminum filter, accessible for cleaning from outside the enclosure; 20,000-hour continuous operation without lubrication or service. Provide matching exhaust grille assembly. Mount fan in lower side corner, exhaust grille in opposite upper side corner.

2.2 CONTACTORS

- A. Acceptable Manufacturers:
 - 1. General Electric Company
 - 2. Square D Company
 - 3. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 26 00 00 and Division 01 for substitution requirement.
- B. Contactors: NEMA ICS 2; electrically held or mechanically held as indicated on Drawings. Two-wire control for electrically held contactors and three-wire control for mechanically held contactors.
- C. Enclosure: NEMA 1 unless indicated otherwise on Drawings.
- D. Control Transformer: Provide when indicated on Drawings. Minimum capacity shall be 100 VA. Provide primary and secondary fuse protection.
- E. Coil operating voltage; 110 volts, 60 Hz or as per drawings.
- F. Size: NEMA ICS 2; size as indicated on Drawings.
- G. Contacts: As indicated on Drawings; 600 Volts, 60 Hz.
- H. Provide solderless pressure wire terminals on bus terminals suitable for mounting in panelboard as indicated on Drawings.

2.3 CONTROL RELAYS

- A. Acceptable Manufacturers
 - 1. General Electric Type CR120A
 - 2. Cutler-Hammer Type M-300
 - 3. Square D Company
 - 4. Allen-Bradley
 - 5. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 26 00 00 and Division 01 for substitution requirement.
- B. Provide magnetic control relays, NEMA Class A: A300 (300 volts, 10 amps continuous, 7,200 VA make, 720 VA break), industrial control type with field-convertible contacts, and meeting the requirements of NEMA ICS 2.
- C. Where time delay relays are specified or required, unless otherwise noted, provide magnetic control relays with a solid-state timer attachment adjustable from 0.2 to 60 seconds (minimum) or with range as indicated. Provide with field convertible from ON delay to OFF delay and vice versa.
- D. Where latching (mechanically held) relays or motor thermal detector relays are specified, provide magnetic control relays with mechanical latch attachment with unlatching coil and coil clearing contacts.

2.4 PUSH BUTTONS, AND SELECTOR SWITCHES

- A. Acceptable Manufacturers
 - 1. Allen-Bradley
 - 2. Square D
 - 3. Cutler Hammer
 - 4. Siemens
 - 5. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 26 00 00 and Division 01 for substitution requirement.
- B. For non-hazardous, indoor, dry locations, including control panels, and individual stations, provide heavy duty, NEMA 13, oil tight type pushbuttons, indicating lights, selector switches, and stations for these devices.
- C. For non hazardous, outdoor, or normally wet locations, or where otherwise indicated, provide heavy duty corrosion resistant, NEMA 4, watertight type pushbuttons, indicating lights, or selector switches mounted in NEMA 4 watertight enclosures. Provide special gasketing required to make complete station watertight.
- D. For hazardous locations, provide control station listed by UL for Class I, Divisions 01 and 02, Groups C and D; Class II, Division 01 and 02, Groups E, F, and G. Specific type shall be in accordance with area classification as indicated on the Drawings.
- E. For corrosive locations, provide nonmetallic components and enclosures meeting NEMA Type 4X.
- F. Provide devices meeting the requirements of NEMA ICS 2, and having individual, extra large nameplates indicating their specific function. Provide push-button stations with laminated plastic nameplates indicating the drive they control. Provide contacts with

NEMA designation rating A600. Install provisions for locking pushbuttons and selector switches in the OFF position wherever lockout provisions are indicated. Nameplates shall be as specified in Section 26 05 53.

- G. Utilize selector switches having standard operating levers. All indicating lights shall be LED type, push-to-test type. Provide ON or START pushbuttons colored black. Provide OFF or STOP pushbuttons colored red.

2.5 TERMINAL BLOCKS AND ACCESSORIES

- A. Signal And Control Terminals:
1. Acceptable Manufacturers
 - a. Phoenix Contact
 - b. Buchanan
 - c. Weidmüller
 - d. Entelec
 - e. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 23 00 00 and Division 01 for substitution requirement.
 2. Signal and Control Terminals: Modular construction type, DIN 46 277/3 channel mounted; screw clamp compression connectors, rated 300 volts. Minimum terminal width of 0.24-inch, capable of holding two No. 12 or two No. 14 AWG conductors in each connector. Terminal identification numbers shall be thermoset characters (black) on a white background. Provide 25 percent spare terminals.
- B. Power Terminals
1. Acceptable Manufacturers
 - a. Buchanan
 - b. IlSCO
 - c. Square D Company
 - d. Burndy
 - e. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 26 00 00 and Division 01 for substitution requirement.
 2. Power Terminals: Unit construction type, closed-back type, with tubular pressure screw connectors, rated 600 volts, size as required. Provide 25 percent spare terminals.

2.6 PENETRATION SEALING SYSTEMS (FIRE STOPS)

- A. Provide penetration sealing where conduit, cable tray, etc. pass through rated walls, ceilings, and floors. See Division 07 requirements for sealing requirements and systems.

2.7 UL LISTING

- A. All equipment and materials shall be new and conform to the requirements of this Section. All equipment and materials shall be UL listed, and shall bear their label whenever standards have been established and level service is regularly furnished. All equipment and materials shall be of the best grade of their respective kind for the purpose.

PART 3 – EXECUTION

3.1 FABRICATION - CONTROL ENCLOSURES AND CABINETS

- A. Shop assemblies enclosures and cabinets housing terminal blocks or electrical components in accordance with NEMA ICS 6.

3.2 INSTALLATION - ENCLOSURES AND CABINETS

- A. Install cabinets and enclosures plumb; anchor securely to wall and structural supports at each corner, minimum. Direct attachment to dry wall is not permitted.
- B. Provide accessory feet for freestanding equipment enclosures.
- C. Install trim plumb.

3.3 ERECTION OF EQUIPMENT

- A. Manufacturer's Installation Instructions: Where furnished or called for by the manufacturer equipment manufacturer's installation instructions shall be considered a part of this specification and fully complied with. Where the Contractor damages the finishing coat of paint in existing or completed areas, he shall refinish with matching paint.
- B. Mounting Heights: Individual safety switches and buttons and devices shall normally be installed at the following mounting heights, when not specified on the Drawings.
 - 1. Safety Switches: 6 feet 0 inches (to top).
 - 2. Pushbuttons: 4 feet 0 inches (to center).
 - 3. Control Panels: 6 feet 0 inches (to top).
- C. Mounting: Equipment and control devices shall be supported independent of conduit connections. Panels or cabinets shall be mounted on metal frame supports independently of equipment. Control devices and metal enclosures shall be bolted or welded to steel channel or steel plate. All electrical equipment and devices not covered by the above, such as miscellaneous switches, thermostats, duct switches, temperature switches, floats, photoelectrical devices, and similar electrical devices shall be located and set as suitable for the application. Where control panels are provided as part of the equipment racks mounted on the floor, they shall be provided to support conduits and flexible connections to control panels.

3.4 COORDINATION

- A. Exact location of all electrical equipment, devices and fixtures shall be determined in field by contractor and verified by Engineer's field representative prior to installation.

END OF SECTION

SECTION 26 05 19 - CABLE, WIRE AND CONNECTORS, 600 VOLT

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Building wire.
 - 1. Power distribution circuitry.
 - 2. Control system circuitry.
 - 3. Lighting circuitry.
 - 4. Appliance and equipment circuitry.
 - 5. Motor-branch circuitry.
 - 6. Outdoors lighting and power.
 - 7. Other systems circuitry as designated.
- B. Cable.
- C. Wiring connections and terminations.
- D. Electrical/control portion of HVAC work covered by Division 23 pertaining 600 volt cable, wire and connectors shall follow the requirement set forth by this specification.

1.2 REFERENCES

- A. NEMA WC 3 - Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- B. NEMA WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- C. ANSI/UL 83 – Thermoplastic-Insulated Wire and Cables
- D. NFPA 70 – National Electrical Code, latest edition
- E. NEFA – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- F. Where application of National Electrical Code, trade association standards or publications appears to be in conflict with the requirements of this Section, the Architect/Engineer shall be asked for an interpretation.

1.3 SUBMITTALS

- A. Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical Requirements, and Division 01 for submittal requirement.
- B. Submit manufacturer's literature and specification data sheets for each item of cable, wire connectors.
- C. Qualification of cable and wire manufacturer: Company specializing in manufacturing products specified in this Section with minimum ten years experience.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Provide factory-wrapped waterproof flexible barrier material for covering wire and cable wood reels, where applicable; and weather resistant fiberboard containers for factory packaging of cable, wire and connectors, to protect against physical damage in transit. Damaged cable, wire or connectors shall be removed from project site.
- B. Store cable, wire and connectors in a clean, dry indoor space in their factory-furnished coverings, which provides protection against the weather.

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Generally, cable, wire and connectors shall be of manufacturer's standard materials, as indicated by published product information.
- B. Provide factory-fabricated wire of the size, rating, material and type as indicated for each service. Where not indicated, provide proper selection as required to comply with installation requirements and with NEC standards. The minimum size wire to be used for power or lighting circuits shall be No. 12 AWG copper with insulation as noted below. Minimum size for control shall be No. 14 AWG copper.
- C. The conductors of wires and cables shall be of copper (tinned where specified), and have conductivity in accordance with the standardization rules of the IEEE. The conductor and each strand shall be round and free of kinks and defects.
- D. Grounding conductors, where insulated, shall be colored solid green or identified with green color as required by the NEC. Conductors intended as a neutral shall be colored solid white, or identified as required by the NEC. All motor or equipment power wiring shall be colored according to Section 26 05 53, Electrical Identification.
- E. All cable specified for use in tray shall be multiconductor and shall have an outer jacket of flame-retardant, moisture and sunlight resistant polyvinyl chloride (PVC) and shall be UL and NEC approved type for tray installation. Cable installed in cable tray outdoors shall have a jacket that is UV resistant chlorinated polyethylene (CPE) or polyvinyl chloride (PVC), rated 90°C per UL Standard 1277.
- F. All low voltage power and control cable installed in open cable tray above ceilings used for return air shall be plenum rated. Where tray cable is not available in size and type required, conductors shall be installed in conduit.
- G. Use compression lugs for all wiring termination's, except on breakers or terminal strips in panel boards.

2.2 BUILDING WIRE

- A. Thermoplastic-insulated Building Wire: NEMA WC 5.
- B. Rubber-insulated Building Wire: NEMA WC 3.

- C. Feeders and Branch Circuits Larger Than 10 AWG: 98% conductivity copper, soft-drawn, stranded conductor, 600 volt insulation, THHN/THWN-2 Use XHHW-2 conductors where installed in conduit underground or outdoors.
- D. Feeders and Branch Circuits 10 AWG and Smaller: 98% conductivity copper, soft-drawn, stranded conductor, 600-volt insulation, THHN/THWN-2.

2.3 REMOTE CONTROL AND SIGNAL CABLE

- A. 600 Volt Insulation Control Cable for Class 1 Remote Control and Signal Circuits, Type TC:
 - 1. Individual Conductors: No. 14 AWG, stranded copper, XHHW insulation. Rated 90 degrees C dry, 75 degrees C wet, color-coded per ICEA Method 1 plus one green equipment grounding conductor.
 - 2. Assembly: Bundle wrapped with cable tape and covered with an overall PVC jacket. Cable shall pass IEEE-1202 vertical tray ribbon-burner flame test (210,000 BTU) VW-1.
- B. Instrumentation Cable
 - 1. 300 Volt Instrumentation Cable, Multiple Pairs, Overall Shield, Type PLTC:
 - a. Individual Conductors: No. 18 AWG, stranded, tinned copper, flame retardant polyethylene or PVC insulated, rated 105 degrees C, black and white numerically printed and coded pairs.
 - b. Assembly: Individual twisted pairs having a 100 percent coverage aluminum-polyester shield and 20 AWG stranded tinned copper drain wire. Conductor bundle shall be shielded with 100 percent coverage overall aluminum-polyester shield complete with 20 AWG drain wire. All group shields completely isolated from each other. Bundle wrapped with cable tape and covered with an overall flame retardant PVC jacket. Cable shall pass IEEE-383 vertical tray flame test (70,000 BTU) UL 1581.
- C. Life Safety Systems Cable
 - 1. All life safety system wiring shall be installed in dedicated conduit or raceway with adequate separation/shielding from all other systems.
 - 2. Life safety systems wiring shall be as specified in the Section 28 31 00 - Fire Alarm and Smoke Detection Systems.
- D. Security/Access Control/CCTV Cable
 - 1. All security/access control wiring shall be installed in dedicated conduits.
 - 2. Security/access control wiring shall be rated and as specified below:

Circuit Type	No. of Conductors	Conductor Specifications	Cable Specifications
20 mA Current Loop	2	18-gauge, stranded copper	2 cables, 1 twisted pair each required
Card Reader Coaxial	--	18-gauge, solid copper, center conductor	Schlage Model No. SE9284PL or Anicom 5910PL
Contact Circuits	2	18-gauge, stranded copper	Nonshielded, twisted
CCTV Coaxial	--	--	Belden 89259 plenum rated, or approved equal

3. All security/access control power circuit wiring shall comply with paragraph 2.2. Building Wire of this Section.
- E. Plenum Cable for Class 3 Remote Control and Signal Circuits: 98% conductivity copper conductor, 300 volt insulation, rated 60 degree C, UL listed for use in air handling ducts, hollow spaces used as ducts, and plenums.

