

S.E. Health & Wellness Center Renovations

Central Health

Austin, Texas

Project Manual



O'CONNELL ROBERTSON

Project Number: 1826.01

09.11.18

SECTION 00 01 07

SEALS PAGE

ARCHITECT OF RECORD

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Architect of Record

Date

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Mechanical Engineer of Record

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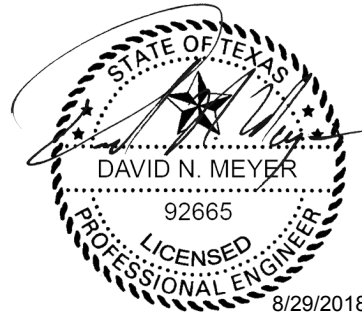
Date

S.E. Health & Wellness Center Renovations
Central Health
Austin, Texas
Project No. 1826.01

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PLUMBING ENGINEER OF RECORD

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Plumbing Engineer of Record

Date

END OF DOCUMENT

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SECTION 01 10 00 – SUMMARY OF WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project Description.
- B. Work by Owner.
- C. Owner-Supplied Products.
- D. Contractor's Use of Premises.
- E. Coordination.
- F. Warranty of Construction.

1.02 PROJECT DESCRIPTION

- A. The project consists of: Renovations of approximately 4,000 SF of the existing Southeast Health and Wellness Center to create new exam rooms. Work space and waiting area.

1.03 WORK BY OWNER

- A. The Owner reserves the right to contract directly with other entities for work not identified as part of the contract.

1.04 OWNER-SUPPLIED PRODUCTS

- A. The Owner will procure specific pieces of equipment as identified on the Drawings and equipment schedules.
- B. The Owner will arrange for delivery and payment of the products to the site, inspect and accept products as in good working order and arrange for manufacturers, warranties, inspections and service.
- C. It shall be the Contractor's responsibility as part of this work to install equipment where indicated on plans and in accordance with the manufacturer requirements making all required connections to building systems to provide a functional installation and working piece of equipment.

1.05 CONTRACTOR'S USE OF PREMISES

- A. Confine operations at site to areas permitted by law, permits, ordinances, and Contract Documents. Coordinate use of premises under direction of the Owner's Representative.
- B. Do not unreasonably encumber site with materials or equipment. Do not load the structure with weight that will damage or endanger the Work.
- C. Assume full responsibility for protection and safekeeping of products stored on premises.

Move any stored products which interfere with operations of Owner. Obtain and pay for use of additional storage or work areas needed for operations.

1.06 COORDINATION

- A. Coordinate Work of the various specification sections to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed by others, and at a later date.
- B. In the event other contractors are doing work in the same area simultaneously with this project, coordinate proposed construction with that of the other contractors.
- C. Verify that characteristics and elements of interrelated operating equipment are compatible; coordinate Work of various sections having interdependent responsibilities for installing, connecting to, and placing in service such equipment.
- D. Coordinate space requirements and installation of mechanical, plumbing, fire protection, and electrical Work which are indicated diagrammatically on drawings. Follow routing shown for pipes, ducts, and conduits as closely as practicable; make runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. Resolve piping and conduit interference's by giving precedence to pipelines which require a stated grade for proper operation.
- F. In finished areas, conceal pipes, ducts and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements including equipment furnished by Owner.
- G. Use of explosives will not be permitted.

1.07 WARRANTY OF CONSTRUCTION

- A. For a period of one year from date of substantial completion (or for longer warranty or guarantee periods stipulated elsewhere), warrant that all work conforms to the Contract requirements and is free of any defect of equipment, materials or workmanship. Under the terms of this warranty, remedy at no expense to the Owner, any such failure to conform or any such defect. All movable or adjustable items must remain in proper operating condition throughout the warranty period. Assume responsibility and pay for replacement or repair of adjacent materials or work which may be damaged due to failure of work or repair or replacement of work. This warranty does not apply to work which has been abused or neglected by the Owner.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 20 00 – PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Schedule of Values
- B. Applications for Payment
- C. Change Procedures
- D. Defect Assessment
- E. Unit Prices

1.02 SCHEDULE OF VALUES

- A. Submit in triplicate printed schedule on AIA Form G703 – Continuation Sheet for G702.
- B. Submit Schedule of Values in triplicate within 15 days after date of established Notice to Proceed.
- C. Format: Utilize Table of Contents of this Project Manual. Identify each line item with number and title of major specification Section. Identify site mobilization, bonds and insurance.
- D. Include separately from each line item, direct proportional amount of Contractor's overhead and profit.
- E. Revise schedule to list approved Change Orders, with each Application For Payment.

1.03 APPLICATIONS FOR PAYMENT

- A. Submit three copies of each application on AIA Form G702 – Application and Certificate for Payment and AIA G703 – Continuation Sheet for G702.
- B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
- C. Submit updated construction schedule with each Application for Payment.
- D. Payment Period: Contractor will submit to the Architect monthly application for payment by the fifth (5th) day of the month for work completed in the prior month. The period covered for each application for payment will be the 1st to the last day of the month, inclusive.
 - 1. Lien Waivers: First payment will be made without lien waivers.
 - a. Lien waivers shall accompany all subsequent applications for payment from the Contractor, Subcontractor, and their Subcontractors and

suppliers for the principle portion of the work covering one hundred percent (100%) of the amount paid for the previous calendar months.

- E. Submit with transmittal letter as specified for Submittals in Section 01 33 00 – Submittal Procedures.
- F. Substantiating Data: When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:
 - 1. Affidavits attesting to off-site stored products.
 - 2. Construction progress schedules, revised and current as specified in Section 01 33 00 - Submittal Procedures.

1.04 CHANGE PROCEDURES

- A. Submittals: Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. Carefully study and compare Contract Documents before proceeding with fabrication and installation of Work. Promptly advise Architect/Engineer of any error, inconsistency, omission, or apparent discrepancy.
- C. Requests for Interpretation (RFI) and Clarifications: Allot time in construction scheduling for liaison with Architect/Engineer; establish procedures for handling queries and clarifications.
 - 1. Use AIA G716 – Request for Information for requesting interpretations.
 - 2. Architect/Engineer may respond with a direct answer on the Request for Interpretation form, AIA G710 – Architect's Supplemental Instruction or Proposal Request AIA G709 – Work Changes Proposal Request.
- D. The Architect/Engineer will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on AIA Form G710.
- E. The Architect/Engineer may issue a Proposal Request including a detailed description of proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change with stipulation of overtime work required and the period of time during which the requested price will be considered valid. Contractor will prepare and submit estimate within 10 days after receipt of Proposal Request.
- F. Contractor may propose changes by submitting a request for change to Architect/Engineer, describing proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on Work by separate or other Contractors. Document requested substitutions in accordance with Section 01 60 00 – Product Requirements
- G. Stipulated Sum/Price Change Order: Based on Proposal Request and Contractor's fixed

price quotation or Contractor's request for Change Order as approved by Architect/Engineer.

- H. Unit Price Change Order: For contract unit prices and quantities, the Change Order will be executed on fixed unit price basis. For unit costs or quantities of units of work which are not pre-determined, execute Work under Construction Change Directive. Changes in Contract Sum/Price or Contract Time will be computed as specified for Time and Material Change Order.
- I. Construction Change Directive: Architect/Engineer may issue directive, on AIA Form G713 Construction Change Directive signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.
- J. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in Conditions of the Contract. Architect/Engineer will determine change allowable in Contract Sum/Price and Contract Time as provided in Contract Documents.
- K. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.
- L. Document each quotation for change in cost or time with sufficient data to allow evaluation of quotation.
- M. Change Order Forms: AIA G701/CM Change Order.
- N. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in Conditions of the Contract.
- O. Correlation of Contractor Submittals:
 - 1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
 - 2. Promptly revise progress schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
 - 3. Promptly enter changes in Project Record Documents.

1.05 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Architect/Engineer, it is not practical to remove and replace the Work, the Architect/Engineer will direct appropriate remedy or adjust payment.
- C. The defective Work may remain, but unit sum/price will be adjusted to new sum/price at discretion of Architect/Engineer and Owner.

- D. Defective Work will be partially repaired to instructions of Architect/Engineer, and unit sum/price will be adjusted to new sum/price at discretion of Architect/Engineer and Owner.
- E. Authority of Architect/Engineer to assess defects and identify payment adjustments, is final.
- F. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products not completely unloaded from transporting vehicle.
 - 4. Products placed beyond lines and levels of required Work.
 - 5. Products remaining on hand after completion of the Work.
 - 6. Loading, hauling, and disposing of rejected products.

1.06 UNIT PRICES

- A. Authority: Measurement methods are delineated in individual specification sections.
- B. Measurement methods delineated in individual specification sections complement criteria of this section. In event of conflict, requirements of individual specification section govern.
 - 1. The Contractor shall take measurements and compute quantities.
- C. Unit Quantities: Quantities and measurements indicated in Bid Form are for contract purposes only. Actual quantities provided shall determine payment.
 - 1. When actual Work requires more or fewer quantities than those quantities indicated, provide required quantities at unit sum/prices contracted.
- D. Payment Includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services and incidentals; erection, application or installation of item of the Work; overhead and profit unless otherwise noted.
- E. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Architect/Engineer multiplied by unit sum/price for Work incorporated in or made necessary by the Work.
- F. Measurement of Quantities:
 - 1. Weigh Scales: Inspected, tested and certified by applicable state Weights and Measures department within past year.
 - 2. Platform Scales: Of sufficient size and capacity to accommodate conveying vehicle.

3. Metering Devices: Inspected, tested and certified by applicable state department within the past year.
4. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.
5. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
6. Measurement by Area: Measured by square dimension using mean length and width or radius.
7. Linear Measurement: Measured by linear dimension, at item centerline or mean chord.
8. Stipulated Sum/Price Measurement: Items measured by weight, volume, area or linear means or combination, as appropriate, as completed item or unit of the Work.

G. Unit Price Schedule:

1. Item 4: Section 07 26 13-Moisture Control System: Provide a unit price to furnish and apply a moisture control system as specified. The unit price shall include the cost for preparing the concrete floor in accordance with this section.

\$_____ per square foot.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 30 00 – ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Coordination and project conditions.
- B. Pre-construction meeting.
- C. Site mobilization meeting.
- D. Progress meetings.
- E. Pre-installation meetings.
- F. Cutting and patching.
- G. Special procedures.

1.02 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, operating equipment.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.
- E. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion.
- F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.03 PRE-CONSTRUCTION MEETING

- A. Contractor will schedule meeting after Notice to Proceed.
- B. Attendance Required: Owner, Architect/Engineer and Contractor.

- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of Subcontractors, schedule of values, and progress schedule.
 - 5. Designation of personnel representing parties in Contract and Architect/Engineer.
 - 6. Procedures and processing of field decisions, submittals and substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 7. Scheduling.
 - 8. Contractor Submittal Schedule.
- D. Contractor shall record minutes and distribute copies within four days after meeting to participants, with one copy to Architect/Engineer, Owner and those affected by decisions made.

1.04 SITE MOBILIZATION MEETING

- A. Contractor will schedule meeting at Project site prior to Contractor occupancy.
- B. Attendance Required: Owner, Architect/Engineer, Contractor, contractor's superintendent and major subcontractors.
- C. Agenda:
 - 1. Use of premises by Owner and Contractor.
 - 2. Temporary utilities provided by Owner.
 - 3. Security and housekeeping procedures.
 - 4. Schedules.
 - 5. Application for payment procedures.
 - 6. Procedures for testing.
 - 7. Procedures for maintaining record documents.
 - 8. Requirements for start-up of equipment.
 - 9. Inspection and acceptance of equipment put into service during construction period.
- D. Record minutes and distribute copies within four days after meeting to participants, with

one copy to Architect/Engineer and Owner and those affected by decisions made.

1.05 PROGRESS MEETINGS

- A. Contractor shall schedule and administer meetings throughout progress of the Work at maximum monthly intervals. In addition to attending Owner's regularly scheduled project progress meetings.
- B. Make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.
- C. Attendance Required: Job superintendent, major subcontractors and suppliers, Owner, Architect/Engineer, as appropriate to agenda topics for each meeting.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of Work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems impeding planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Review of off-site fabrication and delivery schedules.
 - 7. Maintenance of progress schedule.
 - 8. Corrective measures to regain projected schedules.
 - 9. Planned progress during succeeding work period.
 - 10. Coordination of projected progress.
 - 11. Maintenance of quality and work standards.
 - 12. Effect of proposed changes on progress schedule and coordination.
 - 13. Other business relating to Work.
- E. Record minutes and distribute copies within four days after meeting to participants, with one copy to Architect/Engineer and Owner and those affected by decisions made.

1.06 PRE-INSTALLATION MEETINGS

- A. When required in individual specification sections, convene pre-installation meetings at Project site prior to commencing work of specific section.
- B. Require attendance of parties directly affecting, or affected by, Work of specific section.
- C. Notify Architect/Engineer four days in advance of meeting date unless otherwise noted in

the individual specification sections.

- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of installation, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within four days after meeting to participants, with one copy each to Architect/Engineer, Owner and those affected by decisions made.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 CUTTING AND PATCHING

- A. Employ skilled and experienced installer to perform cutting and patching.
- B. Execute cutting, fitting and patching including excavation and fill, to complete Work and to:
 - 1. Fit the several parts together, to integrate with other Work.
 - 2. Uncover Work to install or correct ill-timed Work.
 - 3. Remove and replace defective and non-conforming Work.
 - 4. Remove samples of installed Work for testing.
 - 5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
- C. Execute work by methods to avoid damage to other Work, and to provide proper surfaces to receive patching and finishing.
- D. Cut masonry and concrete materials using masonry saw or core drill.
 - 1. Prior to cutting concrete and masonry construction, locate and map the following items using a Ferroskan or other approved method to measure the size and depth of the embedded material and to map the position and arrangement of the embedded material:
 - a. Reinforcing steel
 - b. Prestressed or post-tension tendons
 - c. Steel conduit
 - d. Steel embedments
- E. Restore Work with new products in accordance with requirements of Contract

Documents.

- F. Fit Work tight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- G. Maintain integrity of wall, ceiling or floor construction; completely seal voids.
- H. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.
- I. Identify hazardous substances or conditions exposed during the Work to Architect/Engineer for decision or remedy.

3.02 SPECIAL PROCEDURES

- A. Materials: As specified in product sections; match existing with new products for patching and extending work.
- B. Employ skilled and experienced installer to perform alteration work.
- C. Cut, move or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.
- D. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.
- E. Remove debris and abandoned items from area and from concealed spaces.
- F. Prepare surface and remove surface finishes to permit installation of new work and finishes.
- G. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- H. Remove, cut, and patch Work in manner to minimize damage and to permit restoring products and finishes to original condition.
- I. Refinish existing visible surfaces to remain in renovated rooms and spaces, to renewed condition for each material, with neat transition to adjacent finishes.
- J. Where new Work abuts or aligns with existing, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
- K. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to Architect/Engineer for review.
- L. Where change of plane of 1/8 inch or more occurs, request instructions from Architect/Engineer.
- M. Patch or replace portions of existing surfaces which are damaged, lifted, discolored or showing other imperfections.

- N. Finish surfaces as specified in individual product sections.

END OF SECTION

SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Product data.
- D. Shop Drawings.
- E. Samples.
- F. Design data.
- G. Test reports.
- H. Certificates.
- I. Manufacturer's instructions.
- J. Manufacturer's field reports.
- K. Erection Drawings.
- L. Construction photographs.
- M. Architect's action.

1.02 SUBMITTAL PROCEDURES

- A. Contractor to provide a submittal schedule at the pre-construction meeting.
- B. Submittal Requirements:
 - 1. Architect/Engineer shall minimize submittals of “common” building materials by requiring, as noted in the specifications section, the contractor to provide written materials and product certification in lieu of a submittal, such certification will attest that Contractor, its Subcontractors, vendors and other entities will provide the material and/or product required by Contract Documents.

 The certification will be in a form acceptable to Central Health and Architect/Engineer and will become a contract document with the Contractor.
- C. Transmit each submittal with Architect/Engineer accepted form.
- D. Assemble complete submittal package into a single file incorporating submittal requirements of a single Specification Section.

- E. Name file with Specification Number and Sequence Number, including alphabetic revision identifier.
 - 1. File name shall use the Specification Section Number followed by a dash and then the Sequential Number (088000-001). Resubmittals shall include an alphabetic suffix after the original sequence number (088000-001A).
- F. Sequentially number transmittal forms and provide index page after transmittal. On Index page provide index of items included in submittal with page numbers where items are located. Identify options requiring selection by Architect/Engineer.
- G. Identify Project, Contractor, subcontractor and supplier; pertinent Drawing and detail number, and specification section number, appropriate to submittal on transmittal form.
- H. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.
 - 1. Submittals which do not contain this stamp shall be returned to the contractor without any action taken by the Architect/Engineer.
- I. Incomplete submittals will be reviewed as deemed necessary to support construction activities.
- J. Schedule submittals to expedite Project, and deliver to Architect/Engineer at business address. Coordinate submission of related items.
- K. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work.
- L. Allow space on submittals for Contractor and Architect/Engineer review stamps.
- M. When revised for resubmission, identify changes made since previous submission.
- N. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- O. Submittals not requested will not be recognized or processed.

1.03 CRITICAL PATH METHOD SCHEDULE (CPM)

- A. Submit initial CPM schedules within 15 days after date established in Notice to Proceed. After review, resubmit required revised data within ten days. Develop CPM in accordance with Article 10.9 of the Construction Agreement.
- B. Submit revised CPM Schedules with each Application for Payment.
- C. Distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other concerned parties.
- D. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

- E. Submit computer generated horizontal bar chart with separate line for each activity noted in Article 10.9 of the Construction Agreement.
- F. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate early and late start, early and late finish, float dates, and duration.
- G. Indicate estimated percentage of completion for each item of Work at each submission.
- H. Submit separate schedule of submittal dates for shop drawings, product data, and samples, including Owner furnished products and dates reviewed submittals will be required from Architect/Engineer. Indicate decision dates for selection of finishes.
- I. Indicate delivery dates for Owner-furnished products.
- J. Revisions to Schedules:
 - 1. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
 - 2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
 - 3. Prepare narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect including effect of changes on schedules of separate contractors.

1.04 PRODUCT DATA

- A. Product Data: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Submit either electronic copies or one hard copy.
- C. Mark each copy to identify applicable products, models, options and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. After review, produce copies and distribute in accordance with Submittal Procedures article and for record documents described in Section 01 70 00 – Execution and Closeout Requirements.

1.05 SHOP DRAWINGS

- A. Shop Drawings: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

- C. When required by individual specification sections, provide Shop Drawings signed and sealed by professional engineer responsible for designing components shown on Shop Drawings.
 - 1. Include signed and sealed calculations to support design.
 - 2. Submit drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
 - 3. Make revisions and provide additional information when required by authorities having jurisdiction.
- D. Submit either electronically or in the form of one reproduction.
- E. After review, produce copies and distribute in accordance with Submittal Procedures article and for record documents described in Section 01 70 00 – Execution and Closeout Requirements

1.06 SAMPLES

- A. Samples: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Samples for Selection as Specified in Product Sections:
 - 1. Submit to Architect/Engineer for aesthetic, color or finish selection.
 - 2. Submit samples of finishes from full range of manufacturers' standard colors, in custom colors selected, textures, and patterns for Architect/Engineer selection.
- C. Submit samples to illustrate functional and aesthetic characteristics of Products, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- D. Include identification on each sample, with full Project information.
- E. Submit number of samples specified in individual specification sections; Architect/Engineer will retain one sample.
- F. Reviewed samples which may be used in the Work are indicated in individual specification sections.
- G. Samples will not be used for testing purposes unless specifically stated in specification section.
- H. After review, produce duplicates and distribute in accordance with Submittal Procedures article and for record documents purposes described in Section 01 70 00 – Execution and Closeout Requirements.

1.07 DESIGN DATA

- A. Submit for Architect/Engineer's knowledge as contract administrator or for Owner.
- B. Submit for information for limited purpose of assessing conformance with information

given and design concept expressed in Contract Documents.

1.08 TEST REPORTS

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

1.09 CERTIFICATES

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

1.10 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, startup, adjusting and finishing, to Architect/Engineer for delivery to Owner in quantities specified for Product Data.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.11 MANUFACTURER'S FIELD REPORTS

- A. Submit reports for Architect/Engineer's benefit as contract administrator or for Owner.
- B. Submit report in duplicate within 5 days of observation to Architect/Engineer for information.
- C. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.12 ERECTION DRAWINGS

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

1.13 CONSTRUCTION PHOTOGRAPHS

- A. Provide digital images of site and construction throughout progress of Work.

1. Coordinate with Article 10.20 of the Construction Agreement.
- B. Each month submit digital images with Application for Payment.
- C. Digital Images: Label CD or Flash drive with Project Name, contract number, Month taken.
- D. Submit a computer disk with all digital images sorted in chronological sequence.

1.14 ARCHITECT'S ACTION

- A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect will review each submittal and mark to indicate action taken. The Architect's action will be taken within seven (7) calendar days unless otherwise agreed in advance.
 1. Compliance with specified characteristics is the Contractor's responsibility.
- B. Submittal Actions:
 1. No Exceptions Taken: The submittal is acceptable as submitted and no changes are necessary. No re-submittal is required.
 2. Exceptions Noted: The submittal is generally acceptable; however, all notations marked on the submittal must be addressed. No re-submittal is required.
 3. Exceptions Noted, Resubmit: The submittal is generally acceptable; however, all notations marked on the submittal must be addressed and re-submitted for review. Submit new, clean drawings or data.
 4. Rejected: The submittal does not conform with the Contract Documents and must be re-submitted.
 5. For Record Only: Submittal required or submitted for record. No action is required.
 6. Pending Additional Information: Submittal lacked Information that was required per the specifications. Submit the requested information for review.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 40 00 – QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Quality control and control of installation.
- B. Tolerances.
- C. References.
- D. Testing and inspection services.
- E. Manufacturers' field services.
- F. Labeling.
- G. Examination.
- H. Preparation.

1.02 QUALITY CONTROL AND CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. When manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. **Do not permit tolerances to accumulate.**
- B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

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

1.04 REFERENCES

- A. For products or workmanship specified by association, trade or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents, except where specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. When specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- E. Neither contractual relationships, duties, nor responsibilities of parties in Contract nor those of Architect/Engineer shall be altered from Contract Documents by mention or inference otherwise in reference documents.

1.05 TESTING AND INSPECTION SERVICES

- A. Owner will employ and pay for specified services of an independent firm to perform testing and inspection.
- B. The independent firm will perform tests, inspections and other services specified in individual specification sections and as required by Architect/Engineer.
 - 1. Laboratory: Authorized to operate in State of Texas.
 - 2. Laboratory Staff: Maintain full time registered Engineer on staff to review services.
 - 3. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to National Bureau of Standards or accepted values of natural physical constants.
- C. Testing, inspections and source quality control may occur on or off project site. Perform off-site testing as required by Architect/Engineer or Owner.
- D. Reports will be submitted by independent firm to Architect/Engineer and Contractor, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. Notify independent firm 48 hours prior to expected time for operations requiring services.
 - 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

- F. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- G. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by same independent firm on instructions by Architect/Engineer. Payment for re-testing or re-inspection will be charged to Contractor by deducting testing charges from Contract Sum/Price.
- H. Agency Responsibilities:
 - 1. Provide qualified personnel at site. Cooperate with Architect/Engineer and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect/Engineer and Contractor of observed irregularities or non-conformance of Work or products.
 - 5. Perform additional tests required by Architect/Engineer.
 - 6. Attend preconstruction meetings and progress meetings.
- I. Agency Reports: After each test, promptly submit two copies of report to Architect/Engineer and to Contractor. When requested by Architect/Engineer, provide interpretation of test results. Include the following:
 - 1. Date issued.
 - 2. Project title and number.
 - 3. Name of inspector.
 - 4. Date and time of sampling or inspection.
 - 5. Identification of product and specifications section.
 - 6. Location in Project.
 - 7. Type of inspection or test.
 - 8. Date of test.
 - 9. Results of tests.
 - 10. Conformance with Contract Documents.
- J. Limits On Testing Authority:
 - 1. Agency or laboratory may not release, revoke, alter or enlarge on requirements

of Contract Documents.

2. Agency or laboratory may not approve or accept any portion of the Work.
3. Agency or laboratory may not assume duties of Contractor.
4. Agency or laboratory has no authority to stop the Work.

1.06 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect/Engineer 30 days in advance of required observations. Observer subject to approval of Architect/Engineer.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- D. Refer to Section 01 33 00 – Submittal Procedures “Manufacturers' Field Reports” article.

1.07 LABELING

- A. Attach label from agency approved by authority having jurisdiction for products, assemblies and systems required to be labeled by applicable code.
- B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification and the following information, as applicable, on each label:
 1. Model number.
 2. Serial number.
 3. Performance characteristics.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.

- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify utility services are available, of correct characteristics, and in correct locations.

3.02 PREPARATION

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

END OF SECTION

SECTION 01 45 23 – CONCRETE IN-SITU RELATIVE HUMIDITY AND PH TESTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Provide in-situ concrete relative humidity and surface pH testing to all concrete specified to be covered with floor covering.

1.02 RELATED SECTIONS

- A. Section 03 54 16 – Hydraulic Cement Underlayment
- B. Section 09 65 00 – Resilient Flooring.
- C. Section 09 68 13 – Tile Carpeting.

1.03 REFERENCES

- A. ASTM F2170-11 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In-Situ Probes
- B. ASTM F710-05 – Standard Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.

1.04 SUBMITTALS

- A. Report all test results in chart form listing test dates, time, depth of test well, in-situ temperature, relative humidity and pH levels.
- B. List test locations on chart and show same on floor plan.
- C. Deliver results in duplicate for distribution to Architect and General Contractor.

1.05 QUALITY ASSURANCE

- A. Independent Testing Agency
 - 1. Certified by the International Concrete Restoration Institute as a Tier 2 concrete moisture-testing technician.
 - 2. Other agency with verifiable experience
- B. Digital Meter and Calibrated Humidity probes
 - 1. Minimum two-point probe calibration
- C. Wide range pH paper, and distilled or de-ionized water.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Humidity and Temperature probe kit as manufactured by Vaisala or equal.
- B. pH test paper as manufactured by Micro Essential Laboratory or equal.

PART 3 EXECUTION

3.01 QUANTIFICATION OF RELATIVE HUMIDITY

- A. The test site should be maintained at the same temperature and humidity conditions as those anticipated during normal occupancy. These temperature and humidity levels should be maintained for 48 hours prior and during test period. If meeting this criteria is not possible, then minimum conditions should be 75 ± 10 degrees F and 50 ± 10 percent relative humidity. When a building is not under HVAC control, a recording hygrometer or data logger shall be in place recording conditions during the test period. A transcript of this information must be included with the test report.
- B. The number of in-situ relative humidity test sites is determined by the square footage of the facility. Perform three tests for the first 1,000 square feet and one additional test for each additional 1,000 square feet.
 - 1. In addition to the number of tests identified in the section, provide one test where the exterior entry is noted to be enclosed. Refer to sheet A2.1, Convenient Care Clinic Demolition Plan 4.
- C. Determine the thickness of the concrete slab, typically from construction documents.
- D. Utilizing a roto-hammer drill test holes to the appropriate depth as follows:
 - 1. Slab drying from top only (slab on grade) drill-to depth from top of slab 40 percent of slab thickness.
 - 2. Hole diameter shall not exceed outside diameter of the insertable test sleeve by more than 0.04 inch. Drilling operation must be dry.
- E. Vacuum all concrete dust from test hole.
- F. Insert a hole liner, or sleeve, to the full depth of test hole, assuring that the liner is capped or plugged at the end protruding from the concrete surface.
- G. Permit the test site to acclimate or equilibrate for 72 hours prior to taking relative humidity readings.
- H. Remove the sleeve plug and place a probe into the sleeve assuring that it reaches the bottom of the test hole. The test probe must be at temperature equilibration with the concrete slab.
- I. Read and record temperature and relative humidity at the test site.

3.02 QUANTIFYING PH LEVEL

- A. At or near the relative humidity test site perform pH test.
 - 1. Place several drops of water onto the concrete surface to form a puddle approximately 1 inch in diameter.
 - 2. Allow the water to set for approximately 60 seconds.
 - 3. Dip the pH paper into the water and remove immediately, compare color to chart provided by paper supplier to determine pH reading
- B. Record and report results.

END OF SECTION

SECTION 01 50 00 – TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities:

1. Temporary electricity.
2. Temporary lighting for construction purposes.
3. Temporary ventilation.
4. Temporary water service.
5. Temporary sanitary facilities.

B. Construction Facilities:

1. Field offices and sheds.
2. Vehicular access.
3. Parking.
4. Progress cleaning and waste removal.
5. Project identification.
6. Traffic regulation.
7. Fire prevention facilities.

C. Temporary Controls:

1. Barriers.
2. Enclosures and fencing.
3. Security.
4. Dust control.
5. Noise control.
6. Pest control.
7. Pollution control.
8. Rodent control.

- D. Removal of utilities, facilities and controls.

1.02 TEMPORARY ELECTRICITY

- A. Owner will pay cost of energy used. Exercise measures to conserve energy.
- B. Provide temporary electric feeder from electrical service at location as directed by Owner. Do not disrupt Owner's use of service.
- C. Complement existing power service capacity and characteristics as required for construction operations.
- D. Provide power outlets, with branch wiring and distribution boxes located as required for construction operations. Provide flexible power cords as required for portable construction tools and equipment.
- E. Provide main service disconnect and over-current protection at convenient location.
- F. Permanent convenience receptacles may not be utilized during construction.
- G. Provide distribution equipment, wiring and outlets to provide single phase branch circuits for power and lighting.
 - 1. Provide 20 ampere duplex outlets, single phase circuits for power tools for every 500 square feet of active work area.
 - 2. Provide 20 ampere, single-phase branch circuits for lighting.

1.03 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain incandescent lighting for construction operations to achieve minimum lighting level of 2 watts/ square feet.
- B. Provide and maintain 1 watt/ square feet lighting to entire site after dark for security purposes.
- C. Provide and maintain 0.25 watt/ square feet HID lighting to interior work areas after dark for security purposes.
- D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps for specified lighting levels.
- E. Maintain lighting and provide routine repairs.
- F. Permanent building lighting may not be utilized during construction.

1.04 TEMPORARY VENTILATION

- A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors or gases.

1.05 TELEPHONE SERVICE

- A. Provide, maintain and pay for telephone service to field office at time of project mobilization.
- B. Provide, maintain and pay for WiFi service to field office at time of project mobilization for the duration of the project work. Provide access to WiFi to Owner reps and Design Team members.

1.06 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of project mobilization.

1.07 FIELD OFFICES AND SHEDS

- A. Office: Weather tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate eight persons.
- C. Locate offices and sheds minimum distance of 30 feet from new structures.
- D. Do not use permanent facilities for field offices or for storage.
- E. Construction: Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations with steps and landings at entrance doors.
 - 1. Construction: Structurally sound, secure, weather-tight enclosures for office and storage spaces. Maintain during progress of Work; remove when no longer needed at completion of Work.
 - 2. Temperature Transmission Resistance of Floors, Walls and Ceilings: Compatible with occupancy and storage requirements.
 - 3. Interior Materials in Offices: Sheet type materials for walls and ceilings, pre-finished or painted; resilient floors and bases.
 - 4. Lighting for Offices: 50 ft C at desktop height, exterior lighting at entrance doors.
 - 5. Interior Materials in Storage Sheds: As required to provide specified conditions for storage of products.
- F. Environmental Control:
 - 1. Heating, Cooling, and Ventilating for Offices: Automatic equipment to maintain comfort conditions 68 degrees F heating and 76 degrees F cooling.
 - 2. Storage Spaces: Heating and ventilation as needed to maintain products in accordance with Contract Documents; lighting for maintenance and inspection of products.
- G. Storage Areas and Sheds: Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products to requirements of Section 01 60 00 – Product Requirements.

H. Installation:

1. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.
2. Parking: Two hard surfaced parking spaces for use by Owner and Architect/Engineer, connected to office by hard surfaced walk.
3. Employee Residential Occupancy: Not allowed on Owner's property.

I. Maintenance and Cleaning:

1. Daily janitorial services for offices; periodic cleaning and maintenance for office and storage areas.
2. Maintain approach walks free of mud, water and snow.

J. Removal: At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

1.08 VEHICULAR ACCESS

- A. Location approved by Owner.
- B. Provide unimpeded access for emergency vehicles. Maintain 20-foot-wide driveways with turning space between and around combustible materials.
- C. Provide and maintain access to fire hydrants and control valves free of obstructions.
- D. Do not use designated existing on-site roads for construction traffic.

1.09 PARKING

- A. Locate as approved by Owner.
- B. When site space is not adequate, provide additional offsite parking.
- C. Use of designated existing onsite streets and driveways used for construction traffic is not permitted. Tracked vehicles not allowed on paved areas.
- D. Use of designated areas of existing parking facilities used by construction personnel is not permitted.
- E. Do not allow heavy vehicles or construction equipment in parking areas.
- F. Do not allow vehicle parking on existing pavement.
- G. Maintenance:
 1. Maintain traffic and parking areas in sound condition free of construction equipment, products, mud, snow and ice.
- H. Removal, Repair:

1. Remove temporary materials and construction before Substantial Completion.
2. Repair existing facilities damaged by use, to original condition.

1.10 PROGRESS CLEANING AND WASTE REMOVAL

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

1.11 PROJECT IDENTIFICATION

- A. Project Identification Sign:
 1. One painted sign, 32 square feet area, and bottom 6 feet above ground.
 2. Content:
 - a. Project number, title, logo and name of Owner as indicated on Contract Documents.
 - b. Names and titles of authorities.
 - c. Names and titles of Architect/Engineer and Consultants.
 - d. Name of Prime Contractor.
 3. Graphic Design, Colors, Style of Lettering: Designated by Architect/Engineer.
- B. Project Informational Signs:
 1. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering for legibility at 100-foot distance.
 2. Provide sign at each field office, storage shed and directional signs to direct traffic into and within site. Relocate as Work progress requires.
 3. No other signs are allowed without Owner permission except those required by law.
- C. Design sign and structure to withstand 60 miles/hour wind velocity.
- D. Sign Painter: Experienced as professional sign painter for minimum three years.
- E. Finishes, Painting: Adequate to withstand weathering, fading and chipping for duration of construction.
- F. Show content, layout, lettering, color, foundation, structure, sizes and grades of

members.