2.4 WIRING CONNECTIONS AND TERMINATIONS

- A. Provide factory-fabricated, metal connectors of the size, rating, material, type and class as indicated for each service. Where not indicated, provide proper selection as required to comply with installation requirements and with NEC standards. Select from only following types, classes, kinds and styles.
 1. Type:
 - a. Solderless pressure connectors
 - b. Crimp.
 - c. Threaded.
 - d. Insulated spring wire connectors with plastic caps for No. 10 AWG and smaller.
 2. Class: Insulated.
 3. Material: Copper (for CU to CU connection).
 4. Style:
 - a. Insulated terminals. Use ring-terminal for control wiring. Use flange (fork) spade compression terminal for termination of stranded conductors at wiring devices, including ground connection.
 - b. Split bolt-parallel connector.
 - c. Pigtail connector.
 - d. Pre-insulated multi-tap connector.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Installer must examine the areas and conditions under which cable, wire and connectors are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Inspect wire and cable for physical damage. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 GENERAL WIRING METHODS

- A. Install electrical cable, wire and connectors as indicated, in accordance with the manufacturer's written instructions, the applicable requirements of NEC and the National Electrical Contractors Association's "Standard of Installation", and as required to ensure that products serve the intended functions.
- B. Coordinate cable and wire installation work with electrical raceway and equipment installation work, as necessary for proper interface. Do not install the conductors until raceway system is complete and properly cleaned.
- C. Cables shall be selected on the basis of their purpose and UL listing. Generally, use Types THHN/THWN-2 in building interiors and other dry locations. Outdoors and underground in raceways, use Type XHHW-2. Conductors subject to abrasion, such as in lighting poles, shall be Type THHN/THWN-2.

- D. No conductor smaller than No. 12 AWG wire shall be used for lighting purposes. In the case of "home runs" over 50' in length (100' for 277 volt) no conductor smaller than a No. 10 AWG wire shall be used. The sizing of all wire except remote control wire shall be accomplished in the case of both feeder and branch circuits by conforming to the following provisions. Separate neutral conductors shall be provided for each phase of the same size for 120V and 277V single-phase application for heavy electrical loads, computer loads, loads fed from isolated transformers, lab equipment, clinic equipment, dedicated circuits, unless noted otherwise on drawings. Voltage drop on feeders and branch circuits shall not exceed NEC requirement.
- E. Remote control wires shall be no smaller than No. 14 AWG conductors. Control wires shall be run in separate conduits from power conductors. Departures from the sizes so determined shall be made only in those cases in which the National Electrical Code requires the use of larger conductors. The sizes as determined from these tables shall be regarded as the acceptable minimum under all other circumstances. In no case, however, shall there be a voltage drop greater than that specified in any feeder or branch circuit. The Contractor may, if he deems it necessary or advisable, use larger sized conductors than those shown. Under no circumstances, however, shall the Contractor use any conductors sized in a manner which does not conform to the above mentioned tables without having first secured the written approval of the Owner's duly authorized representative.
- F. Install exposed wire and cable, parallel and perpendicular to surface or exposed structural members and follow the surface contours, where possible.
- G. Splice branch circuits only in accessible junction or outlet boxes. Control cable shall never be spliced except the final connection to field devices. Where terminations of cables that are installed under this Section are to be made by others, provide pigtail of adequate length for neat, trained and bundles connections, minimum 5 feet at each location, unless noted otherwise on drawings.
- H. Wiring Within An Enclosure: Contractor shall bundle ac and dc wiring separately within an enclosure. The Contractor shall utilize panel wire-ways when they are provided. Where wireways are not provided the Contractor shall neatly tag, bundle wires and secure to sub-panel at a minimum of every three inches with T&B Type TC5355 heavy duty mounting bases.
- I. Do not band any conductor either permanently or temporarily during installation to radii less than four times the outer diameter of 600-volt insulated conductors.

3.3 WIRING INSTALLATION IN RACEWAYS

- A. Wire and cable shall be pulled into clean dry conduit. Do not exceed manufacturer's recommended values for maximum pulling tension.
- B. Pull conductors together where more than one is being installed in a raceway.
- C. Use UL listed pulling compound or lubricant, when necessary; compound must not deteriorate conductor and insulation.
- D. Do not use a pulling means, including fish tape, cable or rope, which can damage the raceway.

- E. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
- F. Place an equal number of conductors for each phase of a circuit in same raceway.
- G. Provide separate conduit or raceway for line and load conductors of motor starters, safety disconnect switches, and similar devices. Those devices shall not share the same raceway.
- H. All conduits shall contain a green grounding conductor. Conduit, wireways, or boxes shall not be used as the equipment grounding conductor.

3.4 CABLE INSTALLATION

- A. Provide protection for exposed cables where subject to damage during construction. Do not install cable before the completion of raceway system.
- B. Cable above ceilings shall be in conduit or raceways. Cables, conduits and raceways shall not be laid on ceiling tiles or strapped to ceiling wire.
- C. Use suitable cable fittings and connectors.
- D. It shall be the Contractor's responsibility to accurately measure all cable runs before the cable is cut. The Contractor shall furnish all tools and equipment, have sufficient properly trained personnel and shall exercise necessary care to ensure that the cable is not damaged during installation. Cable found to be damaged before installation shall not be installed. Cable damage during installation shall be removed and replaced. Repairs to cables can only be done with written permission from the Owner's Representative and only under special circumstances.
- E. Care shall be exercised with cables entering or leaving cable trays that all cable bend radii shall not be less than the recommended minimum and that cables are not left to rest unprotected on any sharp edge or corner.
- F. PVC jacketed cable shall not be installed or worked in any way at temperatures below 32 degrees F, unless cable has been previously stored in a heated area 48 hours prior to being pulled and transported to a heated pulling area.
- G. Each cable entering an enclosure shall have its conductors bundled together and identified with the cable number. All groups of conductors within an enclosure shall be shaped and formed to provide a neat appearance to facilitate future additions or rework. All control conductors shall be numbered and shall be labeled at each termination with this number, using markers designed for the application.
- H. Multi-Conductor Cable Installation: Power and 120V control cable shall be installed in the same tray. When cables leave trays, they shall be protected between the trays and the cable terminal points by drawing them through conduits. Do not route 600V cables (power cable and 120V control cable) in the same conduit or cable tray as low voltage cables (less than 50V, communications, security systems, or control conductors). Do not route security systems, or control cables through communications rooms. Fire alarm cable shall be routed in a separate conduit only.
- I. Instrument Cable: Instrument cable shall, when conduit installation is required be installed in rigid steel conduit. They shall not be spliced at any point. The shields and

drain wires of shielded signal cables shall be grounded only at one point as indicated on the Drawings.

3.5 WIRING CONNECTIONS AND TERMINATIONS

- A. Install splices, taps and terminations, which have equivalent-or-better mechanical strength and insulation as the conductor. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
- B. Keep conductor splices and taps accessible and to a minimum, and in junction boxes only. Control circuit conductors shall terminate at terminal blocks only. Splices below grade shall only be in handholes or manholes and shall be made watertight with epoxy resin type splicing kits similar to Scotchcast.
- C. Use splice, tap and termination connectors, which are compatible with the conductor material.
- D. Thoroughly clean wires before installing lugs and connectors.
- E. Terminate spare conductors with electrical tape and label as spare.
- F. Power and Lighting Circuits: Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and larger. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps on lighting and receptacle circuits.
- G. Use split bolt connectors for copper wire splices and taps, 6 AWG and larger. Tape un-insulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.
- H. Connections for all wire sizes in motor terminal boxes where the motor leads are furnished with crimped-on lugs shall be made by installing ring type compression terminals on the motor branch circuit ends and then bolting the proper pairs of lugs together. First one layer of No. 33 scotch tape reversed (sticky side out), then a layer of rubber tape, then two layers of No. 33 half-lapped.
- I. Identify conductors per Section 26 05 53 - Electrical Identification.

3.6 FIELD QUALITY CONTROL

- A. Torque test conductor connections and terminations to manufacturer's recommended values.
- B. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.
- C. Conductors in vertical conduits or raceways shall be supported in the manner set forth in the appropriate section of the latest revision of the National Electrical Code. Lighting fixtures shall not be used for raceways for circuits other than parallel wiring of fixtures.
- D. Conductors may be run in parallel on sizes No. 1/0 AWG to 500 kcmil inclusive provided all paralleled conductors are the same size, length, and type of insulation. Except as otherwise shown on drawings, no more than three conductors may be run in parallel, and they shall be so arranged and terminated as to insure equal division of the total current between all conductors involved.

- E. Where parallel connection is contemplated, approval of the Owner's representative must be obtained before installation is made.

3.7 TESTING AND ACCEPTANCE

- A. Before final acceptance, the Contractor shall make voltage, insulation, and load tests, necessary to demonstrate to the Owner's representative the satisfactory installation and proper performance of all circuits.
- B. Test feeder conductors clear of faults. Insulation-resistance test shall be conducted per NETA – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems. Test results below 50 megohms shall be cause for rejection of the wiring installation. Replace and retest all such rejected conductor.
- C. At the completion of this project, the Contractor shall provide for the Owner three (3) complete and finally corrected sets of working drawings. These sets of working drawings shall be new, unused and in good condition, and shall include the nature, destination, path, size and type of wire and all other characteristics for complete identification of each and every conduit and circuit.

END OF SECTION

SECTION 26 05 29 - SECURING AND SUPPORTING METHODS

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Raceway, cable tray, and equipment supports
- B. Fastening hardware
- C. Coordinate location of concrete equipment pads

1.2 QUALITY ASSURANCE

- A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry. Support systems shall be sized adequately to support an additional 25% for future loads

1.3 COORDINATION

- A. Coordinate with other trades where conduit and cable tray supports are in the same location as piping, ductwork, and work of other trades and where supports are furnished and installed under other Divisions. Supporting from the work or supports of other Contractors shall not be allowed except by express, written permission of the Owner.

1.4 SUBMITTALS

- A. Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical Requirements, and Division 01 for submittal requirement.

PART 2 – PRODUCTS

2.1 MATERIAL

- A. Support Channel:
 - 1. All non-corrosive locations: Hot-dip galvanized steel.
 - 2. Corrosive locations: Nonmetallic fiberglass.
- B. Hardware:
 - 1. All non-corrosive locations: Hot-dip galvanized steel.
 - 2. Corrosive locations: Stainless steel threaded rod, attachments and fasteners shall be used with fiberglass supports.
- C. Threaded Rod: used for rack support from structure above; 3/8-inch minimum diameter.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using precast insert system, expansion anchors, or beam clamps. Do not use spring steel clips and clamps. Provide necessary calculations to select proper support materials

for electrical equipment, raceway, and cable tray supports. Provide cable tray supports for cable tray filled to 125 percent capacity per NEC.

- B. Install hangers, anchors, sleeves and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NEC for installation of supporting devices. Install supports with spacing in compliance with NEC requirements.
- C. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors in solid masonry walls; or concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.
- D. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
- E. Do not use powder actuated anchors without written permission from the Engineer or Owner's Representative.
- F. Do not drill structural steel members without written permission from the Structural Engineer.
- G. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- H. Bridge studs top and bottom with channels to support recessed mounted cabinets and panelboards in stud walls.
- I. Install surface mounted cabinets and panelboards with a minimum of four anchors. Provide strut channel supports to stand cabinet 1-5/8 inches off wall. Utilize "Post Bases" where support channel is attached to structural floor.
- J. Provide extra care in supporting PVC conduit to protect it from potential damage.
- K. Use fiberglass for nonmetallic raceway systems supports in areas subject to corrosion.
- L. All supports in contact with floor using stanchion type support shall be solidly bolted to the permanent structural floor.
- M. Conduit supports shall have at a minimum, the bottom support member constructed of double strut. This horizontal member shall be double-nutted, and the supporting all-thread rod shall be trimmed to one inch below lowest nut.
- N. Conduit entering/exiting cable tray shall be attached to the tray rail by means of unistrut bolted to the rail and standard manufacturer's accessories. Conduit shall only enter/exit tray horizontally supported within three feet of the tray, and extended into the tray two inches. Conduit shall be terminated with a grounding bushing, and bonded to the tray ground wire. (The attachment to the tray shall not be considered a support.)
- O. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.

- P. Install freestanding electrical equipment on 4-inch concrete pads. Pad shall be a minimum four inches larger than equipment. No crevices shall be left around the pads. Equipment includes but not limited to the following:
1. Motor Control Centers
 2. Static Transfer Switches
 3. Floor mounted VFDs
 4. Floor mounted transformers
 5. Switchboards, 1200A and larger
- Q. Do not anchor supports to columns. Where panelboards, cables, or conduits are routed on the face of a column provide "column hugging" channel supports.

3.2 TOUCH-UP

- A. Touch-up all scratches on securing and supporting system, and paint the ends of channel after cutting with an approved zinc chromate or 90 percent zinc paint.

END OF SECTION

SECTION 26 05 33 - RACEWAYS, CONDUITS AND BOXES

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Raceways:
 - 1. Surface metal raceways.
 - 2. Multi-outlet assemblies.
 - 3. Wireways.
 - 4. Indoor service poles.

- B. Conduit:
 - 1. Rigid metal conduit and fittings. (RGS)
 - 2. Intermediate metal conduit and fittings. (IMC)
 - 3. Electrical metallic tubing and fittings. (EMT)
 - 4. Flexible metal conduit and fittings.
 - 5. Liquid-tight flexible metal conduit and fittings.
 - 6. Non-metallic conduit and fittings. (underground use only)
 - 7. PVC coated rigid steel conduit.

- C. Boxes:
 - 1. Wall and ceiling outlet boxes.
 - 2. Pull and junction boxes.

- D. Electrical/control portion of HVAC work covered by Division 23 pertaining raceway, conduit and boxes shall follow the requirement set forth by this specification.