G. Sign Materials:

1. Structure and Framing: New wood, structurally adequate.
2. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch thick, standard large sizes to minimize joints.
3. Rough Hardware: Galvanized.
4. Paint and Primers: Exterior quality; two coats; sign background white.
5. Lettering: Exterior quality paint; contrasting colors.

H. Installation:

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

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

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

1.12 TRAFFIC REGULATION

A. Signs, Signals and Devices:

1. Post-Mounted and Wall-Mounted Traffic Control and Informational Signs: As approved by authority having jurisdiction.
2. Traffic Cones and Drums, Flares and Lights: As approved by authority having jurisdiction.
3. Flagperson Equipment: As required by authority having jurisdiction.

B. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

C. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

D. Haul Routes:

1. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.
2. Confine construction traffic to designated haul routes.
3. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

E. Traffic Signs and Signals:

1. Provide signs at approaches to site and on site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
2. Provide, operate and maintain traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations.
3. Relocate as Work progresses to maintain effective traffic control.

F. Removal:

1. Remove equipment and devices when no longer required.
2. Repair damage caused by installation.
3. Remove post settings to depth of 2 feet.

1.13 FIRE PREVENTION FACILITIES

- A. Prohibit smoking within buildings under construction.
- B. Establish fire watch for cutting and welding and other hazardous operations capable of starting fires. Maintain fire watch before, during and after hazardous operations until threat of fire does not exist.
- C. Portable Fire Extinguishers: NFPA 10; 10-pound capacity, 4A-60B: C UL rating.
1. Provide minimum one fire extinguisher in every construction trailer and storage shed.
 2. Provide minimum one fire extinguisher on roof during roofing operations using heat producing equipment.

1.14 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas.
- B. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

1.15 ENCLOSURES AND FENCING

- A. Construction: Commercial grade chain link fence.

- B. Provide 6-foot-high fence around construction site; equip with vehicular and pedestrian gates with locks.
- C. Exterior Enclosures:
 - 1. Provide temporary weather-tight closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.16 SECURITY

- A. Security Program:
 - 1. Protect Work, existing premises from theft, vandalism and unauthorized entry.
 - 2. Initiate program at project mobilization.
 - 3. Maintain program throughout construction period until Owner occupancy
- B. Entry Control:
 - 1. Restrict entrance of persons and vehicles into Project site.
 - 2. Allow entrance only to authorized persons with proper identification.
 - 4. Maintain log of workers and visitors, make available to Owner on request.

1.17 DUST CONTROL

- A. Execute Work by methods to minimize raising dust from construction operations.
- B. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

1.18 NOISE CONTROL

- A. Provide methods, means and facilities to minimize noise.

1.19 PEST CONTROL

- A. Provide methods, means and facilities to prevent pests and insects from damaging the Work and entering facility.

1.20 POLLUTION CONTROL

- A. Provide methods, means and facilities to prevent contamination of soil, water and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.
- B. Comply with pollution and environmental control requirements of authorities having jurisdiction.

1.21 RODENT CONTROL

- A. Provide methods, means and facilities to prevent rodents from accessing or invading premises.

1.22 REMOVAL OF UTILITIES, FACILITIES AND CONTROLS

- A. Remove temporary utilities, equipment, facilities and materials prior to Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing and permanent facilities used during construction to original condition.
 - 1. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 60 00 – PRODUCT REQUIREMENTS

PART1 GENERAL

1.01 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options and substitutions:
 - 1. Substitution Request Form, Bidding Phase.
 - 2. Substitution Request Form, After Execution of Contract.

1.02 PRODUCTS

- A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.

1.03 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement or damage.

1.04 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weather-tight, climate-controlled, enclosures in an environment favorable to product.
- D. For exterior storage of fabricated products, place on sloped supports above ground.
- E. Provide bonded off-site storage and protection when site does not permit onsite storage or protection.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.

- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.05 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Standard of Quality:

- 1. Where one manufacturer or material is called for, listed, or otherwise designated by the Drawings or specification, the intent is not to limit competition or to write a closed specification, but rather to set a standard of quality. Where one manufacturer is called for, it shall be deemed to be followed by the words "equivalent" and contractors may, unless otherwise stated, offer any material, process or article which shall be substantially equal or better in every respect to that so indicated or specified by delivering to the Architect a completed substitution request in accordance with this section. If the material, process or article offered by the contractor in the substitution request is not in the best judgment of the Architect/Owner, substantially equal or better in every respect to that specified, then the Contractor shall furnish any material, process or article specified.
- 2. Unless otherwise specified, all materials shall be the best of their respective kind and shall be in all cases fully equal to approved samples.
- 3. With the written approval of the Owner and the Architect as provided below, other manufacturers or materials may be used provided there is not decrease in the quality of the finished product. The Contractor shall assume responsibility for certification of equal quality on substitutions, and shall provide the same warranty for substituted items as for those originally specified.

B. Substitutions:

- 1. Notwithstanding the use in the specifications of the term "or equal," or other such expressions as applied to a material, manufactured article or process, the item specifically designated shall be used unless a substitute, has been approved in writing by the Architect or Owner, and they shall have the right to require the use of such specifically designated materials, articles or processes.
- 2. Proposals for substitutions will be considered only until seven business days prior to the date of bid opening. Subsequently, substitutions will be considered only at the discretion of the Owner and the Architect, or if circumstances beyond the control of the Contractor cause a product to become unavailable.
- 3. Make requests for substitutions on attached Substitution Request Form.

C. Contractor's Options:

The Contractor may exercise the following options regarding substitutions for specified products and materials.

- 1. For products specified only by reference standard or by description only, select

any product by any manufacturer which meets those standards. A substitution request form will not be required.

2. For products specified by naming several manufactures, select any product or manufacturer named.
3. For products specified by naming one or more manufacturers, but with provisions for substitutions, the Contractor must submit written request for substitution of any product not specifically named.
4. For products specified by naming only one manufacturer, substitutions will be reviewed for approval at the discretion of the Architect and the Owner, upon written request for substitution.
5. Substitutions will not be considered when they are indicated or implied on shop drawings or product data submittals without separated written request, or when acceptance will require any revision of Contract Documents.
6. Architect will notify Contractor in writing of acceptance or rejection of proposed substitution within ten business days of bid closing.
7. Only one request for substitution will be considered for each product. When a substitution is rejected, provide material or product as specified.

D. Contractor's Responsibilities:

1. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
2. A request constitutes a representation that Bidder:
 - a. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
 - b. Will provide same warranty for Substitution as for specified product.
 - c. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - d. Waives claims for additional costs or time extension which may subsequently become apparent.
 - e. Will reimburse Owner and Architect/Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.
3. In making written request for substitutions, Contractor represents that proposed product or material has been investigated and determined equal or superior in all respects to that specified. Contractor shall provide same warranty for substituted products and materials as for products or materials specific, and shall coordinate installation of accepted substitutions into Work, making such changes as may be required for Work to be complete in all respects.
4. The Contractor waives all claims for additional costs arising from or related to the subsequent installation of substituted items.

E. Replacement:

1. Within the warranty period, should an accepted substitution prove to be defective or otherwise unsatisfactory for the function intended, it shall be replaced at no cost to the Owner with the material or equipment originally specified.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SUBSTITUTION REQUEST

BIDDING PHASE

PROJECT: **S.E. Health & Wellness Center Renovations**
Central Health

PROJECT NO.: **1826.01**

TO (ARCHITECT):
O'Connell Robertson

FROM (BIDDER):

HEREBY REQUESTS ACCEPTANCE OF THE FOLLOWING PRODUCT OR SYSTEMS AS A SUBSTITUTION
IN ACCORD WITH PROVISIONS OF THE BIDDING DOCUMENTS:

1. SPECIFIED PRODUCT OR SYSTEM:

Substitution request for (Generic Description): _____

Specification Section No. _____ Article(s) _____ Para.(s) _____

2. SUPPORTING DATA:

☐ Product data for proposed substitution is attached (description of product, reference standards, performance and test data).

☐ Sample is attached

☐ Sample will be sent if requested

3. QUALITY COMPARISON:

	SPECIFIED PRODUCT	SUBSTITUTION
Name, brand:	_____	_____
Catalog No.:	_____	_____
Manufacturer:	_____	_____
Vendor:	_____	_____
Significant variations:	_____	_____

Maintenance Service Available: ☐ yes ☐ no

Spare Parts Source: _____

4. PREVIOUS INSTALLATIONS:

Identification of similar projects on which proposed substitution was used: (Attach list)

Project: _____	Architect: _____
Address: _____	Owner: _____
_____	Date Installed: _____

5. REASON FOR NOT GIVING PRIORITY TO SPECIFIED ITEMS:

6. EFFECT OF SUBSTITUTION:

Proposed substitution affects other parts of Work: ☐ No ☐ Yes (If yes, explain)

Substitution requires dimensional revision or redesign of structure or M & E Work:

☐ No ☐ Yes (If yes, attach complete data.)

7. BIDDER'S/SUPPLIER'S STATEMENT OF CONFORMANCE OF PROPOSED SUBSTITUTION TO CONTRACT REQUIREMENT:

I/we have investigated the proposed substitution. I/we:

- ☐ believe that it is equal or superior in all respects to specified product, except as stated above; and
- ☐ will provide the same warranty as specified for specified product; and
- ☐ have included complete implications of the substitution; and
- ☐ will pay redesign and other costs caused by the substitution which subsequently become apparent; and
- ☐ will pay costs to modify other parts of the Work as may be needed, to make all parts of the Work complete and functioning resulting from the substitution.
- ☐ warrant and represent to the Owner and the Architect that the proposed substitution does not infringe on any patents or other rights held by others, or that a license has been or will be obtained timely from the holders of such rights for the use of the substitute as proposed; and acknowledge that by accepting this substitution neither the Architect nor the Owner makes any warranty or representation to the Contractor or any Subcontractor regarding the existence or potential for such infringement.

Bidder/Supplier: _____

Date: _____

By: _____

Answer all questions and complete all blanks - use "NA" if not applicable.

REVIEW AND ACTION:

- ☐ Resubmit substitution request:
- ☐ Provide more information in following categories: _____

- ☐ Sign Bidder's/Supplier's Statement of Conformance.
- ☐ Substitution is accepted.
- ☐ Substitution is accepted, with the following comments: _____

- ☐ Substitution not accepted.
- ☐ No action taken. Substitution Request received less than **7 business** days prior to date set for receipt of bids.

Architect's Signature

Date

SUBSTITUTION REQUEST

AFTER EXECUTION OF CONTRACT

PROJECT: **S.E. Health & Wellness Center Renovations**
Central Health

PROJECT NO.: **1826.01**

TO (ARCHITECT):
O'Connell Robertson

FROM (CONTRACTOR):

HEREBY REQUESTS ACCEPTANCE OF THE FOLLOWING PRODUCT OR SYSTEMS AS A SUBSTITUTION
IN ACCORD WITH PROVISIONS OF DIVISION ONE OF SPECIFICATIONS:

1. SPECIFIED PRODUCT OR SYSTEM:

Substitution request for (Generic Description): _____

Specification Section No. _____ Article(s) _____ Para.(s) _____

2. SUPPORTING DATA:

☐ Product data for proposed substitution is attached (description of product, reference standards, performance and test data).

☐ Sample is attached

☐ Sample will be sent if requested

3. QUALITY COMPARISON:

	SPECIFIED PRODUCT	SUBSTITUTION
Name, brand:	_____	_____
Catalog No.:	_____	_____
Manufacturer:	_____	_____
Vendor:	_____	_____
Significant variations:	_____	_____

Maintenance Service Available: ☐ yes ☐ no

4. PREVIOUS INSTALLATIONS:

Identification of similar projects on which proposed substitution was used: (Attach list)

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

5. REASON FOR NON-AVAILABILITY OF SPECIFIED ITEM:

Attach affidavit, certification or other data as proof of non-availability.

☐ Strikes

☐ Discontinuance of production

☐ Lockouts

☐ Proven shortage

☐ Bankruptcy

☐ Similar occurrences (explain below)

6. EFFECT OF SUBSTITUTION:

Proposed substitution affects other parts of Work: ☐ No ☐ Yes (If yes, explain)

Substitution Request (Executed Contract)

Substitution changes Contract Time: ☐ No ☐ Yes Add/Deduct _____ day

Substitution requires dimensional revision or redesign of structure or M & E Work:

☐ No ☐ Yes (If yes, attach complete data.)

Saving or credit to Owner, if any, for accepting substitution: \$ _____

7. CONTRACTOR'S STATEMENT OF CONFORMANCE OF PROPOSED SUBSTITUTION TO CONTRACT REQUIREMENT:

I/we have investigated the proposed substitution. I/we:

- ☐ believe that it is equal or superior in all respects to specified product, except as stated above;
- ☐ will provide the same warranty as specified for specified product;
- ☐ have included complete cost data and implications of the substitution;
- ☐ will pay redesign and special inspection costs caused by the use of this product;
- ☐ will pay additional costs to other contractors caused by the substitution;
- ☐ will coordinate the incorporation of the proposed substitution in the Work;
- ☐ will modify other parts of the Work as may be needed, to make all parts of the Work complete and functioning;
- ☐ waive future claims for added cost to Contract caused by the substitution;
- ☐ warrant and represent to the Owner and the Architect that the proposed substitution does not infringe on any patents or other rights held by others, or that a license has been or will be obtained timely from the holders of such rights for the use of the substitute as proposed; and acknowledge that by accepting this substitution neither the Architect nor the Owner makes any warranty or representation to the Contractor or any Subcontractor regarding the existence or potential for such infringement.

Contractor: _____ Date: _____

By: _____

Answer all questions and complete all blanks - use "NA" if not applicable.

ARCHITECT'S REVIEW AND ACTION:

- ☐ Resubmit substitution request:
- ☐ Provide more information in following categories: _____

- ☐ Sign Contractor's Statement of Conformance.
- ☐ Submit proof of non-availability.
- ☐ Substitution is accepted.
- ☐ Substitution is accepted, with the following comments: _____

- ☐ Substitution not accepted.

Architect's Signature

Date approval from the A/E.

SECTION 01 70 00 – EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Starting of systems.
- D. Demonstration and instructions.
- E. Testing, adjusting and balancing.
- F. Protecting installed construction.
- G. Project record documents.
- H. Operation and maintenance data.
- I. Manual for materials and finishes.
- J. Manual for equipment and systems.
- K. Spare parts and maintenance products.
- L. Product warranties and product bonds.
- M. Maintenance service.

1.02 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's review.
- B. Provide submittals to Architect/Engineer required by authorities having jurisdiction.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.03 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to

surface and material being cleaned.

- D. Replace filters of operating equipment.
- E. Clean debris from roofs, gutters, downspouts and drainage systems.
- F. Clean site; sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste and surplus materials, rubbish and construction facilities from site.

1.04 STARTING OF SYSTEMS

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

1.05 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.
- B. Demonstrate Project equipment by a qualified manufacturer's representative who is knowledgeable about the Project.
- C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- E. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance and shutdown of each item of equipment at scheduled time and at designated location.

- F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- G. Required instruction time for each item of equipment and system is specified in individual sections.

1.06 TESTING, ADJUSTING AND BALANCING

- A. Owner will appoint, employ and pay for services of independent firm to perform testing, adjusting, and balancing.
- B. Independent firm will perform services specified in Section 23 05 93
- C. Reports will be submitted by independent firm to Architect/Engineer indicating observations and results of tests and indicating compliance or non-compliance with requirements of Contract Documents.

1.07 PROTECTING INSTALLED CONSTRUCTION

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

1.08 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed Shop Drawings, Product Data and Samples.
 - 6. Manufacturer's instruction for assembly, installation and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.

- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured depths of foundations in relation to finish floor datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 4. Field changes of dimension and detail.
 - 5. Details not on original Contract Drawings.
- G. Submit documents to Architect/Engineer with claim for final Application for Payment.

1.09 OPERATION AND MAINTENANCE DATA

- A. Submit data bound in 8-1/2 by 11 inch (A4) text pages, three-ring capacity expansion binders with durable plastic covers.
- B. Prepare binder cover with printed title "Operation and Maintenance Instructions," title of project, and subject matter of binder when multiple binders are required.
- C. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- E. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
 - 1. Part 1: Directory, listing names, addresses and telephone numbers of Architect/Engineer, Contractor, subcontractors and major equipment suppliers.
 - 2. Part 2: Operation and maintenance instructions arranged by system and subdivided by specification section. For each category, identify names, addresses and telephone numbers of subcontractors and suppliers. Identify the following:

- a. Significant design criteria.
- b. List of equipment.
- c. Parts list for each component.
- d. Operating instructions.
- e. Maintenance instructions for equipment and systems.
- f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3. Part 3: Project documents and certificates, including the following:

- a. Shop Drawings and product data.
- b. Air and water balance reports.
- c. Certificates.
- d. Originals of warranties and bonds.

1.10 MANUAL FOR MATERIALS AND FINISHES

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with Architect/Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit two sets of revised final volumes in final form within 10 days after final inspection.
- E. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition and color and texture designations. Include information for re-ordering custom manufactured products.
- F. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- G. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance and repair.
- H. Additional Requirements: As specified in individual product specification sections.
- I. Include listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.11 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return one copy with

comments.

- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within 10 days after acceptance.
- C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with Architect/Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit two sets of revised final volumes in final form within 10 days after final inspection.
- E. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
- F. Panelboard Circuit Directories: Provide electrical service characteristics, controls and communications by label machine.
- G. Include color coded wiring diagrams as installed.
- H. Operating Procedures: Include startup, break-in and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown and emergency instructions. Include summer, winter and special operating instructions.
- I. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing and checking instructions.
- J. Include servicing and lubrication schedule, and list of lubricants required.
- K. Include manufacturer's printed operation and maintenance instructions.
- L. Include sequence of operation by controls manufacturer.
- M. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- N. Include control diagrams by controls manufacturer as installed.
- O. Include Contractor's Coordination Drawings, with color-coded piping diagrams as installed.
- P. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- Q. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- R. Include test and balancing reports as specified in Section 01 40 00 - Quality Requirements.
- S. Additional Requirements: As specified in individual product specification sections.

- T. Include listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

1.12 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Furnish spare parts, maintenance and extra products in quantities specified in individual specification sections.
- B. Deliver to Project site and place in location as directed by Owner; obtain receipt prior to final payment.

1.13 PRODUCT WARRANTIES AND PRODUCT BONDS

- A. Obtain warranties and bonds executed in duplicate by responsible subcontractors, suppliers and manufacturers, within ten days after completion of applicable item of work.
- B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers and manufacturers.
- C. Verify documents are in proper form, contain full information, and are notarized.
- D. Co-execute submittals when required.
- E. Include Table of Contents and assemble in three-ring binder with durable plastic cover.
- F. Submit prior to final Application for Payment.
- G. Time of Submittals:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

1.14 MAINTENANCE SERVICE

- A. Furnish service and maintenance of components indicated in specification sections for one year from date of Substantial Completion unless otherwise specified in the individual specification section.
- B. Examine system components at frequency consistent with reliable operation. Clean, adjust and lubricate as required.
- C. Include systematic examination, adjustment and lubrication of components. Repair or replace parts whenever required. Use parts produced by manufacturer of original component.

- D. Do not assign or transfer maintenance service to agent or Subcontractor without prior written consent of Owner.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 02 41 19 – SELECTIVE STRUCTURE DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Demolishing designated building equipment and fixtures.
- B. Demolishing designated construction.
- C. Cutting and alterations for completion of the work.
- D. Removing designated items for reuse and Owner's retention.
- E. Protecting items designated to remain.
- F. Removing demolished materials.

1.02 RELATED SECTIONS

- A. Section 01 30 00 – Administrative Requirements: Coordination and project requirements.
- B. Section 01 50 00 - Temporary Facilities and Controls: Temporary enclosures, dust control barricades, security at Owner-occupied areas, and cleanup during construction.
- C. Section 01 70 00 – Execution and Closeout Requirements: Project record documents.

1.03 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Requirements for submittals.
- B. Submit each item listed below for information only.
 - 1. Proposed dust-control measures.
 - 2. Proposed noise-control measures.
 - 3. Schedule of selective demolition activities indicating the following:
 - a. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
 - b. Interruption of utility service.
 - c. Coordination for shutoff, capping and continuation of utility services.
 - d. Detailed sequence of selective demolition and removal work to ensure uninterrupted progress of Owner's onsite operations.
 - e. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed work.
 - f. Locations of temporary partitions and means of egress.
- C. Inventory of items to be removed and salvaged.
- D. Inventory of items to be removed by Owner.

- E. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations.

1.04 SUBMITTALS FOR CLOSEOUT

- A. Section 01 70 00 – Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Accurately record actual locations of capped utilities and subsurface structural electrical or mechanical conditions.

1.05 REGULATORY REQUIREMENTS

- A. Conform to current building code for demolition work, dust control, products requiring electrical disconnection and re-connection.
- B. Obtain required permits from authorities.
- C. Do not close or obstruct egress width to any building or site exit.
- D. Do not disable or disrupt building fire or life safety systems without three days' prior written notice to Owner.
- E. Conform to procedures applicable when hazardous or contaminated materials are discovered.
- F. Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.06 SEQUENCING

- A. Activity sequencing schedule to be coordinated with Owner and Architect prior to commencement of Work.

1.07 SCHEDULING

- A. Section 01 30 00 – Administrative Requirements: Requirements for scheduling.
- B. Describe demolition removal procedures and schedule.
- C. Coordinate with the Owner to establish a time period to perform noisy, malodorous or dusty work.

1.08 PROJECT CONDITIONS

- A. Conduct demolition to minimize interference with adjacent and occupied building areas. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Schedule tie-ins to existing systems to minimize disruption.
- C. Coordinate work to ensure fire sprinkler, fire alarms, smoke detectors, emergency lighting, exit signs and other life safety systems remain in full operation in occupied areas.

- D. Cease operations immediately if structure appears to be in danger and notify Architect/Engineer. Do not resume operations until directed.
- E. Owner assumes no responsibility for actual condition of buildings to be selectively demolished.
 - 1. Conditions existing at time of inspection for bidding purposes will be maintained by Owner as far as practical.
- F. Storage or sale of removed items or materials on-site will not be permitted.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Architect.
- E. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES

- A. Notify affected utility companies before starting work and comply with their requirements.
- B. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.
 - a. Provide not less than 72 hours' notice to Owner if shutdown of service is

required during changeover.

- C. Utility Requirements: Locate, identify, disconnect and seal or cap off indicated utility services serving building to be selectively demolished.
 - 1. Owner will arrange to shut off indicated utilities when requested by Contractor.
 - 2. Arrange to shut off indicated utilities with utility companies.
 - 3. Where utility services are required to be removed, relocated or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.
 - 4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit after bypassing.

3.03 PREPARATION

- A. Drain, purge or otherwise remove, collect and dispose of chemicals, gases, explosives, acids, flammables or other dangerous materials before proceeding with selective demolition operations.
- B. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- C. Conduct demolition's operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.
 - 1. Erect temporary protection, such as walls, fences, railings, canopies and covered passageways where required by authorities having jurisdiction.
 - 2. Protect existing site improvements, appurtenances and landscaping to remain.
 - 3. Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.
 - 4. Protect walls, ceilings, floors and other existing finish work that are to remain and are exposed during selective demolition operations.
 - 5. Cover and protect furniture, furnishings and equipment that have not been removed.
- D. Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
 - 1. Construct dustproof partitions of not less than nominal 4-inch studs, 5/8-inch gypsum wallboard with joints taped on occupied side, and 1/2-inch fire-retardant

plywood on the demolition side.

2. Insulate partition to provide noise protection to occupied areas.
 3. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
 4. Protect air-handling equipment.
 5. Weatherstrip openings.
- E. Provide appropriate temporary signage including signage for exit or building egress.
- F. Do not close or obstruct building egress path.
- G. Do not disable or disrupt building fire or life safety systems without 72 hours' prior written notice to Owner.

3.04 POLLUTION CONTROLS

- A. Use water mist, temporary enclosures and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding and pollution.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
1. Remove debris from elevated portions of building by chute, hoist or other device that will convey debris to grade level.
- C. Clean adjacent structures and improvements of dust, dirt and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.05 SELECTIVE DEMOLITION

- A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations and as follows:
1. Neatly cut openings and holes plumb, square and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 2. Cut or drill from exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents

of hidden space before starting flame-cutting operations. Maintain portable fire-suppression device during flame-cutting operations.

4. Maintain adequate ventilation when using cutting torches.
 5. Remove decayed, vermin-infested or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 6. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors or framing.
 7. Dispose of demolished items and materials promptly. Onsite storage or sale of removed items is prohibited.
 8. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.
- B. Demolish concrete in small sections. Cut concrete at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools.

3.06 SALVAGE REQUIREMENTS

- A. Coordinate with Owner to identify building components and equipment required to be removed and delivered to Owner.
- B. Tag components and equipment Owner designates for salvage.
- C. Protect designated salvage items from demolition operations until items can be removed.
- D. Carefully remove building components and equipment indicated to be salvaged.
- E. Disassemble as required to permit removal from building.
- F. Package small and loose parts to avoid loss.
- G. Mark equipment and packaged parts to permit identification and consolidation of components of each salvaged item.
- H. Prepare assembly instructions consistent with disassembled parts. Package assembly instructions in protective envelope and securely attach to each disassembled salvaged item.
- I. Deliver salvaged items to Owner. Obtain signed receipt from Owner.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.

3.08 CLEANING

- A. Sweep the building broom clean on completion of selective demolition operation.
- B. Change filters on air-handling equipment on completion of selective demolition operations.

END OF SECTION

SECTION 03 54 16 - HYDRAULIC CEMENT UNDERLAYMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, general provisions of the Contract, and other related construction documents such as Division 1 specifications apply to this Section

1.02 SUMMARY

- A. This Section includes a cement-based self-leveling underlayment formulated for interior use.
- B. Related sections include the following:
 - 1. Section 01 45 23 – Concrete In-Situ Relative Humidity, and pH Testing.
 - 2. Section 07 26 13 – Moisture Control System.
 - 3. Section 09 65 00 – Resilient Flooring.
 - 4. Section 09 68 13 – Tile Carpeting.

1.03 REFERENCES

- A. ASTM C78 – Flexure Strength of Concrete Using Simple Beam with Third- Point Loading
- B. ASTM C109M – Compressive Strength Air-Cure Only
- C. ASTM C348 – Flexural Strength of Hydraulic-Cement Mortars
- D. ASTM E84 – Surface Burning Characteristics of Building Materials
- E. ASTM 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used. Include manufacturer's Material Safety Data Sheets.

1.05 QUALITY ASSURANCE

- A. Installation of the underlayment product must be completed by a factory-trained applicator using mixing equipment and tools approved by the manufacturer.
- B. Product must have a hydraulic cement-based inorganic binder content as the primary binder which includes Portland cement per ASTM C150: Standard Specification for Portland Cement and other specialty hydraulic cements.
- C. Manufacturer Experience: Provide products of this section by companies which have

successfully specialized in production of this type of work for not less than 10 years.
Contact manufacturer's representative prior to installation.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in original packaging, labeled with product identification, manufacturer, batch number and shelf life.
- B. Store products in a dry area with temperature maintained between 50 degrees and 85 degrees F (10 degrees and 29 degrees C) and Protect from direct sunlight.
- C. Handle products in accordance with manufacturer's printed recommendations.

1.07 PROJECT CONDITIONS

- A. Do not install material below 50 degrees F (10 degrees C) surface and air temperatures. These temperatures must also be maintained during and for 48 hours after the installation of products included in this section.

PART 2 PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

- A. Basis of Design: Contract Documents are based on manufacturer and product named. Other manufacturers with products having equivalent characteristics may be submitted in accordance with Conditions of the Contract and appropriate Division 1 sections. Submitted products shall meet or exceed the performance and physical properties identified in Article 2.01, Paragraph B, of this specification.
 - 1. Manufacturer: Ardex Engineered Cements.
 - 2. Product: Ardex K15 self-leveling underlayment concrete.
 - a. Primer for porous concrete: Ardex P51 primer.
 - b. Primer for non-porous substrates: Ardex P82 primer.
 - c. Additive: Ardex E25 resilient emulsion.
- B. Performance and Physical Properties:
 - 1. Material: Portland cement-based underlayment.
 - 2. Compressive strength: 4,100 psi at 28 days per ASTM C109M.
 - 3. Flexural strength: 1,000 psi at 28 days, per ASTM C78.
 - 4. Maximum installation thickness without aggregate: 1-1/2 inches.
 - 5. Maximum installation thickness with aggregate: 5 inches.
- C. Approved manufacturers and products
 - 1. USG Durock Speed Self-leveling Underlayment.

Note: At locations where the thickness of the underlayment does not exceed 1 inch provide USG Durock Quik-Cover Self-Leveling Underlayment.

2.02 WATER

- A. Water shall be clean, potable and sufficiently cool (not warmer than 70 degrees F).

PART 3 EXECUTION

3.01 PREPARATION

- A. Concrete Subfloors: Prepare substrate in accordance with manufacturer's instructions.
 - 1. Prior to proceeding refer to ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring. All concrete subfloors must be sound, solid, clean, and free of all oil, grease, dirt, curing compounds and any substance that might act as a bond breaker 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. All cracks in the subfloor shall be repaired to minimize telegraphing through the underlayment.
 - 3. Substrates shall be tested in accordance with Section 01 45 23 and corrected for moisture or any other conditions that could affect the performance of the underlayment or the finished floor covering. For areas where moisture vapor emissions exceed the limits required by the floor covering manufacturer, refer to Section 07 26 13 and install the appropriate moisture control system as recommended by underlayment manufacturer.
- B. Joint Preparation:
 - 1. Moving joints: Honor all expansion and isolation joints up through the underlayment.
 - a. Seal joints with Ardiseal RapidPlus as manufactured by Ardex.
 - 2. Saw cuts and control joints: Fill all non-moving joints with Ardifix joint filler as manufactured by Ardex.
- C. Cutback and other non-water soluble adhesive residues must be wet scraped to a thin, well-bonded layer.

3.02 APPLICATION OF UNDERLAYMENT

- A. Examine substrates and conditions under which materials will be installed. Do not proceed with installation until unsatisfactory conditions are corrected.
- B. Coordinate installation with adjacent work to ensure proper sequence of construction. Protect adjacent areas from contact due to mixing and handling of materials.
- 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 (minimum three hours; maximum 24 hours). Underlayment shall not be applied until the primer is dry. Primer coverage is approximately 400 to 600 square feet per gallon.
 2. Primer for extremely absorbent concrete subfloors: Make an initial application of Ardex P-51 mixed with three 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 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 three 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.
- D. Mixing: Comply with manufacturer's printed instructions and the following:
1. Add 7 quarts (6.5 L) of clean potable water per two 55-pound bag.
 2. Mix using a 1/2-inch (650 rpm) low speed heavy-duty mixing drill with an Ardex T-1 mixing paddle. Do not overwater.
 3. Aggregate mix: For areas to be installed over 1-1/2 inch thick, aggregate may be added to reduce material costs. Mix Ardex K15 with water first, then add from 1/3 up to one part by volume of washed, well graded pea gravel aggregate (1/8 inch to 1/4 inch or larger). Do not use sand. Note: The addition of aggregate will diminish the workability of the make it necessary to install a finish coat to obtain a smooth surface. Ardex recommends a 1/4-inch application of Ardex K15 neat to be installed as the finish coat.
 4. For pump installations, Ardex K15 shall be mixed using the 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 overwater. 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.
- E. Application: Comply with manufacturer's printed instructions and the following:
1. Ardex K15 must be installed at a minimum thickness of 1/8 inch over the highest point in the floor, which typically results in an average thickness of 1/4 inch over the entire floor. Ardex K15 can be installed up to 1-1/2 inches over large areas neat, and up to 5 inches with the addition of proper aggregate. Ardex K15 can also be featheredged to match existing elevations.

2. Pour or pump the liquid Ardex K15 and spread in place with the Ardex T-4 Spreader. Use the Ardex T-5 Smoother and featheredge and touch-up. Wear non-metallic cleats to avoid leaving marks in the liquid Ardex K15.
3. Wood subfloors require the use of the mesh-reinforced Ardex K15 + E25 Resilient Emulsion Underlayment System. After priming, install 3.4 galvanized diamond metal lath by stapling to the wooden subfloor approximately every 6 inches to center.

F. Curing

1. Ardex K15 can be walked on in two to three hours. Moisture-insensitive tiles such as ceramic quarry and porcelain can be installed after six hours. Underlayment can accept all other finish floor covering materials after 16 hours at 70 degrees F and 50 percent relative humidity. For resinous systems such as epoxy and polyurethane floors please contact the Ardex Technical Services Department.

3.03 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 05 03 – MASONRY MORTAR AND GROUT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Mortar for masonry.

1.02 RELATED SECTIONS

- A. Section 01 33 00 – Submittal Procedures.
- B. Section 01 40 00 – Quality Requirements.
- C. Section 01 60 00 – Product Requirements: Product substitution procedures.
- D. Section 04 43 13 – Mortar Placed Stone Veneer: Installation of mortar and grout.

1.03 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 530/ASCE 5/TMS 402 – Building Code Requirements for Masonry Structures. (Edition referenced in the applicable building code.)
 - 2. ACI 530.1/ASCE 6/TMS 602 – Specifications for Masonry Structures. (Edition referenced in the applicable building code.)
- B. ASTM International:
 - 1. ASTM C144 – Standard Specification for Aggregate for Masonry Mortar.
 - 2. ASTM C150 – Standard Specification for Portland Cement.
 - 3. ASTM C207 – Standard Specification for Hydrated Lime for Masonry Purposes.
 - 4. ASTM C270 – Standard Specification for Mortar for Unit Masonry.
 - 5. ASTM C979 – Standard Specification for Pigments for Integrally Colored Concrete.

1.04 SUBMITTALS

- A. Refer to Section 01 33 00 – Submittal Procedures, Article 1.02, Paragraph B for submittal requirements.
- B. Submit mortar mix designs indicating type and proportions of ingredients in compliance with the proportion specification of ASTM C270.
- C. Submit product data under provisions of Section 01 33 00.
 - 1. Submit manufacturer of mortar pigment, procedures for mixing colored mortar.

2. For each mortar material used, submit a letter of certification or a test report confirming that the materials meet the ASTM Standards listed under the Materials Section of Specification C270.
 3. For each grout material used, submit a letter of certification or a test report confirming that the materials meet ASTM Standards listed under the Materials Section of Specification C476.
 4. Obtain written acceptance of submittals prior to the purchase of the materials or methods requiring acceptance.
- D. Samples: Submit under provisions of Section 01 33 00.
- E. Samples: Submit two ribbons of each mortar color, illustrating color and color range.
- F. Submit test reports under provisions of Section 01 40 00.
- G. Submit manufacturer's certificate under provisions of Section 01 40 00 that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with the Building Code for Masonry Structures ACI 530/ASCE 5/TMS 402 and Specifications for Masonry Structures ACI 530.1/ASCE 6/TMS 602, and commentaries. Comply with edition referenced in applicable building code.

1.06 QUALITY ASSURANCE FOR MORTAR PIGMENT

- A. ASTM C979: Pigment shall not exceed 10 percent of the weight of Portland cement.
- B. Carbon Black shall not exceed 2 percent of the weight of Portland cement.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site under provisions of Section 01 60 00.
- B. Store and protect products under provisions of Section 01 60 00.
- C. Maintain packaged materials clean, dry and protected against dampness, freezing and foreign matter.
- D. Stock pile and handle aggregates to prevent contamination from foreign materials.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Follow requirements for cold and hot weather construction in ACI 530.1/ASCE6.
1. Cold Weather Requirements: When ambient air temperature is below 40 degrees F (4.4 degrees C), implement cold weather procedures.
 2. Hot Weather Requirements: When the ambient air temperature exceeds 100

degrees F (37.8 degrees C), or exceeds 90 degrees F (32.2 degrees C) with a wind velocity greater than 8 mph (12.9 km/hr), implement hot weather procedures.

PART 2 PRODUCTS

2.01 MORTAR MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C150, Type 1.
 - a. Color:
 - 1) Match existing.
2. Hydrated Lime: ASTM C207, Type S.
3. The use of Masonry Cement will not be permitted.

B. Sand: ASTM C144, Standard Masonry Type.

C. Admixtures:

1. No air-entraining admixtures or material containing air entraining admixture.
2. No anti-freeze compounds shall be added to mortar.
3. No admixtures containing calcium chlorides shall be added to mortar.
4. Set-retarding or set-accelerating, bond-modifying or corrosion-inhibiting admixtures are prohibited without written approval from the Architect and the governing building official.

D. Water: Clean and Potable.

E. Mortar Pigment:

1. Mortar Pigment shall be finely milled (95 percent to 99 percent minus 325 mesh particle size), 90 percent pure inorganic iron oxides. Carbon added for darker shades shall not exceed 4 percent. Color pigments shall be light fast, weather resistant, alkali resistant, water soluble, lime proof, free of deleterious fillers and extenders as manufactured by SGS Solomon Colors, Inc., H series colors.
 - a. At exterior stone masonry veneer, provide mortar color to match existing.

2.02 MORTAR MIXES

A. Mortar Mixes:

1. Mortar for veneer masonry, non-load-bearing walls and partitions: ASTM C270,

Type N using the proportion specification.

PART 3 EXECUTION

3.01 FIELD MORTAR MIXING

- A. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.
 - 1. All cementitious materials and aggregate shall be mixed between 3 and 5 minutes in a mechanical batch mixer with the maximum amount of water to produce a workable consistency. Do not hand-mix mortar.
 - 2. Control batching procedures to ensure proper proportions by measuring materials by volume. Sand measurement by shovel count shall not be permitted.
- B. Maintain sand uniformly damp immediately before the mixing process.
- C. Do not use anti-freeze compounds to lower the freezing point of mortar.
- D. If water is lost by evaporation, re-temper with water only within 2 hours of initial mixing, re-temper with potable water.
- E. Discard all mortar which has begun to stiffen or is not used within 2 hours after initial mixing.
- F. Where required, mix mortar color in accordance with manufacturer's printed instructions to achieve uniformity of mix and coloration.

3.02 INSTALLATION

- A. Install mortar in accordance with Specifications for Masonry Structure, ACI 530.1/ASCE 6.

END OF SECTION

SECTION 04 43 13 – MORTAR-PLACED STONE VENEER

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Stone veneer.
- B. Reinforcement, anchorage, and accessories.

1.02 RELATED SECTIONS

- A. Section 01 33 00 – Submittal Procedures.
- B. Section 01 40 00 – Quality Requirements.
- C. Section 04 05 03 – Masonry Mortar and Grout: Mortar and grout.
- D. Section 05 40 00 – Cold-Formed Metal Framing: Exterior light-gauge steel framing for curtain wall.
- E. Section 06 16 43 – Gypsum Sheathing: Glass-faced wall sheathing.
- F. Section 07 25 00 – Weather Barriers: Sheet weather barriers installed over glass faced gypsum sheathing.
- G. Section 07 65 10 – Flexible Flashing: Installation of through wall flashing.
- H. Section 07 90 00 – Joint Protection: Rod and sealant at control and expansion joints and perimeter joints.

1.03 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 530/ASCE 5/TMS 402 – Building Code Requirements for Masonry Structures. (Edition referenced in applicable building code.)
 - 2. ACI 530.1/ASCE 6/TMS 602 – Specifications for Masonry Structures. (Edition referenced in applicable building code.)
- B. ASTM International:
 - 1. ASTM A82 – Standard Specification for Steel Wire, Plain, for Concrete.
 - 2. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 3. ASTM A366 – Standard Specification for Commercial Steel (CS) Sheet, Carbon (0.15 Maximum Percent) Cold Rolled.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with current ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602.

1.05 SUBMITTALS

- A. Refer to Section 01 33 00 – Submittal Procedures Article 1.02, Paragraph B for submittal requirements.
- B. Samples: Provide five individual stone samples of each color specified to illustrate color, texture and extreme color range.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 530 and ACI 530.1.
- B. Installer: Company specializing in performing work of this section with minimum five years of documented experience.
- C. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from a single quarry or stone fabricator with resources to provide materials of consistent quality in appearance and physical properties.

1.07 JOB CONDITIONS

- A. Protection of Flexible Flashing Membrane.
 - 1. Protect flexible flashing membrane from damage. Prior to installing masonry, inspect flashing for any damage including punctures, tears or loose scrim. Immediately notify contractor of any damage to flexible flashing. Do not proceed with work until flashing has been repaired or replaced in accordance with flexible flashing manufacturer's instructions.
- B. Staining:
 - 1. Prevent mortar from staining the face of stone to be left exposed.
 - a. Remove immediately mortar in contact with face of such stone.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00 – Product Requirements.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Hot and Cold Weather Requirements: Follow requirements for cold and hot weather construction in ACI 530.1/ASCE6/TMS 602 specifications for masonry structures.

1.10 COORDINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination and Project Requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS – STONE

- A. Re-use salvaged stone veneer from demolition of existing stone veneer.

2.02 ANCHORAGE

- A. Adjustable Masonry Veneer Anchors

1. Provide two-piece assemblies for attachment over sheathing to metal studs.
 - a. Anchor: Anchor system for stone veneer to metal stud shall consist of the following:
 - 1) Back Plate: Provide 14 gauge.
 - 2) Sheet metal shall conform to ASTM A366. Anchor shall be hot-dip galvanizing after fabrication conforming to ASTM A153 Class B2, (1.5 oz./ft²).
 - 3) Products: HB-213 by Hohmann & Barnard, Dur-O-Wal D/A 213, Wire Bond RJ-711.
 - b. Tie: Provide masonry wire tie (pintle) fabricated from cold-drawn steel wire 3/16 inch diameter conforming to ASTM A82 (tensile strength). Hot-dip galvanizing after fabrication shall conform to ASTM A153 Class B2. Provide length of tie as required to provide a minimum of 2 inch embedment into the stone bed joint with minimum 5/8 inch mortar cover.
 - c. Steel drill screws for steel studs:
 - 1) Self-drilling self-tapping screws; hex washer head, size #10, lengths required to penetrate steel stud flange by not less than 3 exposed threads.
 - 2) Organic polymer coated with salt-spray resistance to red rust of more than 800 hours per ASTM B117.
 - 3) Provide neoprene sealing washers.
2. Substitutions permitted in accordance with Section 01 60 00 – Product Requirements.

2.03 MORTAR AND GROUT

- A. Mortar: As specified in Section 04 05 03 – Masonry Mortar and Grout.

2.04 FLEXIBLE FLASHINGS

- A. Coordinate with Section 07 65 10 – Flexible Flashing.

2.05 ACCESSORIES

- A. Weep Vents: Quadro-Vent #QV 3/8 inch by 2-1/2 inch by 3-3/8 inch weep vents as manufactured by Hohmann & Barnard, Color: White, or approved equivalent.
- B. Cleaning Solution: Approved by stone manufacturer. Cleaning solution shall not be harmful to stone work or adjacent material.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.
- B. Verify that field conditions are acceptable and are ready to receive work.
- C. Verify items provided by other sections of work are properly sized and located.
- D. Verify built-in items are in proper location and ready for roughing into masonry work.

3.02 PREPARATION

- A. Mix units for exposed stone from several pallets or cubes as they are placed to produce uniform blend of colors and textures.
- B. Clean stone prior to erection. Do not use wire brushes or implements that mark or damage exposed surfaces.

3.03 INSTALLATION

- A. Cut stone as required at site to produce clean faces.
- B. Size stone units to fit opening dimensions and perimeter conditions.
- C. Wet absorptive stone in preparation for placement to minimize moisture suction from mortar.
- D. Arrange stone pattern in color uniformity and minimize visual variations to match existing stone veneer.
- E. Arrange stone coursing in bond to match existing with consistent joint width.
- F. Set stone in full mortar setting bed and with full head joints.
- G. At adjacent existing stone veneer, tooth-in newly placed veneer to match existing.

3.04 WEEP VENTS

- A. Install weep vents in head joints in exterior wythes at 32 inches o.c. horizontally above through-wall flashing, and at top of walls.
 - 1. All weep vents installed in conjunction with through-wall flashing shall be placed directly on top of the horizontal surface of the through-wall flashing. Do not place on top of the mortar bed joint at this location.

3.05 CAVITY BEHIND VENEER

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weeps.
- B. Slope beds toward cavity to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against cavity face of stone.

3.06 REINFORCEMENT AND ANCHORAGE

- A. Secure wall ties to stud framed back-up and embed into stone veneer at maximum 16 inches o.c. vertically and 16 inches o.c. horizontally.
 - 1. Install wall ties after weather barrier is installed.
 - a. Coat back of anchor plate with sealant compatible with WRB
 - 2. Screw-attach veneer anchor to stud face; ensure full contact of veneer anchor to sheathing. Provide two screws per anchor.
 - 3. Install masonry wall tie (pintle) at each veneer anchor location; install ties as exterior wythe of stone construction progresses. The legs of the pintle shall properly engage the back plate. **DO NOT INSTALL THE TIE BEYOND THE ALLOWABLE LIMITS OF ECCENTRICITY.**

3.07 FLEXIBLE MASONRY FLASHINGS

- A. Coordinate with Section 07 65 10 – Flexible Flashing.

3.08 CUTTING AND FITTING

- A. Cut and fit for conduit, sleeves and other penetrations indicated on Drawings. Coordinate with other sections of work to provide correct size, shape and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where strength of masonry work may be impaired.

3.09 CLEANING

- A. Clean work under provisions of Section 01 70 00 – Execution and Closeout Requirements.
- B. Promptly remove excess wet mortar from the face of the stone as work progresses. Do not use strong acids, overaggressive sandblasting or high-pressure cleaning methods.
- C. Replace defective mortar. Match adjacent work.
- D. Clean soiled surfaces with cleaning solution.
- E. Use non-metallic tools in cleaning operations.

3.10 MASONRY WASTE DISPOSAL

- A. Recycling: Undamaged, excess stone materials are contractor's property and shall be removed from the project site.
- B. Excess Stone Waste: Remove and legally dispose of masonry waste off Owner's property. Do not use as fill material.

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END OF SECTION

SECTION 05 40 00 – COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Exterior transverse load-bearing steel stud curtain wall, designed to resist positive and negative wind loads.
- B. Accessories.

1.02 RELATED SECTIONS

- A. Section 01 33 00 – Submittal Procedures.
- B. Section 01 60 00 – Product Requirements: Product substitution procedures.
- C. Section 07 21 16 – Blanket Insulation: Insulation within framing members of studs.
- D. Section 09 21 16 – Gypsum Board Assemblies: Securing gypsum wall board to framing

1.03 REFERENCES

- A. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- B. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot Dip Process.
- C. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- D. ASTM A1003 – Standard Specification for Steel Sheet, Carbon Metallic and Non-Metallic-Coated for Cold-Formed Framing Members.
- E. ASTM C645 – Standard Specification for Non-Structural Steel Framing Members.
- F. ASTM C754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- G. ASTM C955 – Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
- H. ASTM C1002 – Standard Specification for Steel Drill Screws for Application of Gypsum Panel Products on Metal Plaster Bases.
- I. National Association of Architectural Metal Manufacturers:
 - 1. NAAMM ML/SFA 540 – Lightweight Steel Framing Systems Manual.
- J. SSPC: The Society for Protective Coatings:

1. SSPC Paint 20 – Zinc-Rich Primers (Type I – Inorganic and Type II – Organic).
 - K. Steel Stud Manufacturers Association:
 1. SSMA – Product Technical Information.
 - L. AISI – (American Iron and Steel Institute) “North American Specification for the Design of Cold-Formed Steel Structural Members,” Current Edition.
 - M. FS TT-P-645 – Primer, Paint, Zinc-2 Chromate, Alkyd Type.
- 1.04 PERFORMANCE REQUIREMENTS – EXTERIOR TRANSVERSE LOAD-BEARING STEEL STUD CURTAIN WALL
- A. AISI “Specifications”: Calculate structural characteristics of cold-formed metal framing according to AISI's “North American Specification for the Design of Cold-Formed Steel Structural Members” and the following:
 - B. Structural Performance: Fabricate and erect cold-formed metal framing to withstand design loads within limits and under conditions required.
 1. Design framing systems to withstand design loads as follows:
 - a. Wind load: 25.7/27.8 psf.
 - b. Wind load at building corners: 25.7/34.3 psf. extending for 10 feet.
 - c. Horizontal deflection of L/600 of the wall height for masonry veneer.
 2. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 120 degrees F.
 3. Design framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings.
 - a. Vertical Deflection: 3/4 inch.
 - C. Design exterior non-load-bearing curtain wall framing to accommodate lateral deflection without regard to contribution of sheathing materials.
- 1.05 SUBMITTALS – EXTERIOR STEEL STUD TRANSVERSE LOAD-BEARING CURTAIN WALL FRAMING
- A. Section 01 33 00 – Submittal Procedures: Submittal requirements.
 - B. Product data for each type of cold-formed metal framing, accessory and product specified.
 - C. Mill certificates signed by manufacturers of cold-formed metal framing certifying that their products comply with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, and galvanized-coating thickness.
- 1.06 QUALITY ASSURANCE – EXTERIOR STEEL STUD CURTAIN WALL FRAMING

- A. Installer Qualifications: Engage an experienced Installer who has completed cold-formed metal framing similar in material, design and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Manufacturer: Company specializing in manufacturing products specified in this Section.
 - 1. Current member of Steel Stud Manufacturers Association.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Protect metal framing from corrosion, deformation and other damage during delivery, storage and handling.
- B. Store metal framing, protect with a waterproof covering and ventilate to avoid condensation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers for Exterior Curtain Wall Studs: Subject to compliance with requirements, provide metal framing by one of the following:
 - 1. Allied Studco.
 - 2. Allsteel & Gypsum Products Inc.
 - 3. California Expanded Metal Products Co.
 - 4. ClarkDietrich Building Systems.
 - 5. Consolidated Fabricators, Corp.
 - 6. Craco Metal Manufacturing, LLC
 - 7. Custom Stud, Inc.
 - 8. Design Shapes in Steel
 - 9. LFB Engineered Systems, Inc/Lennar Homes of California, Inc.
 - 10. Marino/Ware – A Division of Ware Industries
 - 11. MBA Building Supplies, Inc.
 - 12. Olmar Supply dba Denmar Steel
 - 13. Quail Run Building Materials, Inc.
 - 14. SCAFCO Corporation
 - 15. Southeastern Stud & Components, Inc.

16. Steel Construction Systems
 17. Steeler, Inc.
 18. The Formetal Co., Inc.
 19. The Steel Network, Inc.
 20. United Metal Products, Inc.
- B. Basis-of-Design Product: The design for connecting devices for exterior curtainwall framing is based on The Steel Network, Inc.
- Subject to compliance with requirements, provide named product or a comparable product by:
1. ClarkDietrich Building Systems.
- C. Products shall comply with ASTM C955.