1.2 REFERENCES

- A. NFPA 70 – National Electrical Code, latest edition
- B. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated
- C. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated
- D. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies
- E. EMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing
- F. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
- H. ANSI/NEMA TC 2 – Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)
- I. ANSI/UL 1 – Flexible Metal Conduit
- J. ANSI/UL 5 – Surface Metal Raceways and Fittings
- K. ANSI/UL 360 – Liquid-tight Flexible Steel Conduit
- L. ANSI/UL 467 – Electrical Grounding and Bonding Equipment

- M. ANSI/UL 651 – Schedule 40 and 80 Rigid PVC Conduit (underground use only)
- N. ANSI/UL 797 – Electrical Metal Tubing
- O. ANSI/UL 870 – Wireways, Auxiliary Gutters and Fittings
- P. NEMA RN 1 – Polyvinyl Chloride (PVC) Externally Coated galvanized Rigid Steel Conduit and Intermediate Metal Conduit
- Q. NEMA VE 1 – Metallic Cable Tray Systems
- R. UL 6 – Rigid Metal Conduit
- S. ANSI/UL 5C – Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits
- T. ANSI/UL 498 – Attachment Plugs and Receptacles
- U. ANSI/UL 943 – Ground Fault Circuit Interrupters

1.3 SUBMITTALS

- A. Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical Requirements, and Division 01 requirements.
- B. Shop drawings consisting of a complete list of equipment and materials, which will be used for the project, including manufacturer's descriptive and technical literature, catalog cuts and installation instructions.
- C. Sealing/fire stopping materials and details.

1.4 STORAGE AND HANDLING

- A. Handle materials carefully to avoid damage, breaking, denting and scoring. Damaged equipment or materials shall not be installed.
- B. Store materials in a clean dry space and protected from the weather.

PART 2 – PRODUCTS

2.1 SURFACE METAL RACEWAY

- A. Surface metal raceway shall be factory pre-assembled galvanized steel complete including bases, removable covers, receptacles, end plates, elbows, connectors and fittings, to exact length to match the length of the cabinets, casework, utility chases, and shelving as indicated on laboratory and furniture shop drawings, and work bench details, as applicable.
- B. Size shall be as shown on the Drawings. The length shown on electrical drawings is diagrammatic only and is not accurate for fabrication of raceway Sections. Refer to shop drawings, architectural plans, elevations, and details.
- C. Finish shall be ANSI-61 gray enamel.

- D. Covers shall be field removable by use of a standard screwdriver, without marring the extrusion or cover finish. Raceway with two covers must allow each cover to be removed separately without access into the compartment(s) enclosed by the other cover.
- E. Provide a permanent, integral, grounded metallic dividing barrier to isolate the wiring compartments in the multi-outlet raceway system per drawing as applicable. Provide divider with fittings that maintain the separation of the raceway wiring compartments.
- F. Provide device brackets for mounting standard single-gang or two-gang devices within the raceway system. Devices shall have the capacity of mounting flush or in conjunction with device faceplates.
- G. Provide receptacles for the respective power systems as indicated on the drawings. Refer to Section 26 27 26 Wiring Devices for device specifications.

2.2 MULTI-OUTLET ASSEMBLY

- A. Multi-outlet assembly shall be two-piece sheet metal channel with fitted, removable cover suitable for use as a multi-outlet assembly.
- B. Size shall be as indicated on the Drawings.
- C. Provide receptacles mounted as shown on Drawings.
- D. Finish shall be ANSI-61 gray enamel.
- E. Provide couplings, elbows, outlet and device boxes, and connectors designed for use with multi-outlet system.

2.3 WIREWAYS

- A. Wireways shall be of steel construction general purpose for indoor spaces and rain tight for outdoor applications with knockouts.
- B. Size shall be as indicated on Drawings.
- C. Cover shall be hinged or screw applied as indicated on Drawings. Rain tight wireways shall be provided with full gasketing.
- D. Fittings shall be so constructed to continue the "lay-in" feature through the entire installation.
- E. Provide all sheet metal parts with a rust inhibiting phosphatizing primer coating and finished in gray enamel. All hardware shall be cadmium plated to prevent corrosion.

2.4 CONDUIT AND FITTINGS

- A. Conduit and fittings for all electrical systems on this project shall include the following:
 - 1. Service entrance
 - 2. Electrical power and lighting feeders
 - 3. Electrical power and lighting circuits
 - 4. Telephone systems
 - 5. Control systems (other than HVAC)
 - 6. Fire alarm and signaling systems

7. CCTV rough-in system
 8. Clock and bell system
 9. Computer system rough-in
 10. Sound system rough-in
 11. Other electrical systems
- B. For each electrical wireway system indicated, provide a complete assembly of conduit, tubing or duct with fittings including, but not necessarily limited to, connectors, nipples, couplings, locknuts, bushings, expansion fittings, other components and accessories as needed to form a complete system of the same type indicated.
- C. Conduit fittings shall be designed and approved for the specific use intended. Conduit fittings, including flexible, shall have insulated throats or bushings. Rigid conduits shall have insulated bushings, unless grounding bushings are required by N.E.C. Article 250. Grounding bushings shall have insulated throats.
- D. Rigid and intermediate metal conduit shall be hot-dipped galvanized. Fittings shall be threaded type. Expansion fittings shall be OZ Type DX.
- E. Electrical metallic tubing shall be galvanized. Fittings shall be all steel compression type. Expansion fittings shall be OZ Type TX.
- F. Flexible metal conduit and fittings shall be zinc-coated steel.
- G. Liquid-tight flexible conduit and fittings shall consist of single strip, continuous, flexible interlocked, double-wrapped steel, galvanized inside and outside, forming smooth internal wiring channel with liquid-tight covering of flexible polyvinyl chloride (PVC). It shall be furnished with a sealing O-ring where entering an enclosure subject to moisture. Where O-Rings are used, ground type bushings shall be used in the box or enclosure.
- H. Nonmetallic conduit and fittings shall be suitable for temperature rating of conductor but not less than 90°C. Nonmetallic conduit and fittings shall be molded of high impact PVC compound having noncombustible, nonmagnetic, non-corrosive and chemical resistant properties and shall be of the same manufacturer. Where located outdoors and above ground, the conduit and fittings shall be UV resistant. Solvent cement shall be of the same manufacturer as the conduit and shall be of the brush-on type. Spray solvents are prohibited. PVC coated metallic fittings shall not be permitted for PVC conduit connections.
- I. Crimp or set-screw type fittings are not acceptable.
- J. Minimum conduit size shall be 3/4 inch, except 1/2 inch flexible metallic conduit may be used as fixture whips less than 6-feet in length.
- K. PVC coated rigid steel conduit shall be externally coated with a 40 mil PVC coating and internal phenolic coating over a galvanized surface.

2.5 WALL AND CEILING OUTLET BOXES

- A. Galvanized steel interior 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.

1. Outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes, compatible with outlet boxes being used and meeting requirements of individual situations.
 2. Provide multi-gang outlets of single box design. Sectional boxes are not acceptable. Provide outlet boxes of sufficient volume to accommodate the number of conductors entering the box in accordance with the requirements of NEC, and not less than 1 ½ inch deep unless shallower boxes are required by structural conditions and are approved by the A/E.
- B. Provide deep type cast metal weatherproof exterior outlet wiring boxes of the type, shape and size, including depth of box, with threaded conduit ends, cast metal face plate with spring-hinged waterproof cap suitably configured for each application, including face plate gasket and fasteners. Provide PVC type outlet boxes only in corrosive areas rated as NEMA 13X.
- C. Outlet boxes in poured concrete shall be plenum type without any holes and with reset knockouts. Where extension rings are used to offset conduit between wall reinforcing steel, joint between extension ring and box shall be sealed to prevent concrete from entering box during pour.
- D. Provide 4-inch octagonal ceiling outlet boxes.

2.6 PULL AND JUNCTION BOXES

- A. Boxes shall be galvanized sheet metal conforming to ANSI/NEMA OS 1 with screw-on cover and welded seams, stainless steel nuts, bolts, screws and washers.
- B. Boxes larger than 12 inches in any dimension shall be panelboard code gauge galvanized steel with hinged cover.
- C. Boxes shall be sized in accordance with NEC.
- D. Provide cast-in-place, pre-cast concrete or die-molded fiberglass handholes/pull boxes as per design for underground installations. Cast-in-place and pre-cast boxes shall be provided with reinforcing bars with material compressive strength no less than 11,000 psi, and shall be approved by Owner/Structural Engineer.

PART 3 – EXECUTION

3.1 INSTALLATION – CONDUIT

- A. Install products as indicated, in accordance with the applicable requirements of NEC, NEMA and the National Electrical Contractors Association's "Standard of Installation".
- B. Cut conduit square using a saw or pipe cutter. De-burr cut ends. Joints in steel conduit must be painted with T&B Kopr shield and drawn up tight. Threads for rigid metal conduit and IMC shall be deep and clean. Running threads shall not be used. Wipe plastic conduit clean and dry before joining. Apply full, even coat of cement with brush to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum. Spray type of cement is not acceptable. Install raceway and conduit system from point of origin in outlets shown, complete with support assemblies including all necessary hangers, beam clamps, hanger rods, turnbuckles, bracing, rolls, clips angles, through bolts, brackets,

saddles, nuts, bolts, washers, offsets, pull boxes, junction boxes and fittings to ensure a complete functional raceway system. Where vertical drops of conduit are made to equipment in open space, the vertical conduit shall be rigidly supported from racks supported on the floor.

- C. Install rigid wall hot-dipped galvanized steel conduit or hot-dipped galvanized intermediate metal conduit for service entrance; feeders; wall or floor penetrations; mechanical rooms electrical rooms and exposed locations where there is a high potential subject to physical damage; exposed outdoor locations; damp locations or any location as per design drawing. The following exceptions permitted:
1. EMT
 - a. In sizes up to and including 1-1/2 inch, may be used inside dry locations where not subject to mechanical damage. EMT may be used in air-conditioned spaces, such as accessible ceilings, dry wall partitions and exposed where 6 feet above the floor. EMT may not be used outside, in concrete, underground, in under floor spaces, in masonry walls, in locations likely to be damp, in electrical rooms subject to mechanical damage due to future installation, or exposed within 6 feet of the floor. EMT shall not be used for medium voltage circuits.
 - b. Where used for feeder circuits receptacle branch circuits and motor branch circuits EMT shall also contain a NEC grounding conductor.
 - c. All conduits shall be concealed in walls or ceilings unless otherwise noted.
 2. PVC (underground use only)
 - a. Install PVC schedule 40 conduit where direct buried in earth.
 - b. Type EB, Utility Duct, encased in concrete.
 3. Liquid-tight
 - a. Install liquid-tight flexible metal conduit for connections to rotating, vibrating, moving or movable equipment, including dry-type transformers. Install external ground wire on flexible conduit with grounding bushings. Maximum length shall be 6 feet minimum of 2 feet.
 4. Flexible Metal Conduit
 - a. Install standard flexible metal conduit (not liquid-tight), which shall be only used for lighting fixture whips or motor vibrations, with internal ground wire. Install flexible conduit connection such that vibrations are not transmitted to adjoining conduit or building structure. Maximum length shall be 6 feet, minimum of 3 feet; minimum size shall be 3/4; and minimum size shall be 1/2 inch for lay-in light fixture whips.
- D. Install conduits parallel and supported on Unistrut, or equal, trapezes and anchored with split ring hangers, conduit straps or other devices specifically designed for the purpose. No raceways or boxes shall be supported using wire. Arrange conduit to maintain headroom and present a neat appearance. Conduit routes shall follow the contour of the surface it is routed on. Route exposed conduit and tray above accessible ceilings parallel and perpendicular to walls and adjacent piping. Maintain 12-inch clearance between conduit and heat sources, such as flues, steam pipes, and heating appliances. Wire ties or "wrap lock" are not permitted to support or secure conduit system. Fasten conduit with the following material:
1. Wood screws on wood
 2. Toggle bolts on hollow masonry
 3. Bolts and expansion anchors in concrete or brick
 4. Machine screws, threaded rods and clamps on steel
 5. Conduit clips on steel joists.
 6. 4 inch x 4 inch penta-treated pine installed in pitch pans on roof, spaced at intervals not to exceed 5 feet.

- E. Install conduits outside of building lines at a minimum depth of 30 inches below finished grade. Maintain twelve inches earth or two inches concrete separation between electrical conduits and other services or utilities underground. Encase all plastic service entrance conduits with concrete unless otherwise specifically detailed or noted on the drawings.
- F. Ducts in concrete encased ductbanks shall be independently supported by interlocking module spacers by Formex or equal. Spacers shall provide 3 inches separation between adjacent ducts. Spacers shall be installed at 6 feet maximum intervals.
- G. Ducts in concrete encased ductbanks shall be terminated in manholes, pull boxes, and vaults with interlocking terminators. A watertight tapered plug shall be furnished and installed in unused duct openings. Where terminators are installed in new work, they shall be poured-in-place.
- H. Install underground conduits with sealing glands equal to OZ Type FSK exterior to the conduit and OZ type CSB, or equal internally at the point where conduits enter the building to prevent water seepage into the building.
- I. Fittings shall be approved for grounding purposes or shall be jumpered with a copper grounding conductor of appropriate ampacity. Leave termination of such jumpers exposed.
- J. Install expansion fittings in metal and PVC conduit as follows:
 - 1. Conduit Crossing Building Expansion Joints:
 - a. EMT all sizes
 - b. IMC all sizes
 - c. RMC all sizes
 - d. PVC all sizes
 - 2. Conduits entering environmental rooms and other locations subject to thermal expansion and as required by NEC.
 - 3. Unless expansion fitting has an integral bonding braid, as in Crouse-Hinds Type XC, a green insulated grounding conductor shall be pulled in the conduit. Both ends of the green grounding conductors shall be accessible for inspection.
- K. Install conduit concealed in walls, partitions and above ceilings. Install conduit exposed in ceiling area (at structure) of boiler rooms, mechanical rooms and in other similar rooms where ceilings are not called for. Install conduit concealed in slab when finished areas below do not have ceiling. A written approval shall be obtained from Owner/Structural Engineer prior to construction.
- L. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.
- M. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture if cable or wire are not installed immediate after conduit run. Tape covering conduit ends is not acceptable.
- N. Provide 200 lb. nylon cord full length in empty conduit.
- O. Where conduit penetrates fire-rated walls and floors, provide pipe sleeve two sizes larger than conduit; pack void around conduit with oakum and fill ends of sleeve with fire-resistive compound or provide mechanical fire-stop fittings with UL listed fire-rating or seal opening around conduit with UL listed foamed silicone elastomer compound equal to fire-rating of floor or wall.

- P. Install no more than the equivalent of three 90-degree bends between boxes. Where four 90-degree bends are required, prior approval by the Engineer is required. Use conduit bodies to make sharp changes in direction, as around beams. Conduit bodies shall be readily accessible and sized for the cables installed. Running or rolling offsets are not approved. Use factory long radius elbows for bends in conduit larger than 2-inch size. All parallel bends shall be concentric.
- Q. Conduit entering / exiting cable tray shall be attached to the tray rail by means of strut bolted to the rail and standard manufacturer's accessories or by use of a UL listed conduit to tray connector. Conduit shall only enter / exit tray horizontally supported within 3 feet of the tray and extend into the tray 2 inches. Conduit shall be terminated with a grounding bushing and bonded to the ground conductor routed in the tray. (The attachment to the tray shall not be considered a ground.)
- R. Pull string shall be provided full length in conduit designated for future use.

3.2 INSTALLATION - SURFACE METAL RACEWAY AND MULTI-OUTLET

- A. Use flathead screws to fasten channel to surfaces. Mount plumb and level.
- B. Use suitable insulating bushings and inserts at connections to outlets and corner fittings on multi-outlet assembly.
- C. Maintain grounding continuity between raceway components to provide a continuous grounding path in accordance with the requirement of NEC.

3.3 INSTALLATION – WIREWAYS

- A. Bolt wireways to steel channels fastened to the wall or in self-supporting structure.] Install level.
- B. Gasket each joint in oil-tight wireway.
- C. Mount rain tight wireway for exterior installation in horizontal position only.

3.4 INSTALLATION – BOXES

- A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
- B. Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual situations.
- C. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of outlets prior to rough-in.
- D. Locate and install boxes to allow access, minimum 12 inches above ceiling except where space dimensions do not allow.
- E. Do not install boxes back-to-back in walls. Provide minimum 6-inch separation. Provide minimum 24-inch separation in acoustic-rated walls. If boxes are connected together, install flexible connection between the two and pack openings with fiberglass.

- F. Secure boxes rigidly to the substrate upon which they are being mounted, or solidly imbed boxes in concrete or masonry. Do not support junction boxes from the raceway systems. Boxes shall not be permitted to move laterally. Boxes shall be secured between two studs. Boxes connected to one stud are not permitted.
- G. Provide knockout plugs for unused openings.
- H. Use multiple-gang boxes where more than one device is mounted together. Do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.
- I. Install boxes in walls without damaging wall insulation.
- J. Outlet boxes in plaster partitions shall be "shallow-type" set flush in wall so there is at least 5/8 inch plaster covering back of box.
- K. Outlet boxes for switch shall not be used as junction boxes.
- L. Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes.
- M. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed luminaire, to be accessible through luminaire ceiling opening.
- N. Outlet boxes supporting fixtures shall be securely anchored in place in an approved manner. Support outlet boxes and fixtures in acoustic ceiling areas from building structures, not from acoustic ceilings. Lighting fixture outlets shall be coordinated with mechanical and architectural equipment and elements to eliminate conflicts and provide a workable neat installation.
- O. Set floor boxes level and flush with finish flooring material.
- P. Prove tamper resistance receptacles in child care areas, psychiatric, and medical facilities.

3.5 INSTALLATION - INDOOR SERVICE POLES

- A. Verify that installation of ceiling suspension system and other work above finished ceiling is complete.
- B. Neatly cut openings in ceiling panels.
- C. Attach foot and top clamp in accordance with manufacturer's instructions.
- D. Install trim plate to enclose ceiling panel opening.
- E. Install poles plumb. Install grounding.

3.6 WALL AND FLOOR PENETRATIONS:

- A. Core drilling shall be approved in writing by the Structural Engineer prior to execution. Avoid anchor bolt on structural column by installing "column hugging" type of unistrut support for electrical installation. PVC shall not be used for wall and floor penetration.

- B. Wall penetrations for cable tray or under floor raceway shall be sealed in accordance with Division 07 requirements.
- C. Provide a 3 1/2 inch curb around block outs through concrete floors. Fire-stop per Architectural specification.
- D. Route conduit through roof openings for piping and ductwork where possible; otherwise, route through roof jack with pitch pocket. Coordinate roof penetrations with the roofing contractor.

END OF SECTION

SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Nameplates and tape labels
- B. Wire and cable markers
- C. Conduit color coding and labeling

1.2 REFERENCES

- A. NFPA 70 – National Electrical Code (latest edition)

1.3 SUBMITTALS

- A. Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical Requirements, and Division 01 for submittal requirement.
 - 1. Furnish nameplate identification schedules listing equipment type and nameplate data with letter sizes and nameplate material.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Equipment Nameplates:
 - 1. For normal power electrical equipment, provide engraved three-layer laminated plastic nameplates, engraved white letters on a black background.
 - 2. For emergency equipment provide engraved three-layer laminated plastic nameplates with engraved white letters on a red background.
 - 3. For UPS powered equipment provide engraved three-layer laminated plastic nameplates with engraved white letters on an orange background.
 - 4. For fire alarm system provide engraved three-layer laminated plastic nameplates with white letters on a yellow background.
 - 5. For security and CCTV system panels, provide engraved three-layer laminated plastic nameplates with white letters on a blue background.
- B. Underground Warning Tape
 - 1. Manufactured polyethylene material and unaffected by acids and alkalines.
 - 2. 3.5 mils thick and 6 inches wide.
 - 3. Tensile strength of 1,750 psi lengthwise.
 - 4. Printing on tape shall include an identification note BURIED ELECTRIC LINE, and a caution note CAUTION. Repeat identification and caution notes over full length of tape. Provide with black letters on a red background.
- C. Conductor Color Tape and Heat Shrink:
 - 1. Colored vinyl electrical tape shall be applied perpendicular to the long dimension of the cable or conductor.

2. In applications utilizing tray cable, heat shrinkable tubing shall be used to obtain the proper color coding for the length of the conductor in the cabinet or enclosure. Variations to the cable color coding due to standard types of wire or cables are not acceptable.
- D. Conduit Labels (5 kV and 15 kV Conduits Only): 2-inch black letters on yellow background reading "DANGER - 12,470 VOLTS" or "DANGER - 4,160 VOLTS". Labels shall have adhesive backing, and shall be installed at intervals not exceeding 50 feet and on all pull boxes located to be visible from floor.
- E. Warning labels: Provide warning labels with black lettering on red background with a minimum of 1/2" lettering.
- F. Tape Labels: Embossed adhesive tape, with minimum 1/4-inch letters for labeling receptacles, switches, control device stations, junction and pull boxes and manual motor starter units, etc.
 1. White letters on black background for normal power.
 2. White letters on red background for emergency/standby power.
 3. White letters on orange background for UPS power.
- G. J-Box and Cover plate Voltage Labels: Black stenciled letters 1/4" high. Adhesive back tapes may be used if a clear tape is applied over the label for protection.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Degrease and clean surfaces to receive nameplates or tape labels.
- B. Install nameplates parallel to equipment lines.
- C. Secure plastic nameplates to equipment fronts using screws or rivets. Use of adhesives shall be per Owner's approval. Secure nameplate to outside face of flush mounted panelboard doors in finished locations.

3.2 WIRE IDENTIFICATION

- A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits. Label control wire with number as indicated on schematic and interconnection diagrams or equipment manufacturer's shop drawings for control wiring.

- B. Conductors for power circuits to be identified per the following schedule.

Conductor	System Voltage			
	480/277V	208/120V	240/120V High Leg	Medium Voltage
Phase A	Brown	Black	Black	One White Band
Phase B	Purple	Red	Orange (High Leg)	Two White Bands
Phase C	Yellow	Blue	Blue	Three White Bands
Neutral	Gray	White	White	N/A
Grounding IG	Green N/A	Green Green w/Yellow	Green Green w/Yellow	Green N/A

3.3 NAMEPLATE ENGRAVING SCHEDULE

- A. Provide nameplates of minimum letter height as scheduled below. Nameplates shall be same as equipment names indicated on the Drawings.
- B. Individual Circuit Breakers in Distribution Panelboards, Disconnect Switches, Motor Starters, and Contactors: 1/4-inch; identify source to device and the load it serves, including location.
- C. Dry Type Transformers Not in Substations: 3/8-inch; identify equipment designation. 1/4-inch; identify primary and secondary voltages, primary source, and secondary load and location.
- D. Automatic Transfer Switches: 3/8-inch; white letters and red background; identify equipment designation 1/4-inch; identify voltage rating, normal source, standby source and load served including location.
- E. Panelboards: 3/8-inch; identify equipment designation. 1/4 -inch; identify source, voltage and bus rating.

3.4 ENCLOSURE COLOR CODING

- A. The following systems shall have each junction and pull box cover completely painted per the following:

System	Color of Box Cover
Ethernet Backbone	Blue
Telecommunications	Brown
FCMS	Green
Emergency Power	Red
Security**	White
Fire Alarm	Yellow
Clock	Fluorescent Violet
U.P.S.	Fluorescent Pink

**Security shall include, but not be limited to, the following systems:

- Card Access
- Duress Alarms
- Perimeter Door Alarms
- CCTV

END OF SECTION

SECTION 26 27 26 - WIRING DEVICES AND FLOOR BOXES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Wiring Devices:
 - 1. Wall switches.
 - 2. Receptacles.
 - 3. Device plates and box covers.
 - 4. Wall dimmers.
 - 5. Occupant sensors.
- B. Floor boxes.
- C. Wiring for HVAC in Division 23 shall meet the requirement of this specification.

1.2 REFERENCES

- A. Americans with Disabilities Act (ADA)
- B. ANSI/NEMA OS 1- Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- C. ANSI/UL 20 – General Use Snap Switches.
- D. ANSI/UL 498 – Attachment Plugs and Receptacles.
- E. ANSI/UL 943 – Ground Fault Circuit Interrupters.
- F. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts maximum).
- G. NEMA WD 1 – General-Purpose Wiring Devices.
- H. NEMA WD 2 - Semiconductor Dimmers for Incandescent Lamps.
- I. NEMA WD 5 - Specific-Purpose Wiring Devices.
- J. Texas Accessibility Standards. (TAS)

1.3 SUBMITTALS

- A. Provide submittals in accordance with and in addition to Section 26 00 00, Basic Electrical Requirements, and Division 01 for submittal requirement.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver wiring devices individually wrapped in factory-fabricated containers.
- B. Handle wiring devices carefully to avoid damage, breaking and scoring.
- C. Store in a clean dry space and protected from the weather.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide factory fabricated wiring devices in the type and electrical rating for the service indicated. Where type and grade are not indicated, provide proper selection to correspond with branch circuit wiring and overcurrent protection. Attachment of wires to devices shall be by screw pressure under the head of binding screws. Arrangements depending on spring pressure or tension are not acceptable. All binding screws shall be brass or bronze.
- B. Device color:
 - 1. Switches, receptacles, and dimmers on normal power shall match facility standard color at HCPC.
 - 2. Switches, receptacles, and dimmers on emergency power shall be red.
 - 3. Isolated ground receptacles shall be orange.
 - 4. Key operated switches shall be gray.
 - 5. Provide receptacles in surface mounted raceways in colors as shown on drawings. Coordinate color of devices and device plates in other areas with the architectural finish. Refer to architectural drawings and specifications.
 - 6. For renovation or expansion of existing facilities, provide devices and plates to match existing.

2.2 WALL SWITCHES

- A. Acceptable manufacturers
 - 1. Arrow-Hart
 - 2. Hubbell
 - 3. Pass & Seymour
 - 4. Leviton
 - 5. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 26 00 00 and Division 01 for substitution requirement.
- B. Material
 - 1. Wall switches for lighting circuits and motor loads under 1/3 hp shall be AC general use snap switch with toggle handle, 20 amperes and 120/277 volt AC with number of poles as required.
 - 2. Pilot light type shall be equipped with red toggle handle (glow when on), 20 amperes and 120/277 volt AC with number of poles as required.
 - 3. Key operated switches shall be Gray, 20 amperes and 120/277 volt AC with number of poles as required key all locks alike. Furnish keys compatible with key switch, quantity as directed by Owner, minimum of ten copies.
 - 4. Illuminated Emergency-Power-Off switch shall be provided with button guard equal to Allen-Bradley #800T-QA10R or approved substitutions.
 - 5. A listed manual switch having a horsepower rating not less than the rating of the motor and marked "Suitable as Motor Disconnect" shall be permitted to serve as disconnect means for stationary motor of 2 horsepower or less.
 - 6. Switch terminal screws or connectors shall be designed to accommodate No. 10 solid conductor.

2.3 RECEPTACLES

- A. Acceptable manufacturers

1. Arrow-Hart
2. Hubbell
3. Pass & Seymour
4. Leviton
5. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in Section 26 00 00 and Division 01 for substitution requirement.