2.02 EXTERIOR CURTAIN WALL FRAMING

- A. Steel Sheet: ASTM A1003, structural grade, Type H, metallic coated, of grade and weight as follows:
1. Grade: ST50H for 68 mil studs.
 2. Coating: G60.
- B. Steel sheet for vertical deflection clips: ASTM A653, structural steel, zinc coated, of grade and coating as follows:
1. Grade: 50, Class 1 or 2.
 2. Coating: G90.
- C. Wall Framing:
1. Steel Studs: Manufacturer's standard C-shaped steel studs of web depths indicated, with lipped flanges and complying with the following:
 - a. Studs: C shaped structural studs, complying with SSMA.
 - b. Design Uncoated Steel Thickness: Stud gauge to be determined based on design criteria and stud span. But in no case shall the stud mils be less than 68.
 - c. Flange Width: Minimum 1-5/8 inches.
 - d. Web: Punched unless otherwise noted.
 - e. Stud Width: 3-5/8 inches.
 - f. Stud Spacing: Maximum 16 inches o.c.
 2. Steel Track: Manufacturer's standard U-shaped steel track, unpunched of web depths to match width of studs with 1 1/4 inch straight flanges and complying as follows:

- a. Track: Design uncoated steel thickness, match gauge of studs as a minimum, unless otherwise scheduled.
 3. Jamb Studs: Unless otherwise noted, as a minimum, install two studs and one track nested within stud at each end of wall. Depth of stud and track along with flange width of the stud shall match wall studs. Flange width of track shall be minimum 1-1/4 inches. Studs and track shall extend the full height of the wall.
- D. Framing Accessories:
1. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 50,000 psi for 68 mil thickness material.
 2. Vertical Deflection Clips: VertiClip as manufactured by The Steel Network, Inc. (TSN) ASTM A653, 68 mil thickness, 1-1/2 inch by 3-inch clips, Grade 50, Class 1, 50 ksi yield strength, 65 ksi minimum tensile strength, G90 hot dip galvanized coating. Provide clips with manufacturer's step bushings and load rated screw fasteners. Use only deflection connection products that comply with ICC Acceptance Criteria AC261 such as Report No. ESR-1903 (or equivalent). Field fabricated clips are not permitted. Provide the following clips where shown on Drawings:
 - a. Top of Wall (Head Condition): VertiClip SL: Length of clip to match width of studs.
 - 1) Framing system shall be installed to provide for a vertical deflection of 1-1/2 inches (3/4-inch up and 3/4-inch downstep bushings).
 - 2) Provide clips with 2 slots, 2 screws and 2 step bushings. Based on loads, provide clips with 3 slots, 3 screws and 3 step bushings.

2.03 ANCHORS, CLIPS AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36, zinc coated by the hot-dip process according to ASTM A123.
- B. Powder-Actuated Anchors: Federal Specification FF-P-395b. Manufactured from AISI 1062 or 1065 steel, austempered to a minimum core hardness of 50 to 54 HRC and zinc plated in accordance with ASTM B 633. Provide fasteners listed or approved by one or more of the following and of type, diameter and length as required by structural design calculations:
 1. Underwriters Laboratory.
 2. Factory Mutual.
 3. International Code Council (ICC).
- C. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws. Provide screw type and size as required by structural design calculations for the specific condition and thickness of materials being joined.

1. Head Type: Low profile head beneath sheathing, manufacturer's standard elsewhere.

2.04 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

2.05 FABRICATION

- A. Fabricate metal framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
 1. Fabricate framing assemblies in jig templates.
 2. Cut framing members by sawing or shearing; do not torch cut.
 3. Fasten metal framing members by screw fastening as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Locate mechanical fasteners and install according to metal framing manufacturer's instructions with screw penetrating jointed members by not less than 3 exposed screw threads.
- B. Fabrication Tolerances: Fabricate assemblies to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet and as follows:
 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 2. Squareness: Fabricate each metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that building framing components are ready to receive work.
- B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION – GENERAL

- A. Install metal framing and accessories plumb, square, true to line and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
 1. Cut framing members by sawing or shearing; do not torch cut.
 2. Fasten metal framing members by screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

- a. Locate mechanical fasteners and install according to metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
- B. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.

3.03 NON-LOAD-BEARING CURTAIN WALL INSTALLATION

- A. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing – General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
 - B. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated, and at spacings as determined by structural design calculations for power driven fasteners.
 - C. At ends of studs provide a minimum of 10 inches of unpunched steel. Where field cuts reduce this minimum 10-inch unpunched steel, install web stiffening in accordance with manufacturers' requirements.
 - D. Isolate steel framing from building structure at locations indicated to prevent transfer of vertical loads while providing lateral support.
- 1. Install defection clips as shown on Drawings.
 - a. Secure clips to primary structure.
 - b. Position slotted holes of clip vertically. Secure clips to each stud using fasteners provided by the manufacturer through the center of each step, bushing. Verify step bushing is fully seated inside each slot. Do not remove tape until screws have been installed through each brushing.

3.04 TOLERANCES

- A. Maximum Variation from Plumb, Level and True Position: 1/8 inch in 10 feet.

END OF SECTION

SECTION 06 10 53 – MISCELLANEOUS CARPENTRY

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Concealed wood blocking for support of wall-hung equipment, fixtures, accessories and where shown on Drawings.
- B. Rigid wall backing plates.

1.02 REFERENCES

- A. APA American Plywood Association.
- B. SPIB – Southern Pine Inspection Bureau.
 - 1. SPIB – Standard Grading Rules for Southern Pine Lumber.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM A153/A153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 2. ASTM B695 – Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
 - 3. ASTM F1667 – Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- E. U.S. Department of Commerce National Institute of Standards and Technology:
 - 1. DOC PS1 – Construction and Industrial Plywood.
 - 2. DOC PS2 – Performance Standard for Wood-Based Structural-Use Panels.
 - 3. DOC PS 20 – American Softwood Lumber Standard.

1.04 QUALITY ASSURANCE

- A. Lumber Grading Agency: Certified by DOC PS 20.
- B. Plywood Grading Agency: Certified by APA/EWA.

1.05 SUBMITTALS

- A. Refer to Section 01 33 00 – Submittal Procedures, Article 1.02, Paragraph B for submittal requirements.

- B. Fasteners: Provide manufacturer's recommendations for types of fasteners to be used with treated materials.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surface. Stack lumber, plywood and other panels. Provide for air circulation within and around stacks and temporary coverings. Store materials off the ground
- B. Allow materials exposed to incidental moisture to dry thoroughly prior to covering with vapor- or moisture-retarding finish materials.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Lumber in accordance with DOC PS 20 and as follows:
 - 1. Softwood Lumber: Southern Pine species, #1 grade.
 - a. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified.
 - b. Provide dressed lumber S4S, surfaced four sides.
 - c. Moisture content: Kiln dried to 19% maximum moisture content at time of dressing for lumber not to receive wood preservative or fire retardant treatment.
- B. Plywood in accordance with DOC PS 1 and as follows:
 - 1. Interior
 - a. Not Exposed: APA rated all veneer plywood sheathing, exposure 1, Group 1, minimum 5 plies, of thickness indicated on Drawings.
 - b. Moisture content of panels at time of shipment shall not exceed 18 percent.
- C. Wood blocking at grab bars, shower seats, bench seats, floor-mounted cabinets and wall-hung cabinets:
 - 1. Provide a rigid wall backing system; Backit as manufactured by The Steel Network.
 - 2. Substitutions Permitted: Provide test reports verifying system will resist the following loads in accordance with the International Building Code:
 - a. Resist a minimum of 200 lbs. of concentrated load or 50 lbs. per linear foot in any direction.
 - b. Resist a concentrated load of 250 lbs.

3. Material: ASTM A653, Grade 33, 33 ksi minimum yield strength, 45 ksi minimum tensile strength, G-60 hot-dipped galvanized coating. Material thickness 20 gauge, 33 mil.

2.02 ANCHORAGE AND FASTENING MATERIALS

- A. Select proper type, size, material and finish for each application. Comply with the following:
 1. Nails and Staples: FS FF-N-105.
 2. Wood Screws: FS FF-S-111.
 3. Bolts and Studs: FS FF-B-575.
 4. Nuts: FS FF-N-836.
 5. Washers: FS FF-W-92.
 6. Lag Screws or Lag Bolts: FS FF-B-561.
 7. Toggle Bolts: FS FF-B-588.
 8. Bar or Strap Anchors: ASTM A 575 carbon steel bars.
- C. Fasteners and Anchors:
 1. At all non-treated locations, provide hot-dipped galvanized per ASTM A153, size and type to suit location.

PART 3 EXECUTION

3.01 FRAMING

- A. Set members level and plumb, in correct position.
- B. Place horizontal members crown side up.
- D. Securely attach carpentry work. Use fasteners of appropriate type and length. Coordinate with applicable specification section for size and spacing of fasteners.

3.03 SCHEDULING

- A. Concealed wood blocking in interior metal stud partitions for supporting washroom accessories, wall-hung equipment, chair rails, steel support brackets, etc:
 1. Southern pine species for lumber, untreated. Wood blocking or nailers on metal stud framing shall be screwed to framing.
- B. Concealed wood blocking in interior metal stud partitions for supporting floor-mounted cabinets and wall-hung cabinets.

1. 2 by 6 Southern pine, untreated, installed with Backit rigid wall backing. Provide an approved hot-dipped galvanized screw fastener in each guide hole in the rigid wall backing plate.

END OF SECTION

SECTION 06 16 43 – GYPSUM SHEATHING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Glass-Faced Wall Sheathing.

1.02 RELATED SECTIONS

- A. Section 01 60 00 – Product Requirements: Substitutions.
- B. Section 05 40 00 – Cold-Formed Metal Framing.
- C. Section 07 25 00 – Weather Barriers: Sealing joints in glass-faced gypsum sheathing.

1.03 REFERENCES

- A. ASTM C473 – Standard Test Methods for Physical Testing of Gypsum Panel Products.
- B. ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of Heat Flow Meter Apparatus.
- C. ASTM C954 – Standard Specification for Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs from 0.033 in. to 0.112 in. in thickness.
- D. ASTM 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.
- E. ASTM C1177 – Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- F. ASTM C1280 – Standard Specification for Application of Gypsum Sheathing.
- G. ASTM D3273 – Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environment Chamber.
- H. ASTM E72 – Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
- I. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- J. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
- K. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.

- L. ASTM E136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

1.04 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures.
- B. Product Data: Submit technical data on sheathing and roof board.
- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Mold Resistance:
 - 1. Wall sheathing shall receive a score of 10 indicating no mold growth detected in the category of mold and mildew resistance when tested in accordance with ASTM D3273.
- B. Standards:
 - 1. Wall sheathing shall meet or exceed ASTM C1177.
- C. Fire Performance, Wall Sheathing:
 - 1. Maximum flame spread – 10, maximum smoke developed – 0, when tested in accordance with ASTM E84.
 - 2. Non-combustible when tested in accordance with ASTM E136.
- D. Warranties:
 - 1. Wall Sheathing:
 - a. Wall sheathing shall have a 12-month exposure warranty.
 - b. Wall sheathing shall have a 5-year warranty against manufacturing defects.
- E. Compatibility:
 - 1. Wall sheathing shall be compatible with materials specified in Division 7 which are to be installed directly to the sheathing.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Store and protect products under provisions on Section 01 60 00 – Product Requirements: Product storage and handling requirements.
- B. Delivery: Deliver materials to the job site in manufacturer's original packaging, containers and bundles with manufacturer's brand name and identification intact and legible.

- C. Store materials protected against damage from weather, direct sunlight, surface contamination, construction traffic or other causes. Stack sheathing flat on leveled supports off the ground, under cover and fully protected from weather.
 - 1. Store and support sheathing in flat stacks to prevent sagging.
 - 2. Protect materials to keep them dry. Do not permit the entrapment of moisture or condensation.
 - 3. Protect gypsum board panels to prevent damage to edges, ends and surfaces.

PART 2 PRODUCTS

2.01 GLASS-FACED GYPSUM WALL SHEATHING

- A. Glass-Faced Sheathing: Composition, gypsum sheathing board core in accordance with ASTM C1177 with glass mats both sides and long edges.
 - 1. Products/Manufacturers:
 - a. DensGlass exterior sheathing/Georgia Pacific.
 - b. GlasRoc sheathing with EGRG technology/CertainTeed Gypsum, Inc.
 - c. GreenGlass/Temple-Inland.
 - d. Securock glass-mat sheathing/USG.
 - e. e2 XP/National Gypsum.
 - f. Substitutions permitted: Product shall comply with ASTM C1177 and shall have been tested in accordance with ASTM D3273 and receive a value of 10, and requirements of this section.
 - 2. Thickness: 1/2 inch
 - 3. Size: 4'-0" by 8'-0"

2.02 ACCESSORIES

- A. Steel drill screws complying with ASTM C1002 for the following locations:
 - 1. Fastening glass-faced sheathing to steel members less than 0.033 inch thick.
- B. Steel drill screws complying with ASTM C954 for fastening glass-faced sheathing to steel members from 0.033 to 0.112 inch thick.

PART 3 EXECUTION

3.01 GLASS-FACED SHEATHING

- A. Glass-Faced Sheathing (Exterior Wall Sheathing)
 - 1. General: Provide glass-faced board sheathing in the cavity behind the stone veneer, and where noted on the Drawings. Fasten to exterior heavy gauge stud framing using 1 1/4 inches, type S-12 bugle head self-tapping corrosion-resistant

fine thread screw fasteners for 1/2 inch and 5/8 inch thick sheathing. For light gauge metal framing use 1 1/4 inches, Type S bugle head, corrosion-resistant sharp point, fine thread screws for 1/2 inch and 5/8 inch thick sheathing. Attach sheathing perpendicular (horizontal) to framing, with end joints staggered not less than one stud spacing. Abut ends of boards over centers of stud flanges. Keep perimeter fasteners 3/8 inch from edges and ends of board units. Fit boards tightly against each other and around openings. Note: Board manufacturer shall recommend the type of coating on the fasteners based on the air/water barrier system specified.

2. Install sheathing in accordance with manufacturer's instructions and applicable instructions in GA-253. Apply DensGlass gold side, side labeled USG Securock, GreenGlass, CertainTeed GlasRoc or National Gypsum logo side out. Center end joints over supports and stagger in each course. Attach with screws to each support in accordance with manufacturer's recommended spacing, but provide not more than 8 inches o.c. at perimeter and 8 inches o.c. in the field. Drive fasteners to bear tight against and flush with surface of sheathing. Do not counter sink.

END OF SECTION

SECTION 06 41 16 – PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 GENERAL

1.01 SUMMARY

- A. Base and wall cabinets, laminated, factory finished.
- B. Countertops.
- C. Cabinet hardware.
- D. Preparation for installing utilities.
- E. Shelving.
- F. Definitions of Casework Items:
 - 1. Exposed Surfaces:
 - a. Exposed exterior surfaces, defined as all exterior surfaces exposed to view, include:
 - 1) All surfaces visible when doors and drawers are closed, including knee spaces.
 - 2) Underside of cabinet bottoms over 42 inches above the finished floor, including cabinet bottoms behind light valances and the bottom edge of light valances.
 - 3) Cabinet tops under 80 inches above the finished floor, or if 80 inches and over and visible from an upper building level or floor.
 - 4) Visible front edges of stretchers, ends, divisions, tops, bottoms, shelves and nailers.
 - 5) Sloping tops of cabinets that are visible.
 - b. Exposed interior surfaces, defined as all interior surfaces exposed to view in open casework or behind transparent doors, include:
 - 1) Shelves, including edgebanding.
 - 2) Divisions and partitions.
 - 3) Interior face of ends (sides), backs and bottoms (including pull-outs). Also included are the interior surfaces of cabinet top members 36 inches or more above the finished floor.
 - 4) Interior face of door and applied drawer fronts.
 - c. Semi-exposed surfaces, defined as those interior surfaces only exposed to view when doors or drawers are opened, include:
 - 1) Shelves, including edgebanding.
 - 2) Divisions.
 - 3) Interior face of ends (sides), backs and bottoms (including a bank of drawers). Also included are the interior surfaces of cabinet top members 36 inches or more above the finished floor.
 - 4) Drawer sides, sub-fronts, backs and bottoms.

- 5) The underside of cabinet bottoms between 24 inches and 42 inches above the finished floor.
- 5) Security and dust panels or drawer stretchers.
- d. Concealed surfaces, defined as those exterior or interior surfaces that are covered or not normally exposed to view include:
 - 1) Toe space unless otherwise specified.
 - 2) Sleepers, stretchers and solid sub-tops.
 - 3) The underside of cabinet bottoms less than 24 inches above the finished floor.
 - 4) The flat tops of cabinets 80 inches or more above the finished floor, except if visible from an upper floor or building level.
 - 5) The three non-visible edges of adjustable shelves.
 - 6) The underside of countertops, knee spaces and drawer aprons.
 - 7) The faces of cabinet ends of adjoining units that butt together.

1.02 RELATED SECTIONS

- A. Section 06 10 53 – Miscellaneous Carpentry: Securing wall and floor mounted cabinets to wood blocking.
- B. Section 06 61 16 – Solid-Surfacing Fabrications.
- C. Section 09 90 00 – Painting and Coating: Field painting work station brackets.