B. Material

1. Hospital grade receptacles shall be installed in clinic, patient care and other areas required by NFPA. Tamper proof in areas serving children.
2. Dedicated circuit and convenience duplex receptacles shall be rated 20 amperes, 125 volt AC.
3. GFCI receptacles shall be rated 20 amperes, 125 volt with integral ground fault current interrupter
4. Isolated ground duplex receptacles shall be Orange, rated 20 amperes, 125 volt.
5. Heat trace receptacles shall be Arrow-Hart #5262CRGRY with Crouse Hinds #WLRD-1 cover. Install round plug on cord supplied with heat trace to match weatherproof bushing on receptacle cover for watertight installation.
6. Specific-use receptacles shall have volts, amps, poles and NEMA configuration as noted on drawings.
7. Heavy-duty lock-blade receptacles shall be NEMA WD5 heavy-duty specification grade.
8. Emergency receptacles shall be red plastic face or with pre-wired neon glow lamp behind each pair of slots as per drawings.
9. Weatherproof receptacles as specified shall be mounted in a cast steel box with gasketed, weatherproof device plate as specified.

2.4 WALL PLATES

A. Acceptable manufacturers

1. Arrow-Hart
2. Hubbell
3. Pass & Seymour
4. Leviton
5. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in Section 26 00 00 and Division 01 for substitution requirement.

B. Material

1. Wall plates in IT, mechanical and electrical rooms, loading dock, and other industrial areas shall be 316 or 302 stainless steel with cutouts as required for devices indicated on drawings, unless otherwise noted. Other wall plates shall be smooth plastic, 0.1-inch thick. Where switches or outlets are shown adjacent to each other, they shall be ganged with partitions between different type services and covered by a single custom wall plate.
2. Exposed boxes:
 - a. Dry interior spaces: Use cast metal plates with cast metal box. Use heavy cadmium-plated sheet steel plates with steel boxes and copper-free aluminum with aluminum boxes. All screws shall be stainless steel. Edges of plates must be flush with edges of boxes.
 - b. Other locations: Use weatherproof devices plates. Provide cast metal plates with gasketed spring door
3. Jumbo plates are not permitted.

4. Weatherproof cover plate shall be gasketed cast aluminum or feraloy (by Crouse-Hinds) with hinged gasketed device covers.
5. Wall plate for isolated ground receptacles shall be silk-screened "ISOLATED GROUND".

2.5 WALL DIMMERS

- A. Acceptable manufacturers
 1. Lutron
 2. Leviton
 3. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in Section 26 00 00 and Division 01 for substitution requirement.
- B. Material
 1. Provide NEMA WD 2 solid-state wall-box dimmers, where indicated on drawings. Dimmers shall be complete, with linear slide-type solid-state dimming controls, and LED light level ON/OFF indicators. Dimmer shall produce IES square-law response from blackout to full brightness. Dimmer rise time shall be restricted to prevent interference with professional quality audio or video equipment. Dimmer shall be compatible with ballast per manufacturer's specification.
 2. Device: White finish plastic with linear slide.
 3. Voltage: As noted on drawings.
 4. Power rating: Match load shown; 1000 watts minimum, larger size is required to accommodate connected loads greater than 1000watts. Load to 80% of the dimmer capacity, maximum.

2.6 FLOOR MOUNTED SERVICE FITTINGS AND BOXES

- A. Acceptable manufacturers
 1. Steel City
 2. Walker
 3. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in Section 26 00 00 and Division 01 for substitution requirement.
- B. Material
 1. Floor mounted service boxes shall be flush mounted brushed aluminum housing with poke-through assembly. Provide brass cover plate with two hinged lift lids where carpeting is installed.
 2. Quantity of outlets for A/V and power per drawings.

2.7 OCCUPANT SENSORS

- A. Acceptable manufacturers
 1. Pass & Seymour
 2. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in Section 26 00 00 and Division 01 for substitution requirement.
- B. Material
 1. Self-mounting, ceiling bracket.
 2. Quad element, infrared detector behind a fresnel lens.
 3. Detection range

- a. 8 to 14 micrometer frequency spectrum of bodily emitted infrared radiation.
 - b. 110 degree sensing field over 400 gross square feet.
 - c. Adjustable time-out delay: 5 second – 15 minutes.
 - d. Supplied with plenum rated low voltage wire leads for termination.
 - e. Manual shutoff per sensor is required.
4. Control unit
- a. Enclosure: Galvanized, heavy duty for mounting to a 4 inch or 4-11/16 inch square box.
 - b. Control up to (7) sensors.
 - c. Power rating
 - 1) 600 watts for incandescent at 120 volts.
 - 2) 2500 watts for fluorescent at 277 volts.
 - d. Supplied with plenum rated low voltage wire leads for termination.

2.8 TAPE LABELS

- A. Provide tape labels in accordance with Section 26 05 53, Electrical Identification, on all receptacles and switches indicating panelboard and circuit number. White tape with 3/16 inch black letters/numbers.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Installer must examine the areas and conditions under which wiring devices and floor boxes are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Inspect devices for physical damage. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 DEVICE COORDINATION

- A. Where items of equipment are provided under other sections of this specification or by the Owner, provide a compatible receptacle and/or device plate for the cap or plug, and cord of the equipment.

3.3 INSTALLATION

- A. General:
 1. Install wiring devices and floor boxes as indicated, in accordance with the applicable requirements of the latest release of NEC, NEMA, and ANSI.
 2. The approximate location of switches, power outlets, floor boxes, etc., is indicated on the drawings. These drawings, however, may not give complete and accurate information in regard to locations of such items. Determine exact locations by reference to the general building drawings and by actual measurements during construction of the building before rough-in, subject to the approval of the Constructor Inspector.
 3. Where more than one device occurs in one outlet box, causing 300 volts or more voltage difference between them, a barrier must be provided for isolation to meet NEC Article 380.
- B. Wall Switches and Dimmers:
 1. Location:

- a. Install wall switches and dimmers in suitable outlet box centered at the height of 48 inches above finished floor, OFF position down.
 - b. Where wainscot occurs at the 48" level, install device in the wall below the wainscot and as near the 48" level as possible to provide the most pleasing appearance, but in no case partially in the wainscot and partially in the wall.
 - c. Where shown near doors, install switches and dimmers not less than 2" and not more than 12" from door trim.
 - d. Verify all door swings before rough-in and locate switches and dimmers on strike side of door as finally installed.
2. Position:
 - a. Wall switches: Install wall switches in a uniform position so the same direction of operation will open and close the circuits throughout the project, generally up or to the left for the ON position.
 - b. Wall dimmers: Install dimmers in a uniform position so the same direction of operation will brighten and dim the lights throughout the project, generally up for brightest position.
 3. Wall Box Dimmers:
 - a. De-rate ganged dimmers as instructed by manufacturer. Do not use common neutral.
 - b. Compatibility: Where dimmers are connected to fluorescent lights, verify with ballast manufacturer and dimmer manufacturer the suitability of the ballast for dimming applications.
 - c. Test: Test dimmers per manufacturer's instructions. Demonstrate that unit's function as specified. Where remote dimmers are provided, demonstrate that unit's function properly as master and remote.
 - d. Burn-in: Where dimmers are connected to fluorescent fixtures, operate at full brightness for the full burn-in duration as specified or recommended by the lamp manufacturer.
- C. Receptacles:
1. Location:
 - a. Install convenience outlets, telephone, data and TV outlets in suitable steel outlet boxes centered at the height of 18 inches above the finished floor, 6 inches above countertop or at the backsplash level, or as indicated on the drawings. Coordinate with equipment and architectural drawings.
 - b. Install receptacles generally where indicated on drawings. The Owner's representative reserves the right to make any reasonable changes in receptacle locations without change in the contract sum.
 - c. Install specific-use receptacles at heights shown on Drawings.
 2. Position:
 - a. Install receptacles vertically with ground pole on bottom. Install receptacles horizontally, where field condition does not allow vertical installation, with ground pole on left.
 3. All receptacles with 6 feet of a water source such as sinks shall be GFCI type. Arrange circuit wiring for last receptacle on circuit to be GFCI. Feed through to non-GFCI receptacles is not permitted.
- D. Plates:
1. Where cover plates do not completely conceal the rough openings for the devices, it shall be the responsibility of the General Contractor to patch, paint, etc. around the opening to the satisfaction of the Owner's representative.

2. All devices and cover plates shall be plumb and parallel to adjacent surfaces or trim. Devices must be flush with the finished trim cover plates and plates must be tight to surfaces over which they are installed.
 3. Where switches controlling devices that are out of sight, or where three or more switches are gang mounted, plates shall be labeled to identify items being controlled, or areas being lighted. Labeling shall be 3/16-inch Condensed Gothic and shall be filled with black enamel.
- E. Floor Boxes:
1. Verify locations of all floor boxes with the Owner's representative before installation. Increase slab thickness at boxes if required to obtain a minimum of 1 inch of concrete below bottom of box.
 2. Install floor boxes level and flush with finish flooring material. Completely envelope floor boxes in concrete except at the top.
 3. Adjust covers flush with finished floor.
- F. Occupant Sensors:
1. Flush mount occupant sensors through round hole cut in ceiling tile, positioning and placement per sensor manufacturer's recommendation.
 2. It is the installer's responsibility to replace damaged ceiling tiles during his installation of sensor.
 3. The low voltage control wiring installed above ceiling tiles shall be plenum rated or general building wiring installed in raceway system.

END OF SECTION

SECTION 26 28 13 - FUSES, 600 VOLT

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Dual-element, current limiting Class R fuses for loads up to 600 volts, 0-600 Amps.
- B. Time delay, current limiting Class L fuses for loads up to 600 volts, 601-6000 Amps.

1.2 REFERENCES

- A. UL 248-12 - Standard For Safety For Low-Voltage Fuses-Part 12: Class R Fuses
- B. UL 248-10 - Standard For Safety For Low-Voltage Fuses-Part 10: Class L Fuses
- C. Where application of local codes, trade association standard or publications appears to be in conflict with the requirements of this Section, the Architect/Engineer shall be asked for an interpretation.

1.3 SUBMITTALS

- A. Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical Requirements, and Division 01 for submittal requirement.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Store fuses in a clean and dry space and protected from weather. When necessary to store outdoors, elevate materials well above grade and enclose with durable, waterproof wrapping.

PART 2 – PRODUCTS

2.1 MATERIAL AND EQUIPMENT

- A. Furnish fuses manufactured by Buss, or equal, in accordance with the following:
 - 1. Motors and Transformers, 0 to 600 Amp:
 - a. 250 volt - Buss LPN-RK, UL Class RK1.
 - b. 600 volt - Buss LPS-RK, UL Class RK1.
 - 2. Lighting Loads, 0 to 600 Amp:
 - a. 250 volt - Buss KTN-R, UL Class RK1.
 - b. 600 volt - Buss KTS-R, UL Class RK1.
 - 3. All Applications, 601 to 6000 Amp:
 - a. 600 volt - Buss KRP-C, UL Class L.
- B. Size fuses serving motor loads as specifically recommended by motor or equipment manufacturer or in the range of 150% to 175% of motor nameplate rating per NEC in accordance to the type of motor.
- C. Interrupting Rating: 200,000 RMS Amps.

- D. Maintenance Stock, Fuses:
 - 1. Furnish the following:
 - a. Three spare fuses of each size and type for a spare set.
 - b. Furnish spare fuse cabinet sized to contain required spare fuse stock.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install fuses where indicated, in accordance with the manufacturer's written instructions, the applicable requirements of NEC, national and local codes, regulations, and requirements.
- B. Provide quantity of spare fuses and fuse cabinet per the requirement of this Section at the location per drawing or the direction of Owner's Representative, in addition to replace blown or defective fuses during installation, startup, system commissioning and acceptance.

END OF SECTION

SECTION 26 51 00 - INTERIOR AND EXTERIOR LIGHTING

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Interior lighting fixtures and accessories
- B. Exterior lighting fixtures and accessories
- C. Emergency lighting units
- D. Emergency exit signs
- E. Emergency fluorescent lamp power supplies
- F. Lamps
- G. Ballasts
- H. Site lighting poles
- I. Lighting controls

1.2 REFERENCES

- A. NEPA 101 - Code for Safety to Life from Fire in Buildings and Structures
- B. NEMA WD1 - General-Purpose Wiring Devices
- C. ANSI C82.1 - Specification for Fluorescent Lamp Ballasts
- D. ANSI C82.4 - Specifications for High-Intensity-Discharge Lamp Ballasts (Multiple Supply Type)
- E. NEMA LE - H-I-D Lighting System Noise Criterion (LS-NC) Ratings
- F. UL 844 - Electric Lighting Fixtures for Use in hazardous (classified) Locations
- G. UL 924 - Emergency Lighting and Power Equipment
- H. UL 935 - Fluorescent-Lamp Ballasts
- I. UL 1029 - High-Intensity-Discharge Lamp Ballasts
- J. UL 1572 - High Intensity Discharge Lighting Fixtures
- K. UL 1574 – Track Lighting Systems
- L. IESNA – Lighting Handbook
- M. NEMA WD 1 - General Color Requirements for Wiring devices

- N. NEMA LE 5B – Procedure for Determine Luminaire Efficacy Ratings for High-Intensity Discharge Industrial Luminaires
- O. NFPA 70 – National Electrical Code
- P. ASHRAE/IES 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings
- Q. Standards For State-Funded Outdoor Lighting Fixture – Texas House Bill 916 (1999)
- R. UT System OFPC – Security Planning and Design Guidelines (2002 release)

1.3 DESIGN CRITERIA

- A. Lighting level design shall be per IESNA (Illuminating Engineering Society of North America) recommendation.
- B. The power consumption for interior and exterior lighting shall not exceed power allowance as per ASHRAE 90.1 latest revision.
- C. Outdoor lighting for state-funded project shall meet “cutoff luminaire” criteria set forth by Texas House Bill 916 (1999).
- D. Design for exterior lighting shall meet security criteria required by UT System OFPC – Security Planning and Design Guidelines (2002 release).