1.03 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A156.9 - Cabinet Hardware.
 - 2. ANSI A208.2 – Medium-Density Fiberboard (MDF) for Interior Applications.
 - a. Medium-density fiberboard (MDF) panels with a formaldehyde-free adhesive system.
 - b. Moisture-resistant, medium-density fiberboard (MDF) panels with a formaldehyde-free adhesive system.
- B. Architectural Woodwork Institute:
 - 1. AWI – Architectural Woodwork Standards, current edition.
- C. ASTM International:
 - 1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 2. ASTM D1037 – Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.
 - 3. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

- D. Composite Panel Association (CPA) Environmentally Preferable Product (EPP) Grademark Program.
- E. Federal Specification Unit:
 - 1. FS A-A-1936 - Adhesive, Contact, Neoprene Rubber.
- F. Hardwood Plywood and Veneer Association:
 - 1. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.
- G. National Electrical Manufacturers Association:
 - 1. NEMA LD 3 - High Pressure Decorative Laminates.
- H. National Fire Protection Association:
 - 1. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.
- I. Woodwork Institute:
 - 1. WI - Manual of Millwork.

1.04 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures.
- B. Submit product data for each type of product specified in this section and incorporated into items of casework.
- C. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location, and schedule of finishes.
 - 1. Show locations and sizes of furring, blocking and hanging strips specified in Section 06 10 53.
- D. Samples: Submit two 8 by 10 inch size samples, illustrating each cabinet finish specified.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with AWI Custom quality, as the minimum standard unless a higher standard of construction is specified throughout this specification.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to site under provisions of Section 01 60 00 – Product Requirements and AWI Section 2 – Care and Storage.
- B. Protect units from moisture damage.
- C. Environmental Conditions: Obtain and comply with woodwork manufacturer's and installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these

conditions have been attained and stabilized from date of installation through remainder of construction period.

1.07 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.01 HARDWOOD LUMBER

- A. Graded in accordance with AWI: Average moisture content of 6-8 percent, species yellow poplar, plain sawn.
- B. Graded in accordance with AWI: Average moisture content 6-8 percent, species yellow birch natural, plain sawn.

2.02 SHEET MATERIALS

- A. Medium-Density Fiberboard (MDF) Panels
 - 1. Material:
 - a. Wood Fiber: 100 percent pre-consumer recycled wood residuals
 - b. Binder: Formaldehyde-free adhesive system.
 - 2. Conformance: ANSI A208.2, industrial-grade MDF
 - 3. Certifications:
 - a. SCS Certified: Pre-consumer recycled wood fiber. No added formaldehyde.
 - b. CHPS Compliant: Section 01350 approved.
 - c. CPA Certified: Environmentally Preferable Product.
 - d. FSC Certified.
 - 4. Panel Thickness: 3/4 inch.
 - 5. Moisture Resistant: ASTM D1037, 6-cycle accelerated aging test.
 - 6. Physical Properties:
 - a. Density: 48 pounds per cubic foot.
 - b. Internal Bond: 200 psi.
 - c. Modulus of Rupture: 6,000 psi.
 - d. Modulus of Elasticity: 600,000 psi.
 - e. Screw Holding: Required to pull 1-inch #10 sheet metal screw.
 - 1) Face: 350 lbs.
 - 2) Edge: 275 lbs.
 - f. Water Absorption: 5 percent average, 24-hour soak.
 - g. Thickness Swell: 3 percent average, 24-hour soak.
 - h. Linear Expansion: 0.30 percent, dimensional change in length and width due to humidity change.
 - i. Flame Spread: ASTM E84; Class C
 - j. Moisture Content: 4 to 6 percent average, oven dry.
 - k. Formaldehyde Emissions: 0.01 ppm

7. Manufacturer/Product:
 - a. Sierra Pine/Medex or approved equal per Section 01 60 00.
8. Use: Countertops and backsplash.
- B. Medium-Density Fiberboard (MDF) Panels:
 1. Material:
 - a. Wood Fiber: 100 percent pre-consumer recycled wood residuals
 - b. Binder: Formaldehyde-free adhesive system
 2. Conformance: ANSI A208.2 industrial-grade MDF
 3. Certifications:
 - a. SCS Certified: Pre-consumer recycled wood fiber. No added formaldehyde.
 - b. CHPS Compliant: Section 01350 approved.
 - c. CPA Certified: Environmentally Preferable Product.
 - d. FSC Certified.
 4. Panel Thickness: 3/8 inch, 1/2 inch and 3/4 inch.
 5. Physical properties, based on 3/4 inch thickness:
 - a. Density: 48 pounds per cubic foot.
 - b. Internal Bond: 150 psi.
 - c. Modulus of Rupture: 5,500 psi.
 - d. Modulus of Elasticity: 550,000 psi.
 - e. Modulus of Hardness, Janka Ball: 1,150 pounds.
 - f. Screw Holding: Required to pull 1 inch #10 sheet metal screw.
 - 1) Face: 350 lbs.
 - 2) Edge: 275 lbs.
 - g. Water Absorption: 6.5 percent average, 24-hour soak.
 - h. Thickness Swell: 3.5 percent average, 24-hour soak.
 - i. Linear Expansion: 0.27 percent dimensional change in length and width due to humidity change.
 - j. Flame Spread Rating: ASTM E84; Class C.
 - k. Moisture Content: 6 percent average, oven dry basis
 - l. Formaldehyde Emissions: 0.01 ppm.
 6. Manufacturer/Product:
 - a. Sierra Pine/Medite II or approved equal per Section 01 60 00.

2.03 LUMBER

- A. Lumber Base: Pressure-treated lumber or 5-ply veneer core plywood.

2.04 MANUFACTURERS – PLASTIC LAMINATE

- A. Refer to finish schedule for manufacturer.

2.05 LAMINATE MATERIALS

- A. Plastic Laminate: High Pressure Decorative Laminate, NEMA LD3, Current Edition, for type; color, pattern, and finish indicated.
 - 1. General Purpose, Horizontal and High Usage Exposure: NEMA Standard HGS, nominal thickness 0.048 inches.
 - 2. General Purpose, Vertical and Medium Usage Exposure: NEMA Standard VGS, nominal thickness 0.028 inches.
 - 3. Cabinet Liner: NEMA Standard CLS, nominal thickness 0.020 inches.
 - 4. Unfinished Backing Sheet: NEMA Standard BKL, nominal thickness 0.020 inches.
- B. Thermoset Decorative Overlay: Decorative surfaces of thermally fused polyester or melamine impregnated web, pre-laminated to specified substrate and complying with Composite Panel Association.
 - 1. Substrate: Medium-density fiberboard.
 - 2. Color:
 - a. White.

2.06 ACCESSORIES

- A. Contact Adhesive and Sealants:
- B. Edging: High-pressure laminate and 3mm PVC, as noted.
- C. Cable Grommet with 90-Degree Rotating Top: Hafele 60 mm diameter opening, Cat. No. 631.26.301, color black.
- D. Fasteners: Size and type to suit application.
 - 1. To secure base cabinets to preservative treated wood plywood, use hot-dipped galvanized fasteners complying with ASTM A153 or Type 304 or 316 stainless-steel fasteners.
- E. Bolts, Nuts, Washers, Lags, Pins and Screws: Of size and type to suit application; finish in exposed locations. Shall match finish of hardware. **Note:** The use of drywall screws is not permitted. Use heavy shank steel screws.
- F. Concealed Joint Fasteners: Threaded steel.
- G. MDF water proof sealer:
 - 1. Two part epoxy system as manufactured by The West System.
 - a. Part A, West System 105 Epoxy Resin.
 - b. Part B, West System 206 Slow Hardener.
 - c. VOC Content: The combined VOC content is 9.59g/L less than 100 g/L. for weatherproofing sealer in accordance with SCAQMD Rule 1113, Architectural Coatings, amended July 13, 2007, or current version.
- H. Dowels: Minimum 5/16 inch by 1 3/16 inches.
- I. Dowel Screw: Minimum 9/32 inch by 2 inches.

J. Biscuits: #30.

2.07 HARDWARE

A. Hardware: Shall conform to ANSI/BHMA A156.9, "American National Standard for Cabinet Hardware" and BIFMA, "Business and Institutional Furniture Manufacturers' Association," Current Edition.

B. Shelf Supports for 5mm Hole: Knappe and Vogt #345 NP.

1. Shelf support shall meet ANSI/BHMA A156.9 Grade 1 requirements and test standard.

C. Wire Drawer and Door Pulls: Stanley #4484-US26D, 4 inch.

D. Hinges: European style conforming to ANSI/BHMA A156.9 Grade 1 performance and permanent set test requirements and as follows:

1. 170-degree opening.

2. Self-closing

3. All metal construction.

4. Use two per door for doors up to 36 inches high, three per door for doors up to 60 inches high, four per door for doors up to 80 inches high.

5. Provide screws as recommended by hinge manufacturer appropriate to specified panel product.

E. DualAxess by Complx Security Products with both combination and key locks. Keyed alike in room in which locking cabinet is located unless otherwise noted.

1. Unless noted otherwise provide one lock at each cabinet door and drawer.

2. At cabinet drawers, verify keying requirements for each drawer with Owner.

F. Spring-Loaded Elbow Catch: H'A'FELE #245.74.200. Provide one catch on the inactive leaf of each pair of doors noted to be locked.

G. Drawer Slides:

1. All drawer slides shall be tested in accordance with ANSI/BHMA A156.9 and in accordance with BIFMA standards.

2. Box and File Drawers: Accuride 7432, 100 lb. load rating, side mounting, steel ball bearing, full extension, for drawer widths up to 24 inches wide and drawer depths deeper than 6 inches.

a. Finish: Clear zinc (ROHS compliant)

H. Magnetic Catch: Knappe & Vogt 918 ALUM.

I. Door Bumpers: Clear plastic bumpers.

J. Work Station Brackets: A&M Hardware, Inc.

1. 1/8 inch steel, load limit 1,000 lbs.
2. 24 inches by 24 inches for 24-inch counters pre-primed for field painting.
3. 24 inches by 29 inches for 30-inch counters pre-primed for field painting. Install 29 inches length under cabinet.

2.08 FABRICATION

- A. Casework, Laminate: Shall conform to the design and details shown of the Drawings, and shall meet the requirements for casework as defined in the Architectural Woodwork Standards current edition, Section 10 – Casework, for Custom Grade woodwork for laminate finish.

1. Construction Style:
 - a. Flush Overlay Style: Provide base, wall and full height units (if any) with drawer fronts, doors and fixed panels (if any) overlaying and concealing frames and sides of cabinet bodies, Architectural Woodwork Standards, Construction Type A, Style 1 – Flush Overlay.
2. Cabinet Construction:
 - a. Laminate Cabinets: Laminate facings conforming to Architectural Woodwork Standards, Section 10 – Casework.
 - 1) Exposed exterior surfaces finish: High-pressure decorative laminate as specified.
 - 2) Exposed interior surfaces finish: High-pressure decorative laminate as specified, matching color of exposed exterior laminate unless noted otherwise.
 - 3) At inside face of door and drawer fronts: Same material and thickness as the face.
 - 4) Semi-exposed surfaces finish:
 - a) Thermally fused melamine
 - 5) Drawer sides, back and sub-fronts:
 - a) Minimum thickness: 1/2 inch.
 - b) Material: Single-species solid lumber.
 - b. Joinery and Fastening of Case Body Members. Refer to Architectural Woodwork Standards, Section 10. Case body members shall be joined in accordance with Architectural Woodwork custom grade standards as listed below:
 - 1) Exposed Ends (finished ends on casework shall be integral, not applied secondarily): Rabbeted or plowed to receive backs. Horizontal members, excluding countertops shall not extend beyond the exposed ends..
 - 2) Concealed Ends: Rabbeted or plowed to receive backs.
 - 3) Cabinet Backs: Where non-housed shall be screwed to the case body, divisions and/or fixed shelves at a maximum of 4 inches on center.
 - 4) Cabinet Backs: Where plowed-in with a minimum shoulder of 3/8 inch shall be securely nailed or stapled to the case body at a maximum of 4 inches on center.

- 5) No nails, screws or other fastenings may be visible on exposed or semi-exposed surfaces.
- 6) Rails or top panels must be provided where case will have a separate top, in order to permit concealed fastening of the separate top through such rails.
- 7) Anchor Strips: Minimum 1/2 inch thick lumber or panel product, min. 2 1/2 inches width; securely glued and mechanically attached to cabinet body members on the wall side of the cabinet back-top and bottom for wall hung and floor mounted standing cabinets. Cabinet heights over 60 inches require an intermediate anchor strip.

c. Component Construction: Wall and base cabinet.

- 1) Doors: 3/4 inch thick MDF with VGS high-pressure plastic laminate on both sides. **Note:** Laminate face side and thermoset decorative overlay back side not permitted on doors. Apply laminate to both faces in the same machine direction.
 - a) Edging: 3 mm PVC.
 - b) No cabinet door shall be more than 24 inches wide.
 - c) Stop silencers to be installed at the top and bottom of all hinged doors on the hinge side.
 - d) Doors shall stop, as applicable, against the cabinet body at the bottom, sides and top stretcher. At single and paired doors below a drawer, a rail, stretcher or partition shall be provided.
 - e) Locking pairs:
 - i. Provide an elbow catch on the inactive leaf and a stop block. The stop block shall be adequate to prevent the elbow catch from being defeated by applying pressure on the door.
- 2) Drawer Fronts: 3/4 inch thick MDF with VGS high-pressure plastic laminate on both sides. **Note:** Laminate face side and thermoset decorative overlay back side not permitted on drawers.
 - a) Edging: 3 mm PVC.
 - b) Secure to drawer box sub-front with pan/binder head, countersunk flathead or oval head screws with a minimum of two screws at each end a maximum of 1 1/2 inches from inside corners of the drawer box and a maximum of 12 inches on center.
 - c) False fronts shall be securely attached to the cabinet body.
- 3) Exposed End Panels: 3/4 inch thick MDF thermally fused melamine panel with VGS high-pressure laminate on exposed face. Where exposed end panel surfaces are exposed to view (interior and exterior), provide VGS high-pressure laminate on both surfaces.
 - a) Edging: VGS high-pressure laminate on exposed edge.
- 4) Concealed end panels (Faces of cabinet ends of adjoining units that butt together): 3/4 inch thick MDF thermally fused melamine panels at semi-exposed side. At exposed end, provide VGS high-pressure plastic laminate.

- a) Edging: 3 mm PVC on exposed surfaces.
- 5) Division Panels: 3/4 inch thick MDF.
 - a) At semi-exposed surfaces provide thermally fused melamine on both faces.
 - b) At exposed surfaces provide VGS high-pressure laminate on both sides.
 - c) Edging: 3 mm PVC on exposed edges.
- 6) Base Cabinet Bottoms: 3/4 inch thick MDF thermally fused melamine panels at semi-exposed panels. At exposed panels provide HGS high-pressure laminate.
 - a) Edging: 3 mm PVC on exposed surfaces.
- 7) Tops of Wall-Hung Cabinets and Tall Cabinets: 3/4 inch thick MDF thermally fused melamine panels at semi-exposed panels. At exposed panels provide VGS high-pressure laminate.
 - a) Edging: 3 mm PVC on exposed edges.
- 8) Bottoms of Wall-Hung Cabinets: 3/4 inch thick MDF thermally fused melamine panels at semi-exposed panels. At exposed panels provide HGS high-pressure laminate.
 - a) Edging: 3 mm PVC on exposed edges.
 - b) When unsupported do not exceed 48 inches in length. Over 48 inches provide center support.
- 9) Security and Dust Panels: 1/2 inch thick MDF.
 - a) Furnish above locked doors and drawers, only if each drawer or door is keyed differently.
 - b) Where front and rear stretchers are provided, the panel may be 1/4 inch thick and let into the stretchers.
- 10) Drawer Boxes (Sides, Backs, Sub-Fronts): 1/2 inch thick, single-species solid hardwood lumber with a hardness rating of medium or better per Appendix B, Section 3 – Lumber of the standards, factory finished with minimum one seal coat and one top coat, sides, backs and sub-fronts. Joints to be doweled and glued under pressure. Provide a minimum of two per joint. Dowels shall be spaced a maximum 1 1/4 inches on center for joints up to 4 inches in length and 2 1/2 inches on center for joints over 4 inches in length. Optional fastening methods include multiple-dovetailed or biscuit-joined under pressure. Biscuits shall be spaced a maximum of 3 inches on center, minimum two per biscuits per joint. All joints shall be securely glued.
- 12) Drawer Bottom: Minimum 1/4 inch thick MDF thermally fused melamine panels, balanced.

Note: Where drawer exceeds 30 inches in width, or bottom-mount hardware is required, the drawer bottom shall be a minimum of 1/2 inch thick MDF thermally fused melamine panels, balanced. The drawer bottom shall be plowed into drawer sides, back and sub-fronts 1/4 inch, and securely glued to form a rigid unit. Provide a minimum 3/8 inch standing shoulder on sides, back and sub-front.
- 13) Drawer Hardware, Locks:
 - a) Drawer slides to operate smoothly.

- b) Provide closing stops at the rear of both drawer sides, unless such is built into the slides to prevent the drawer from impacting the cabinet body.
 - c) Spring-loaded tip-down stop to be provided (design permitting) to prevent the drawer from pulling out of the cabinet, unless such is built into the drawer slides.
 - d) At locked banks of drawers where each drawer is keyed differently provide security or dust panels. Coordinate with locks specified in the hardware section of this specification.
 - e) At file drawers, provide clear inside height sufficient for hanging file folder tabs. Provide either a system stand or rails. At legal-sized drawers with hanging file suspension bars provide both legal- and letter-sized files.
- 14) Base and Wall Cabinet Back: 1/2 inch thick MDF. At exposed surfaces provide VGS high-pressure laminate, panels balanced. At semi-exposed surfaces provide thermally fused melamine panels.
- 15) Aprons: 3/4 inch thick MDF with VGS high-pressure plastic laminate on both sides.
- a) Edging at bottom: 3 mm PVC.
- 16) Fixed Shelves: 3/4 inch thick MDF thermally fused melamine panels at semi-exposed surfaces. At exposed surfaces provide HGS high-pressure laminate.
- a) Edging: 3 mm PVC.
 - b) Shelves shall be fixed to ends, dividers and backs.
 - c) Shelves over 48 inches in length shall have a center support.
- 17) Adjustable Shelves: 3/4 inch thick MDF for spans up to 30 inches, 1 inch for spans up to 40 inches. At semi-exposed shelves provide thermally fused melamine panels. At exposed surfaces provide HGS high-pressure laminate.