1.4 SUBMITTALS

- A. Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical Requirements, and Division 1 for submittal requirement.
- B. Submit manufacturer's data on interior and exterior lighting fixtures in booklet form, with separate sheet for each fixture, assembled by luminaire "type" in alphabetical order, with the proposed fixture and accessories clearly labeled.
- C. Submit dimensioned drawings and performance data including complete photometric test data for each luminaire, candlepower distribution curves in two or more planes, candlepower chart zero to 90 degrees, lumen output zonal summary chart, average and maximum brightness data, and coefficients of utilization for zonal cavity calculations, , spacing to mounting height ration, efficiency and visual comfort probability. Also provide luminaire weights, mounting data, and accessory information for each luminaire type.
- D. Lamps: Catalog cuts showing voltages, colors, approximate hours life, approximate initial lumens, lumen maintenance curve, lamp type and base.
- E. Ballasts: Catalog cuts showing type, wiring diagram, nominal watts, input voltage, starting current, input watts, sound rating, power factor and low temperature characteristics.
- F. Site lighting pole data and catalog cuts, including wind loading, complete dimensions and finish.
- G. Shop drawings for site lighting luminaries showing pertinent physical characteristics, including fastening details, ballast type and location.

- H. Controls: Catalog cuts and/or shop drawings showing dimensions, voltage capacity, contact ratings, wiring diagrams, operating levels, and temperature ratings.
- I. Lighting design shall be in compliance with power allowance for lighting, which is stipulated by ASHRAE 90.1. Compliance forms along with engineering data associated with it shall be submitted for Owner's review during design phase.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver lighting fixtures individually wrapped in factory-fabricated fiberboard type containers. Parabolic louvers shall be shipped in thermally sealed polyethylene wrapper.
- B. Handle lighting fixtures carefully to prevent breakage, denting and scoring the fixture finish. Do not install damaged lighting fixtures.
- C. Store lighting fixtures in a clean, dry space and protected from the weather.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Lighting fixtures and accessories shall comply with the design and function requirements of the project. Design characteristics shall be as noted in manufacturer's submittal data.
- B. Provide lighting fixtures of the size, type and rating as scheduled, complete with, but not limited to, lamps, lamp holders, reflectors, ballasts, poles and wiring.

2.2 INTERIOR LIGHTING FIXTURES

- A. Fluorescent Fixtures
 1. Lenses shall be UV stabilized, injection-molded, clear, 0.150- inch minimum thickness virgin acrylic. Provide a minimum of 8 hold-down lens retaining clips for troffers utilizing framed diffuser lenses.
 2. Parabolic aluminum louvers shall be semi-specular, low-iridescence finish silver anodized aluminum, 2 or 3 inches deep as per drawings. Louvers shall be roll formed with roll grain horizontal to view plane. Louver intersections shall be of a close-fitting, tab-and-slot construction permitting no light leaks.
 3. Parabolic plastic louvers shall be vacuum-metalized polystyrene with specular finish and antistatic properties.
 4. Lighting fixture door frames shall be flush steel hinged and equipped with rotary-action cam latches.
 5. Lighting fixture housing shall be minimum 22-gauge, cold-rolled steel with pre-punched knockouts and access plate for electrical connections. End plates shall be minimum 20-gauge with pre-punched hanger holes. Ballast mounts shall be separated for heat dissipation.
 6. Three lamp luminaires for dual level switching shall have outer two lamps on one ballast, inner lamp on second ballast, shared with adjacent luminaire's inner lamp if practical.
- B. Incandescent fixtures shall be pre-wired equipped with integral thermal protection. Use incandescent only where aesthetics outweighs economic considerations.
- C. Lighting track shall be surface mount or pendant mount per the requirement on drawings, by manufacturer of track mounted light fixtures.

- D. High Bay, Low Bay HID Fixtures
 - 1. Provide rugged, lightweight, cast aluminum ballast housing with a baked electro-coat paint finish.
 - 2. Optic reflector shall be fully fluted, anodized aluminum providing high efficiency. Where enclosed and gasketed type fixtures are specified, provide luminaires designed for continuous operation in an ambient temperature of 55° C.
- E. Lamp Holders or Sockets
 - 1. Incandescent lamp holders shall be screw base and have porcelain insulating shells and be rated for heavy duty, 660W.
 - 2. Fluorescent Sockets: Fluorescent lamp holders shall be heat-resistant porcelain or plastic, designed and rated for the lamp type specified. Lamp holders shall be designed to maintain solid electrical contact at all times. The detent position for bi-pin lamp holders shall be a positive lock so that mechanical effort shall be required to rotate the lamps. Lamp holder shall be specifically compatible with lamping.
 - 3. HID Medium and Mogul Base Sockets: Provide glazed porcelain pulse-rated heavy duty sockets with silicone leads hard soldered to nickel plated brass screw shell. Lamp holders shall also employ a positive spring locking means to maintain good electrical contact at the center terminal of the lamp.
 - 4. Lamp holders and sockets shall be provided with minimum 18 AWG wiring leads.
- F. Reflector Finishes
 - 1. Painted Finishes: Provide electro-statically applied dry polyester white powder coat finish with minimum reflectance of 88 percent on all light reflecting surfaces.
 - 2. Specular/Semispecular Finishes: Provide Alzak-type anodized finish on aluminum louvers and reflectors as specified in Luminaire Schedule as shown on the drawings. Minimum reflectivity shall be:
 - a. Specular: 80 percent
 - b. Semi-specular: 75 percent
- G. UL Listing
 - 1. All Luminaires and components shall be UL tested, listed, and labeled.
 - 2. Luminaires installed under canopies, roofs, or similar damp or wet locations shall be UL listed and labeled as suitable for damp or wet locations.
 - 3. Recessed luminaires installed in fire rated ceilings and using a fire rated protective cover shall be thermally protected for this application and shall be approved for the installation in a fire-rated ceiling.

2.3 EXTERIOR LIGHTING FIXTURES

- A. Enclosures shall be complete with gaskets to form weatherproof seal and UL approved for wet locations.
- B. Provide low temperature ballasts with reliable starting to 0 degrees F.

2.4 BATTERY BACKED EMERGENCY LIGHTING UNITS

- A. Acceptable Manufacturers
 - 1. Dual Lite
 - 2. Lithonia
 - 3. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 26 00 00, and Division 1 for substitution requirement.

- B. General Requirements
1. Provide emergency lighting units self-contained complete with batteries, charger, and lamps to provide automatic emergency lighting upon failure of normal power.
 2. Battery shall be 6 or 12 volts, sealed maintenance free, nickel cadmium type, 24-watt rated capacity, with 1.5 hours minimum capacity to supply the connected lamp load.
 3. Charger shall be solid state capable of maintaining the battery fully charged during normal conditions, and capable of recharging discharged battery to full charged within 24 hours.
 4. Lamps shall be 12 watt minimum, sealed beam Tungsten Halogen type.
 5. Unit housing shall be thermoplastic or steel with beige finish.
 6. Indicators: Provide lamps to indicate AC ON and RECHARGING.
 7. Provide test switch to manually transfer unit from normal supply to battery supply.
 8. Unit shall be 120 or 277 volt.

2.5 EXIT SIGNS

- A. Acceptable Manufacturers
1. Dual Lite
 2. Lithonia
 3. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 26 00 00, and Division 1 for substitution requirement.
- B. General Requirements
1. Provide red LED with red diffuser exit signs at the locations per drawings. Exit signs shall have stencil face, 6-inch high red letters on white background, or as specified otherwise, with red Chevron type directional arrows as indicated on drawings.
 2. Battery backed exit signs shall be provided with integral battery-operated emergency power supply, including power failure relay, test switch, AC ON pilot light, battery, and fully-automatic charger. Provide test switch to manually transfer unit from normal supply to battery supply.
 3. Battery shall be sealed maintenance free, nickel cadmium type, 6 or 12 volts, 24-watt rated capacity, with 1.5 hour minimum capacity to supply connected lamp load.
 4. Unit shall be 120 or 277 volt.

2.6 LAMPS

- A. Acceptable Manufacturers
1. General Electric Company
 2. Philips Lighting Company
 3. Sylvania
 4. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 26 00 00, and Division 1 for substitution requirement.
- B. General Requirements
1. Lamps including linear fluorescent, compact fluorescent, and HID shall be low mercury type and shall pass all federal TCLP (Toxicity Characteristic Leaching Procedure) test requirements in effect at the time of manufacture. All lamps shall be energy saving and rapid start type.
 2. General use incandescent lamps shall be inside frosted type, 120 volts, 750 hour minimum.

3. Linear fluorescent lamps shall be T8 lamps. Compact lamps shall be twin or double twin tubes. All lamps for one project shall be provided by the same manufacturer with color temperature as indicated on drawings. Operation voltage and wattage shall be as indicated on drawings..
4. Mercury vapor HID lamps shall not be used.
5. Metal halide HID lamps shall be phosphor coated, suitable for the burning position required.
6. High-pressure sodium HID lamps shall be clear or diffuse coated.
7. Maintenance Stock: Furnish a stock of replacement lamps in the original cartons or packing sleeves, amounting to 10% (but not less than two lamps in each case) of each type and size lamp used in each fixture type. Deliver replacement stock as directed to Owner's storage space.

2.7 BALLASTS

- A. Acceptable Manufacturers
 1. Valmont
 2. Advance
 3. Magnetek
 4. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 26 00 00, and Division 1 for substitution requirement.
- B. General Requirements: All ballasts shall be UL listed and have the UL symbol on the label.
 1. Ballasts for fluorescent lamps
 - a. Provide 277V ballasts for all operations except for under-counter fixtures that shall be rated for 120V operation. Ballasts shall be electronic type, rapid start, and power factor of 95 percent or greater, suitable to operate at 60 Hz input frequency.
 - b. Electronic ballasts shall comply with all FCC and NEMA limits governing EMI and RFI, and shall have Total Harmonic Distortion (THD) of less than 20 percent.
 - c. Ballasts shall be Class P thermally protected.
 - d. Sound level criteria
 - 1) Nominal 430 mA Lamps: Class A sound rated.
 - 2) Nominal 800 mA Lamps: Class B sound rated.
 - 3) Nominal 1500 mA Lamps: Class D sound rated. Provide isolation mounting and insulation to reduce sound transmission and radiation.
 - e. Electronic Dimming Ballasts: Compatible with lamp and dimming system, labeled for use and listed as compatible by dimmer manufacturer with a minimum full-to-20 percent dimming range.
 - f. Exterior Fluorescent Ballasts: Provide zero degree starting rating.
 2. Ballasts for HID lamps
 - a. HID ballast shall be multi-tap encased and potted thermally protected high power factor of 90 percent or greater, constant wattage regulating, and autotransformer type. Ballast ambient operating temperature range shall be -20 to +130°F. Ballasts shall be compatible to the lamps chosen for specific burning position, and compensate for the loss in efficiency.
 - b. Provide isolation mounting and insulation of HID ballasts to reduce sound transmission or radiation.
 - c. Each HID ballast shall have a fast acting primary inline fuse built into the fixture assembly by the manufacturer.

2.8 LIGHTING POLES

- A. Lighting poles shall be metal, type and finish as specified in Luminaire Schedule as shown on the drawings.
- B. Site lighting poles shall meet wind load rating requirements per local building code.
- C. Pole foundation shall be design by A/E. Refer to pole base details as shown on the drawings for specific pole base requirements.
- D. The entire pole assembly shall be designed to withstand a steady wind load rating requirements per local building code and a gust factor of 1.3 without permanent deflection.
- E. Anchor bolts shall be fabricated from commercial quality hot rolled carbon steel bar with guaranteed minimum yield strength of 55,000 psi. Bolts shall have an "L" bend on one end and be galvanized a minimum of 12" on the tread end. Furnish four bolts and bolt setting template with each set of anchor bolts. Furnish one hex nut, 2 hardened steel washers, and one hex nut with a stainless steel locking pin with each bolt. Furnish two leveling shims with each anchor bolt set.
- F. Standard finish for pole and accessories shall be a factory applied polyester thermosetting powder coating electro-statically applied to the surface of the substrate to a minimum thickness of 3 mil. Color as specified.
- G. Provide and install pole base covers on all poles. Each pole to have internal grounding lug and ground rod.

2.9 LIGHTING CONTROL

- A. Refer to Section 26 27 26 Wiring Devices and Floor Boxes for lighting switch, dimming control, and occupancy sensor.
- B. Photocell shall be automatic dawn on, dusk off switching; moisture, temperature, and vibration-resistant die-cast aluminum housing; time delay feature to prevent false switching; field adjustable to control operating levels.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Prior to order lighting fixture, check the building electrical system requirements, architectural finishes, and the type of ceilings that lighting fixture will be installed. Any discrepancies of compatibility pertaining trim, frames, color, mounting, ballast, voltage and etc. shall be brought to the attention of A/E by written notice. Do not proceed with procurement until discrepancies are resolved in a satisfactory manner.
- B. Installer shall examine the areas and conditions that light fixtures are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF LIGHTING FIXTURES

- A. Install light fixtures in accordance with the manufacturer's written instructions, the applicable requirements of NEC and national and local code, standard, and regulations. Install lamps in accordance with manufacturer's instructions.
- B. Install luminaries at locations as shown on the Drawings; install aligned, aimed, and leveled. Install fixtures in accordance with manufacturer's installation instructions complete with mounting accessories, trim and support materials. Fasten fixtures securely to structural support members of the building; solid pendant fixtures shall be plumb.
- C. Coordinate with other crafts to avoid conflicts between luminaires, supports, fittings and mechanical equipment.
- D. Incandescent Fixtures
 1. Surface Mounted Incandescent Fixtures: Mount directly to outlet box equipped with fixture stud or mounting bar.
 2. Recessed Incandescent Fixtures: Mount with support rails attached to ceiling suspension support system.
- E. Surface Mounted Fluorescent Fixture:
 1. Mount with support rails attached to ceiling suspension support system, provided ceiling system has been certified to be suitable to support weight of fixtures.
 2. Where ceiling system has not been certified to support weight of fixtures, fixtures shall be supported at four points near each corner of fixtures.
 3. Provide a minimum 5/8" air space between the fixture and the ceiling.
- F. Recessed Fluorescent Fixtures:
 1. Handle specular/semi-specular louvers and down light cones using only new clean white cotton or silk gloves. Do not touch louvers or cones with bare hands. Leave luminaries clean and free of any visible dust, debris, or fingerprints with all lamps operational at time of acceptance of work.
 2. All recessed fluorescent fixtures shall be supported from building structure above ceiling with galvanized steel wire at not less than 4 points near corners of fixture. Size of wire shall be capable of supporting weight of fixtures.
 3. Recessed luminaries trims shall fit snugly to the mounting surface and shall not exhibit light leaks or gaps. Provide feed-through junction boxes or provide separate junction boxes. All components shall be accessible through the ceiling opening.
 4. Connect recessed luminaries to junction box with flexible steel conduit and fixture wire.
- G. HID Fixtures
 1. Mount with support rails attached to ceiling suspension support system, provided ceiling system has been certified to be suitable to support weight of fixtures.
- H. Pole Mount Lighting
 1. Provide in-line fusing at handhole for all pole-mounted luminaries.
 2. Provide removable unitized ballast/component tray with separable connector in all pole-mounted luminaries.
 3. Construct base of concrete with dimension and depth as noted on the drawings.
 4. Install anchor bolts with minimum projection above top of bases, as specified by pole manufacturer. Ground as indicated on drawings.

5. Mount standards on bases plumb and true utilizing shims as necessary. Grout thoroughly between base-plate and foundation.
 6. Touch up chips and scratches on poles (to match new finish) upon completion.
- I. Lighting Fixtures Adjustment
1. Adjust to illuminate intended areas as directed.
 2. Adjust exterior fixtures during hours of darkness.
- J. Immediately before final observation, clean all fixtures, inside and out, including plastics and glassware, and adjust all trim to properly fit adjacent surface, replace broken or damaged parts, and lamp and test all fixtures for electrical as well as mechanical operation.
- K. Protect installed fixtures from damage during the remainder of the construction period.
- L. Upon completion of installation of interior lighting fixtures, and after circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at the site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.
- M. Incandescent lamps shall be new at time of final acceptance. Fluorescent lamps may be used in the final finishing of the building. Those that have exceeded more than 1/3 of their rated life (as established by Construction Inspector records), or that have blackened ends or inoperable shall be replaced with new lamps before final acceptance.
- N. Lamp Disposal
1. The procedure of disposal of lamps that are mercury containing shall follow the guideline set by EPA (definitions in Title 40 Code of Federal Regulations 261 Subpart C, January 2000).

END OF SECTION

SECTION 28 31 00 - FIRE ALARM AND SMOKE DETECTION SYSTEM

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. This Section specifies the requirements for furnishing and commissioning a fully functional addressable fire alarm and voice evacuation system with full interface with other related systems. Work shall include, but not limited to, the following.
1. Fire alarm control and annunciator panels
 2. Manual fire alarm stations
 3. Automatic fire, smoke, and heat detection devices
 4. Audible and visual alarm notification devices
 5. Required batteries, battery panels, and associated accessories
 6. Fire door control, security door control
 7. Air handler duct smoke detection, and shutdown
 8. Sprinkler system PIVs, OS&Y valves, and tamper switch monitoring
 9. Sprinkler systems water flow and/or pressure switch monitoring
 10. Monitoring of fire pump controls
 11. Fire/smoke damper control
 12. Smoke purge controls
 13. Activation of deluge and pre-action sprinkler systems
 14. Elevator recall and power shutdown
 15. System acceptance testing and commissioning
 16. Firefighters' two-way voice communication system

1.2 REFERENCES

- A. NFPA 101 - Safety to Life from Fire in Buildings and Structures
- B. NFPA 13 - Installation of Sprinkler Systems
- C. NFPA 20 – Installation of Stationary Pumps
- D. NFPA 70 - National Electric Code
- E. NFPA 72 - National Fire Alarm Code
- F. NFPA 90A – Installation of Air-Conditioning and Ventilating Systems
- G. NFPA 92A – Smoke- Control Systems
- H. UL 864 - Control Units for Fire Protective Signaling Systems
- I. ADA Accessibility Guidelines (ADAAG)
- J. Texas State Insurance Code
- K. Texas Accessibility Standards (TAS)
- L. Local-city Ordinances
- M. International Building Code

- N. All electronic equipment shall comply with all FCC limits governing radio frequency electromagnetic interference and be so labeled.
- O. None of the terms or provisions of this specification shall be constructed as waiving any of the rules, regulations or requirements of Codes.

1.3 SYSTEM DESCRIPTION

- A. The automatic fire detection and alarm system shall consist of a main fire alarm control panel, local control panel nodes, operator workstation, graphics terminal, audio control panel, printer, remote annunciator, detection devices, audible and visual notification devices, remote devices, and manual stations wired in accordance with the schedule on the Drawings and shall function as specified herein. The system shall use supervised multiplex data communications circuits, close loop initiation circuits, individual zone supervision, and individual audible and visual alarm circuit supervision.
- B. The system shall have sufficient capacity to incorporate all equipment and perform all functions as per intent of the specifications and Drawings. The system shall have an overall 20 percent spare capacity that includes but not limited to communication network, terminal strips, amplifier, batteries, etc., reserved for future expansion.
- C. The system shall be capable of being programmed on site for downloading, uploading or editing operating sequence or programming to accommodate and facilitate building parameter changes or changes as required by codes.
- D. A data communications network transmitting multiplexed input and output signals, which shall be electronically supervised, shall connect all control panel nodes. The communication network shall consist of a communication cable transmitting all system operations in a digitally encoded format, an audible signaling bus serving all remote amplifiers, and a two-way phone communications bus serving all individually controlled fire phone circuits.
- E. The fire alarm control panels shall provide power, annunciation, supervision, and control for the fire detection and alarm system. Fire alarm control panels shall be distributed per floor or per zone as practical, such that each fire alarm control panel shall operate as a local stand-alone system with communication network connection to peers and main fire alarm control panel that normally resides in Fire Command Center. The Main Fire Control Panel in Fire Command Center shall monitor and annunciate all alarms and troubles of each Fire Alarm Control Panel in the fire alarm network system scattered throughout the building. All data communication wiring between the controls panels shall be supervised for open circuit, short circuit and ground fault.
- F. Data communication transmission shall use a peer-to-peer network communication channel with token-ring communication protocol as follows.
 - 1. Each node shall communicate to the next node in a peer-to-peer token-ring configuration.
 - 2. In the event that the path to the next node on the ring has experienced a communication failure, the node with possession of the token shall transmit it back in the direction from which it came to attempt to reach the next node by going around the ring in the opposite direction. At the same time the status of non-communication node shall be added into the content of transmission.
 - 3. In the event of communication break down and a group of nodes become isolated from the network, that group shall form a sub-network with all common

- interaction of monitoring and control remaining intact. The network shall be notified with the exact details of the lost communications.
4. In the event that a single node becomes unable to handle the network token, the network interface card shall continue communications to the rest of the network. The off-line node is reported as such to the network and is periodically interrogated to determine if it is ready to be brought back online with the rest of the network.
- G. Fire detection initiation devices and audible visual alarm devices shall be wired to the fire alarm control panel on the same floor or with the same zone as practical. Smoke or heat alarm initiation devices shall be individually configurable on site to function desirable selective alarm, general alarm, evacuation, alert, test, fire/smoke damper operation, fire door/security door release, smoke control operation, HVAC interface or trouble warning.
 - H. The system shall be designed such that alarm indications override trouble conditions. There shall be no limit, other than maximum system capacity, as to the number of addressable devices and/or zones, which may be in alarm simultaneously. The panel shall be capable of measuring the sensitivity of the addressable ionization and photoelectric detectors connected to it.
 - I. The system shall initiate the following system outputs when any area or duct detector, manual station, or water flow switch operates in accordance with the fire alarm functional matrix:
 1. Audible devices - speakers.
 2. Visual devices – strobes and/or beacons.
 3. Automatically notify fire department, central station, and/or command center.
 4. Display individual detector and/or zone number on alphanumeric display with optional user-defined message.
 5. Light an indicating lamp on the device initiating the alarm.
 6. Shut down the associated HVAC system and operate dampers per drawing.
 7. Activate the elevator recall.
 8. Release all magnetic fire door holders.
 9. Activate deluge or pre-action sprinklers.
 - J. The fire alarm and smoke detection system shall be used to monitor tamper switches and water flow switches on sprinkler and fire suppression systems.
 - K. Fire alarm and smoke detection system shall release fire doors that are held open and security access controlled doors that are held close if desired.
 - L. Fire pumps shall be monitored by the fire alarm and smoke detection system.
 - M. Fire alarm and smoke detection system shall include the installation of duct-mounted smoke detectors, interface with HVAC damper control, and air-handler shutdown.
 - N. Type and quantity of signals, which are expected to be transferred and monitored by existing campus command/dispatch center, shall be verified during design phase. Compatibility issue also needs to be addressed.

1.4 QUALITY ASSURANCE

- A. The system shall be installed by competent mechanics, regularly employed by a Fire Alarm contractor with full responsibility for proper operation of the system including debugging and proper calibration of each component in the entire system. The Contractor shall be with 3 years or more experience with installation of this type. The fire alarm technician shall be licensed by State Fire Marshal in order to install, certify and service the fire alarm system. Supplier shall be licensed by State Fire Marshal in order to sell fire alarm product, and shall have an in-place support facility within 50 miles of the site with technical staff, spare parts inventory and all necessary test and diagnostic equipment.
- B. The complete Fire Alarm and Smoke Detection System installation shall be in strict accordance to the national and local electrical codes and the electrical Section of these specifications. The equipment shall be manufactured by a manufacturer who has been engaged in this type of production (both hardware and software) for at least ten years. The product shall be UL listed under standards 864 (Control Units for Fire Protective Signaling Systems).

1.5 SUBMITTALS

- A. Provide submittals for the following information in addition to and in accordance with 26 00 00, Basic Electrical Requirements, and Division 01 for submittal requirement.
- B. Complete plan drawings showing all devices, panels, and conduit runs.
- C. Project specific system interconnection (riser) diagrams. (System architecture.)
- D. Dimensional drawings/manufacturer's specification data for each component.
- E. Complete elementary and/or schematic drawings for all Fire Alarm System electrical and electronic circuits.
- F. Typical component connection and interconnection diagrams.
- G. Complete system wiring diagrams for all components and interfaces to equipment supplied by others.
- H. Technical program for execution of interface between Fire Alarm System and facility Building Automation System (BAS) pertaining HVAC shutdown, smoke fan control, stairway pressurization control, fire/smoke damper control, etc. The proposal shall include estimated data input/output points interfacing with BAS.
- I. Complete sequence of operations of all functions of the system. A fire alarm typical input/output functional matrix clearly defining fire alarm event and action, which is recommended by NFPA 72 A.10.6.2.3 (9), shall be submitted to the Owner for review and approval.
- J. Graphic penetration tree showing all graphics and all points.
- K. Detailed color conventions proposed for all graphics and graphic elements and states.

- L. Data entry forms for initial parameters. Contractor shall provide a listing of all analog points with columnar blanks for high and low warning limits and high and low alarm limits, and samples of proposed text for points and messages (for at least two systems of at least 30 points total). All text and graphics shall be approved prior to data entry.
- M. Recommended Spare Parts. The Contractor shall include a listing of their recommended spare parts.
- N. Manufacturer's Representatives. The Contractor shall submit a listing of the manufacturer's representatives responsible for installation coordination and service.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver fire alarm system components in factory-fabricated containers.
- B. Store in a clean, dry space and protected from the weather.
- C. Handle control and annunciator panels carefully to avoid damage to material components, enclosure and finish.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. The system shall be a product of the same manufacturer as the existing fire alarm system within the facility, and shall be fully compatible with the signaling arrangement and requirements of the existing system.

2.2 FIRE COMMAND CENTER OPERATOR WORKSTATION

- A. Existing to Remain

2.3 FIRE ALARM CONTROL PANELS

- A. Existing to Remain

2.4 PERIPHERAL DEVICES

- A. All detection devices shall contain an integral alarm LED. All addressable detectors shall be individually identifiable by zone. Mounting bases shall be provided by life safety contractor, included with detector as a complete assembly.
- B. The addressable ionization detector shall be a plug-in, twist/lock unit, which shall be capable of removal from or installation into its base with one hand.
 - 1. The detector shall contain two ionization chambers and solid-state indicator lamp. The reference chamber shall compensate against sensitivity changes due to changes in environmental temperature, humidity, and barometric pressure. The sensing chamber shall be open to the outside elements through a protective cover, which will permit product of combustion to enter while preventing foreign matter from entering and causing unwanted alarms.
 - 2. The detector shall be dynamically supervised, indicating a trouble condition at the control panel when the detector is unable to sense a fire condition due to either internal and external operation conditions or malfunctions.

- C. The addressable photoelectric smoke detector shall contain an LED as its light source and photodiode as a light receiver. An automatic gain control circuit shall be provided to maintain correct sensitivity by compensating for detector aging and dirt accumulation. The detector shall be a plug-in twist/lock unit, which allows for easy connection to its mounting base. The detector shall provide complete supervision of the detector optics. The detector shall be supervised for complete failure of the LED light source or a critical reduction in the light output of the LED caused by excessive dirt, which could not normally be compensated for by the automatic-gain control circuit.
- D. The addressable thermal detector shall be of the rate-compensated, fixed-temperature type. The detector shall be individually annunciated on the control panel. The detectors shall contain an integral alarm lamp.
- E. The addressable programmable interface module is designed to provide an interface for direct-shorting contact devices. The unit is used with water flow switches, pressure switches, tamper switches on OS&Y valves, and other contact closure devices. The unit shall electrically supervise wiring to contacts via EOLR provided by life safety contractor.
- F. The addressable manual pull station shall operate on any addressable detection circuit. The addressable manual pull station shall be individually annunciated on the control panel. The unit shall be double-action initiated, having latching relays.
- G. The air duct smoke detector shall operate on a cross-sectional air-sampling principle to overcome stratification and skin effect. The air duct detector shall consist of a standard addressable photoelectric detector mounted in an air duct sampling assembly and sampling tube that protrudes across the duct of the ventilating system. The air duct detector shall retain the features of the addressable photoelectric detector, and be installed in the ventilating duct as indicated in the manufacturer's instructions. The air duct smoke detector shall come with appropriate addressable detector and base, remote test station, and inlet sampling tubes.
- H. The detector mounting base shall be of the twist/lock type with screw terminals. Pigtails or in-line connectors shall not be permitted. It shall be possible to secure the detector in the base. The detector mounting base shall be universal for addressable photoelectric detectors.
- I. Alarm bells shall be of the polarized 24-Vdc type. The mechanisms shall be fully enclosed and dust-proof. They shall be designed to be mounted on a wall, ceiling, or other suitable rigid surface that is free from vibration.
- J. Alarm horns shall be of the polarized 24-Vdc type. The mechanisms shall contain an aerospace-grade aluminum diaphragm; blued, tempered, and polished armature, and tungsten contact points, all housed in a die-cast frame-and-grill assembly. They shall be designed to be mounted on a wall, ceiling, or other suitable rigid surface and capable of being surface, semi flush, or flush mounted.
- K. Alarm speakers (non-ceiling mounted) shall be of the polarized 24-Vdc type. The speaker shall have 70.7 VRMS inputs and have field-selectable power taps from 1/8 watt to 8 watts. Speaker shall have frequency response of 400 to 4,000 Hz and be UL listed for fire alarm voice evacuation use. Speaker shall have vandal-resistant red grill faceplate. Speakers shall be designed to be mounted on a wall or other suitable rigid surface and shall be capable of being surface, semi flush, or flush mounted.

- L. Alarm speakers (ceiling mounted) shall be of the polarized 24-Vdc type. The speaker shall have 70.7 VRMS inputs and have field selectable power taps from 1/8 watt to 8 watts. Speaker shall have frequency response of 400 to 4,000 Hz and be UL listed for fire alarm voice evacuation use. Speaker shall have 4-inch cone and shall have 7.25-inch-diameter circular metal faceplate with white enamel finish. Speakers shall be designed to be mounted on a wall, ceiling, or other suitable rigid surface and be capable of being flush mounted.
- M. Alarm speakers (extra loud) shall be of the polarized 24-Vdc type. The speaker shall have 70.7 VRMS inputs and have field-selectable power taps from 0.9 watt to 15 watts. Speakers shall have frequency response of 400 to 4,000 Hz and be UL listed for fire alarm voice evacuation use. Peak speaker output shall be 121 dB at 4 feet, 15 watt or 111 dB at 10 feet, 15 watt. Speaker shall have high-efficiency compression driver with re-entrant horn, and shall have a baked gray epoxy finish. Speakers shall be designed to be mounted on a wall, ceiling, or other suitable rigid surface, and be capable of being surface mounted.
- N. Strobe lights shall produce a minimum of 75 candelas at approximately one flash per second with continuously applied voltage. The maximum pulse duration shall be 0.2 seconds with a maximum duty cycle of 40 percent. Rated voltage shall range from 18 to 31.2 volts for nominal 24-Vdc models. The xenon flash tube and associated circuitry shall be enclosed in a translucent white polycarbonate lens with "fire" inscribed on the lens. Plate color shall be red.
- O. Water flow switches: Flow switches shall be UL listed for its intended purpose; furnished under Division 23 and electrically connected under Division 26. Individual addressable modules shall be provided on each switch.
- P. Sprinkler Valve Tamper Switches: Switch shall be provided with either one or two sets of SPDT micro switches as required. Tamper switch shall be UL listed for its intended purpose, furnished under Division 23 and electrically connected by Division 26. Individual addressable modules shall be provided on each switch.
- Q. Firefighter's emergency telephone shall include handset, cradle with switch hook and heavy gauge steel enclosure. Handset shall be red, high-impact plastic with retractable coil cord. Telephone assembly shall permit two-way communication from fire alarm audio control panel and shall produce a distinct zone or call-in signal when the handset is removed from its cradle. Enclosure shall be finished in baked, red enamel and shall bear a silk-screened handset symbol and the words "emergency telephone". Enclosure shall be suitable for flush or surface mounting. Anticipated enclosure size shall be 5-1/8 inches wide by 8-1/8 inches high by 3 inches deep.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Contractor shall examine the areas and conditions under which the fire alarm system is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install system and materials in accordance with the manufacturer's written instructions, drawing set, and details, the applicable requirements of the NEC and NFPA 72, and specifications in Division 26.
- B. Junction boxes used as back boxes for fire alarm system field devices shall be 4-inch square with 2 1/8-inch minimums in depth. Install adapter plates and extension rings where required. Junction boxes for concealed conduit system shall be flush mounted.
- C. Mount outlet box for electric door holder to withstand 80-pound-pulling force.
- D. Upon initial installation, all fire alarm detection devices shall have the original plastic dust covers installed. Dust covers shall not be removed until installation is completed and the system is ready for test.
- E. Each conductor shall be identified as shown on the shop drawings by attaching permanent alphanumeric wire markers within 2 inches of the wire termination at both ends. Marker legends shall be visible. Junction box and pull box covers shall be painted yellow or have embossed adhesive tape labeling that is minimum 1/4-inch white letters over a yellow background with text "Fire Alarm". Install end-of-line device in box with text "End-of-Line" or "EOL". Number-code or color-code conductors, appropriately and permanently for identification and servicing of system.
- F. Splices shall only be made on terminal strips. All fire alarm wiring shall be installed in raceways as per drawing. All external wiring shall be color-coded and shall not be installed in the same outlet box, junction box, or conduit with conductors of lighting or power systems.
- G. Locate and install the detector assembly for optimum response time and easy accessibility.

3.3 TESTING

- A. The entire fire alarm system shall be field tested in accordance with NFPA standards and other applicable standards in the presence of the Construction Inspector. Inspection and test method shall be in compliance with NFPA 72. Inspection and test record forms that are recommended by NFPA 72 shall be utilized. Results of such testing shall be recorded on forms approved for the purpose, certified and submitted to the Construction Inspector prior to final acceptance.
- B. All test equipment; instruments, tools, and labor that required conducting the system tests shall be provided by the Contractor. The following equipment, but not limited to, shall be a minimum for conducting such tests.
 - 1. Ladders and scaffolds as required for access all field devices.
 - 2. Multi-meter for reading voltage, current and resistance.
 - 3. Intelligent device programmer/tester.
 - 4. Laptop computer with programming software for any required program revisions.
 - 5. Two-way radios, flashlights, smoke generation devices and supplies.
 - 6. Spare printer paper.
 - 7. Decibel meter.

- C. Perform all electrical and mechanical tests required by the equipment manufacturer's certification form. In addition, measure and adjust each of the ionization detectors to the maximum stable sensitivity setting. This must be performed with the detector at its operational environmental conditions in the area. Bench settings are not acceptable. All test and report costs shall be in the contract price. A checkout report shall be prepared by the installation technicians and submitted in triplicate, of which one copy will be registered with the equipment manufacturer. The report shall include, but not be limited to:
1. A complete list of equipment installed and wired.
 2. Indication that all equipment is properly installed and functions and conforms to these Specifications.
 3. Serial numbers, locations by zone and model number for each installed detector. All intelligent devices shall be tested and logged for correct address and sensitivity using test equipment specifically designed for that purpose. Sensitivity settings for each ionization and photoelectric detector as measured in place with the HVAC system operating.
 4. Wiring runs shall be tested for continuity, short circuits and ground before system is energized. Resistance, current and voltage reading shall be made as work progresses.
 - a. A systematic record shall be maintained for all readings using schedules or charts of tests and measurements. Areas shall be provided on the logging form for readings, dates, and witnesses.
 - b. The Owner shall be notified before the start of the required tests. All items found at variance with the applicable drawings and/or specifications during testing and inspection by the Owner, shall be corrected by Contractor at no additional cost to the Owner.
 - c. Test reports shall be delivered to the Owner when completed.
 5. Test of individual zones as applicable.
 6. Duct detector cfm readings with HVAC system operating.
 7. HVAC shutdown response upon smoke detection.
 8. Water flow alarm response upon water flow or tamper switch activation.
 9. Elevator recall, alternate floor recall, and power shutdown response.
 10. Firefighter's emergency telephone response time.
 11. Response time on thermostats and flame detectors (if used).
 12. Technician's name, certificate number, and date.
- D. Final Acceptance Test (FAT)
1. The FAT shall be conducted in the presence of the Owner and under the supervision of the Manufacturer. Prior to FAT, the Owner shall be provided drawings showing the correct address for all addressable alarm initiation devices. The address shall be shown in their respective locations for the device on drawings. Signals shall be sequentially numbered as the address of the controlling module.
 2. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:
 - a. Open, short, and ground fault for intelligent analog signaling circuit.
 - b. Open, short, and ground fault for intelligent digital signaling circuit.
 - c. Open, short, and ground fault for network signaling circuit.
 - d. Intelligent device removal.
 - e. Primary power or battery disconnected.
 - f. Type of device miss-match the address ID.
 - g. Polarity check.
 - h. Printer trouble, off line or out of paper.

3. System indications shall be demonstrated as follows.
 - a. Correct message display for each alarm input at the remote control panel, central control panel and operator's workstation graphic display.
 - 1) Correct annunciator light for each alarm input at each annunciator and color graphic of operator's workstation.
 - 2) Correct printer logging for all system activity.
 - b. Secondary power capacities shall be demonstrated as follows.
 - 1) System primary power shall be disconnected for a period of 8 hours. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period of 5 minutes.
 - 2) System primary power shall be restored 48 hours and system charging current shall be normal trickle charge for a fully charges battery pack.
 - 3) System battery voltages and charging currents shall be checked at the fire alarm control panel using the test code and displayed on the LCD display.
 - c. Firefighter's HVAC override system functions shall be demonstrated as following.
 - 1) On/off control of each controlled element and test for interaction of others automatic and manual control functions while in the override mode.
 - 2) Correct status display of monitored elements.
 - 3) Correct logging of activity to printer and historical memory as programmed.
4. The entire system needs to be tested in compliance with the building emergency operation sequence specified by contract document. The tests are included, but not limited to, fire door control, security door control interface, air handler duct smoke detection shutdown interface, sprinkler system PIVs, OS&Y valves, and tamper switch monitoring, sprinkler systems water flow and/or pressure switch monitoring, monitoring of fire pump controls, fire/smoke damper control, smoke purge control interface, activation of deluge or pre-action sprinkler systems, and elevator recall power shutdown.
5. In the event of system failure to perform as specified and programmed during the FAT, the test shall be terminated at the discretion of the Owner.
 - a. The Contractor shall retest the system correcting all deficiencies and providing test documentation to the Owner without additional cost to the Owner.
 - b. In the event that software changes are required during the FAT, a utility program shall be provided by the system manufacturer to compare the edited program with the original. The utility shall field a printed list of the changes and all system functions, inputs and outputs affected by the changes. The items listed by the program shall be the minimum acceptable to be retested before calling for resumption of the FAT. The printed list and the printer log of the retesting shall be submitted before scheduling of the FAT.
 - c. The Owner may elect to require the complete FAT to be performed again if, in their opinion, modifications to the system hardware or software warrant complete retesting.

3.4 MANUFACTURER'S FIELD SERVICES

- A. Include services of factory-certified technicians to supervise installation, adjustments, calibrations, final connections, and system testing. A representative of the manufacturer shall instruct the Owner and demonstrate the system after the Owner has occupied the building.
- B. Formal training for the operation and maintenance of fire alarm equipment and the systems specified herein shall be provided by manufacturer trained and certified personnel. The formal training shall consist of a minimum of five-day eight-hour training sessions or the number of hours as indicated per contract document. The timing of the training shall coincide with the schedule for the manufacturer's representatives to be on site for testing and start-up of each building fire alarm system. The formal training shall be provided at a location designated or provided by the Owner for number of personnel selected by the Owner, in addition to any informal on-site orientation and training.
- C. A formal training proposal shall be submitted with curriculum material, schedule, instructor's qualification for the Owner's approval at least 60 days prior to formal training. The trainer shall provide approved training material manuals at the time of training with quantity of copies per Owner's instruction.
- D. As-built drawings shall be provided upon acceptance of the system with quantities per contract document.

END OF SECTION