NOTE: Thickness and span of shelves is based on the following:

Load: 50 lbs. per sq. ft.
Total load: 200 lbs.
MOE of material: Minimum 525,000.

- a) Edging: 3 mm PVC.
- b) Width of shelf, maximum 1/8 inch less than inside cabinet width except where shelf-support clips require notching. Ends may exceed 1/8 inch provided both ends are banded and the total clearance between shelf clips is a maximum of 1/8 inch.
- c) Depth of shelf shall be as follows:
 - i. Maximum length 30 inches. Maximum depth 19 inches.
 - ii. Maximum length 40 inches. Maximum depth 14 inches.
- d) Shelves shall be supported on cleanly bored holes at a maximum of 2 inches on center with shelf rests.

- i. Centerline of rests shall not exceed a minimum of 1 inch to a maximum of 3 inches from the front and back of cabinet body.
- ii. Support placement shall not conflict with hinge placement.
- iii. Dimension between the centerline of the rest shall not be less than 60% of the shelf depth.
- iv. Shelves over 29 3/4 inches deep provide 3 supports at each end.
- v. Bored shelf hole support systems shall extend vertically to within 6 inches of the interior top or bottom of the cabinet.

18) Toe Kick: 3/4 inch thick preservative treated plywood.

d. Countertops (Plastic Laminate):

- 1) Exposed surfacing material: HGS high-pressure laminate.
- 2) Substrate: 3/4 MDF. Refer to 2.02, A, for product. Seal all edges of MDF at sink cutout with a color-toned water-resistant sealer.
- 3) Nominal thickness at edge 1 1/2 inches.
- 4) Provide standard unfinished backing sheet BKL.

a) Front edge: 3 mm PVC.

e. Backsplash and Sidesplash (Plastic Laminate):

- 1) Exposed surfacing material: HGS high pressure laminate.
- 2) Substrate: 3/4 inch thick MDF. Refer to 2.02, A, for product.
- 3) Exposed Ends: HGS high-pressure laminate.
- 4) Backside of all splashes shall have a backing sheet.
- 5) Assembly 1, wall mount, jobsite assembled.

- B. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- C. Install edging as specified in one piece for full length of component.
- D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- E. Apply plastic laminate finish in full uninterrupted sheets. Fit corners and joints hairline; securing with glue and concealed bolt type fasteners. Locate counter butt joints minimum 2 feet from edge of sink cutouts.
- F. Cutouts in plastic laminate countertops shall have a minimum 1/4-inch radius at all inside corners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

- A. Install casework plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8 inch to 8 feet 0 inches for plumb and level (including tops); and with no variations in flushness of adjoining surfaces.

- B. Scribe and cut casework to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.
- C. Anchor casework to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Attach countertops securely to base units.
 - 1. Casework Wall Anchorage:
 - a. Continuous Blocking or Backing: Provide minimum 2-inch by 6-inch nominal wood or 6-inch by 16 gauge metal track notched at each stud at locations shown on the casework Shop Drawings. Coordinate with Section 06 10 53 for plate used with 2 by 6.
 - b. Anchorage fasteners shall be neatly installed through the back and anchor strip, at the top and bottom of each cabinet body (wall hung and base cabinets).
 - c. Fastener to be a minimum 3-1/2 inch by #10 diameter screw with a surface-bearing head. Achieve a minimum of 1-1/2 inch penetration into the wall studs, blocking or masonry. The use of drywall or bugle-head screws is prohibited.
 - d. Exposed interior surfaces require screws capable of being recessed and covered with matching cover caps.
 - e. Each cabinet unit (wall and base unit) or undivided span shall have a minimum of four anchorage fasteners, two at the top and two at the bottom subject to:
 - 1) A maximum spacing of 16 inches on center, except wall cabinet units over 48 inches in height shall be 12 inches on center.
 - 2) Install fasteners vertically within 2 inches of the outside top and bottom of the cabinet and within 2 inches horizontally of the outside end.
 - 2. Adjoining cabinets: Adjacent cabinets shall be fastened together at the front with a minimum of two #8 by 1-1/4 inch flat, oval or pan-head screws a maximum of 30 inches on center and at exposed interior surfaces, fasteners shall be countersunk and covered to match the surface.
- D. Install casework without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
- E. Grommets shall be provided at all locations designated by the Owner. Do not install grommets until the Owner has approved the location.
- F. Provide cutouts for plumbing fixtures, and appliances as indicated. Smooth cut edges and coat with waterproof coating or adhesive.
- G. Apply a continuous bead of silicone sealant to the joint between the countertop and splash.
- H. Provide all brackets as shown on Drawings.
- I. Adjustable Shelf Supports: Two vertical rows of 5 mm diameter holes spaced at 2 inches on center.
- J. Countertop overhangs shall be consistent with a minimum of 1/2 inch and a maximum of 1 1/4 inch of cabinet face and/or finish end.

- K. Unsupported countertops spans shall not exceed 48 inches and shall be reinforced to prevent deflection in excess of 1/4 inch under a 50 lb. per square foot load.
- L. Laminations to countertops shall be made securely with Type II adhesive.
- M. Built-up members for countertops shall be MDF material.
- N. Backsplashes require end splashes at walls.
- O. At Assembly 1, wall mount backsplash and end-splash:
 - 1. Top edge to be banded.
 - 2. Front edge of end-splash to be banded.
 - 3. All splash components shall be securely adhered to the wall, butt-joined to the countertop and shall be caulked with a clear waterproof caulking so as to leave a visual bead not exceeding 1/8 inch between the bottom of the splash and the countertop.

3.03 ADJUSTING

- A. Adjust work under provisions of Section 01 70 00 – Execution and Closeout Requirements: Testing, adjusting and balancing.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean work under provisions of Section 01 70 00 – Execution and Closeout Requirements: Final cleaning.
- B. Clean casework, counters, shelves, hardware, fittings and fixtures.
- C. Protect surfaces from damage. Repair or replace damaged work that cannot be repaired to Architect's satisfaction.

3.05 PLASTIC LAMINATE SCHEDULE

- A. Refer to Drawings for location, color and manufacturer of plastic laminate.

END OF SECTION

SECTION 06 61 16 – SOLID SURFACING FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes cast plastic fabrications as scheduled at end of section.
- B. Related Sections:
 - 1. Section 06 41 16 – Plastic-Laminate-Clad Architectural Cabinets.

1.02 REFERENCES

- A. ASTM International:
 - 1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. National Electrical Manufacturers Association:
 - 1. NEMA MG 1 - Motors and Generators.
- C. Underwriters Laboratories Inc.:
 - 1. UL - Fire Resistance Directory.

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures.
- B. Shop Drawings: Indicate dimensions, thicknesses, required clearances, tolerances, materials, colors, finishes, fabrication details, field jointing, adjacent construction, methods of support, integration of plumbing components, and anchorages.
- C. Product Data: Submit data on specified component products, electrical characteristics and connection requirements.
- D. Samples: If colors are indicated on Drawings, submit an 8-inch-square sample of each selected color. If colors are not indicated on Drawings, submit manufacturer's standard color book showing colors of actual material in 2-inch by 2-inch size.
- E. Manufacturer's Instructions: Submit complete manufacturer's fabrication and installation instructions.
- F. Maintenance Instructions: Upon completion, furnish the Owner one set of manufacturer's recommended cleaning procedures.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit list of approved cleaning materials and

procedures required; list of substances harmful to component materials. Include instructions for stain removal and surface and gloss restoration.

1.05 QUALITY ASSURANCE

- A. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Installation of solid surfacing materials shall be by a firm that is authorized by solid surfacing manufacturer to fabricate and install solid surfacing materials, and that can demonstrate successful experience in installing finished carpentry items similar in type and quality to those required for this project.

1.07 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.
- B. Verify field measurements are as indicated on Shop Drawings.

1.08 SEQUENCING

- A. Sequence Work to permit installation of adjacent affected construction, plumbing rough-in.

1.09 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish ten-year manufacturer warranty for each type of unit.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Transport and handle sheets and fabricated items by methods that will prevent damage and defacing.
- B. Storage: If units are not installed immediately upon delivery to site, store in covered location, off the ground or floor, and cover with moisture- and stain-resistant paper or plastic.

1.11 ENVIRONMENTAL CONDITIONS

- A. Obtain and comply with solid surfacing manufacturer's recommendation for optimum temperature and humidity conditions for solid surfacing material during its storage and installation.

1.12 MAINTENANCE

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance

products.

- B. Furnish two containers of 16 ounces of polishing cream.

PART 2 PRODUCTS

2.01 MATERIAL

- A. General: Solid surfacing material shall be non-porous, homogenous blend of polyester or acrylic alloys and fire fillers to create a material that cuts like wood. The color and pattern shall extend throughout the material. The material shall be 3/4 inch thickness as indicated, in one piece wherever possible.

2.02 MANUFACTURER/COLOR

- A. Corian by DuPont
 - 1. Colors: As indicated in the List of Finishes on the Drawings.
 - 2. Finish: Matte.
 - 3. Thickness: 3/4 inch.
 - 4. Edge Treatment: Eased edge.
 - 5. Backsplash: Coved.
 - 6. Sidesplash: Applied.

2.03 FABRICATION AND INSTALLATION MATERIALS

- A. Joint Adhesive: Type recommended by manufacturer, in color to match solid surface material.
- B. Mildew-Resistant Silicone Sealant: FDA/UL sealant as recommended by manufacturer, in colors matching components.
- C. Contact Adhesive and Sealants as recommended by manufacturer:

2.04 FABRICATION

- A. Solid surface materials shall be fabricated by an authorized solid surface fabricator.
- B. Solid surface countertops shall be the thickness indicated, one piece wherever possible, and with flush joints sealed with joint adhesive where required. Solid surface manufacturer shall guarantee color match within the crate. Follow solid surface manufacturer's standard "Color Matching" procedures when joining sheets from outside the crate. Shop shall fabricate in the largest sections possible for transporting and building access.
- C. Ease top and front edges and corners.
- D. Solid surface materials shall be fabricated to field measurements. Seams shall be located

where shown on approved Shop Drawings. Provide seam blocks under all seams where necessary in accordance with manufacturer's recommendations.

- E. Edge detail shall be as selected by Architect.
- F. Backsplash height shall be according to detail provided.
- G. Backsplashes shall be field-installed, with tight, sealed joints, unless otherwise noted.
 - 1. Coves: Provide shop-fabricated integrally molded cove, with 3/8 inch radius between top and splash.
 - 2. Finish of exposed surfaces shall be matte according to the methods prescribed by the manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that counters and supports are suitable for installation in accordance with Shop Drawings.

3.02 INSTALLATION

- A. Install tops in locations indicated, conforming to manufacturer's recommended installation procedures. Set tops on supports and anchor using fasteners shown on approved submittals.
- B. Use silicone sealant for attaching backsplashes and reveal edges. Seal all joints with sealant.
- C. Field joints shall be hard-seamed unless otherwise specified.

3.03 CLEANING

- A. At completion of work, remove all excess material, dirt, dust, trash and other materials resulting from the installation. Clean surfaces of solid surface materials, remove all labels and leave the area clean.

3.04 PROTECTION

- A. Provide suitable protection on counters and other solid surfaces to protect the installation from damage until final acceptance. Place temporary covers over sinks to preclude their use for construction purposes.

END OF SECTION

SECTION 07 21 16 – BLANKET INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Thermal Batt Insulation.

1.02 RELATED SECTIONS

- A. Section 05 40 00 – Cold Formed Metal Framing: Installing thermal batt insulation between metal studs.
- B. Section 09 21 16 – Gypsum Board Assemblies: Acoustic insulation.
- C. Section 09 22 16 – Non-Structural Metal Framing: Installing acoustic insulation and thermal batt insulation between metal studs.

1.03 REFERENCES

- A. American Society for Testing Materials:
 - 1. ASTM C665 – Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 2. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 3. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
 - 4. ASTM E970 – Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source.

1.04 SUBMITTALS

- A. Refer to Section 01 33 00 – Submittal Procedures, Article 1.02, Paragraph B for submittal requirements.

1.05 COORDINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination and project location.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – THERMAL AND ACOUSTICAL INSULATION MATERIALS

- A. CertainTeed Corporation
 - 1. Unfaced Sustainable Insulation CertaPro Acousta Therm Batts
- B. Johns Manville

1. Unfaced formaldehyde-free batt insulation
- C. Knauf Insulation
 1. EcoBatt with ECOSE technology thermal/acoustical insulation
- D. Owens Corning
 1. EcoTouch Pink Fiberglass Insulation

2.02 MATERIALS

- A. Thermal Batt Insulation: ASTM C665; pre-formed glass fiber batt; friction fit, between metal studs, conforming to the following:
 1. Thermal Resistance:
 - a. Exterior Walls:
 - 1) At 3-5/8 metal stud walls install R13.
 2. Facing: Unfaced.
 3. Flame/Smoke Properties: 25/450 in accordance with ASTM E84.
 4. Material shall be formaldehyde free.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.
- B. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

3.02 INSTALLATION

- A. Install insulation in accordance with insulation manufacturer's instructions.
- B. Install thermal batts in exterior walls as shown on the Drawings without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.

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END OF SECTION

SECTION 07 25 00 - WEATHER BARRIERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Commercial weather barrier assemblies.
 - 2. Weather barrier flashing.
 - 3. Weather barrier accessories.
- B. Related Requirements:
 - 1. Section 04 43 13. - Mortar Placed Stone Veneer for stone masonry ties and flashing installation.
 - 2. Section 07 65 10 – Flexible Flashing: Installation of through wall flashing over WRB.

1.03 DEFINITIONS

- A. Weather Barrier: A combination of materials and accessories that do the following:
 - 1. Prevents the accumulation of water as a water-resistive barrier.
 - 2. Minimizes the air leakage into or out of the building envelope as a continuous air barrier.
 - 3. Provides sufficient water vapor transmission to enable drying as a vapor-permeable membrane.
- B. Water-Resistive Barrier: A combination of materials and accessories that prevent the accumulation of water within the wall assembly per International Building Code Section 1403.2.
- C. Continuous Air Barrier: The combination of interconnected materials, assemblies, and sealed joints and components of the building envelope that minimize air leakage into or out of the building envelope per ASHRAE 90.1 section 5.4.3.1.
- D. Vapor Diffusion: A slow movement of individual water vapor molecules from regions of higher to lower water vapor concentration (higher to lower vapor pressure).
- E. Vapor Permeable Membrane: The property of having a water-vapor permeance rating of 10 perms or greater, when tested in accordance with the desiccant method using Procedure A of ASTM E 96 per definition in International Building Code. Vapor permeable material permits the passage of moisture vapor through vapor diffusion.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference:

1. Meet with Owner, Architect, Manufacturer's Certified Installer, and installers of work that interfaces with or affects weather barrier.
2. Review methods and procedures related to weather barrier installation, including manufacturer's written instructions.
3. Review and finalize construction, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine substrate conditions and finishes for compliance with requirements.
5. Review flashings, special weather barrier details, weather barrier penetrations, and condition of other construction that affects weather barrier.
6. Review weather barrier manufacturer's Project Registration and Observation process.
7. Review Construction Indoor Air Quality Management Plan "Moisture Protection for Absorbent Materials."
8. Review temporary protection requirements for weather barrier during and after installation.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For weather barrier, include data on air and water-vapor permeance based on testing in accordance with referenced standards.

B. Shop Drawings: Show details of weather barrier at terminations, openings, and penetrations. Show details of flexible flashing applications.

1.06 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For weather barrier and flexible flashing, from ICC-ES.

B. Manufacturer's Instructions: For installation of each product specified.

C. Qualification Data: For Installer.

D. Sample Warranty: For manufacturer's warranty.

E. Reports: Field test and inspection reports.

F. Installer's weather barrier manufacturer-training certificate.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is certified by weather barrier system manufacturer to install manufacturer's product.

B. Laboratory Mockup Testing Agency Qualifications: Qualified in accordance with ASTM E 699 for testing indicated.

- C. Manufacturer's Field Service: Register project with weather barrier manufacturer prior to installation of weather barrier and comply with weather barrier manufacturer's Project registration and observation process.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Do not store near heat source or open flame.

1.09 WARRANTY

- A. Manufacturer's Product Warranty: To repair or replace weather barrier product that fails in materials within specified warranty period.
 - 1. Warranty Period: 10 years from date of purchase.
- B. Manufacturer's Product and Labor Warranty: Manufacturer agrees to repair or replace weather barrier that fails in materials within specified warranty period, including removal and replacement of affected construction up to manufacturer's limits.
 - 1. Warranty Period: 10 years from date of purchase.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Obtain weather barrier assembly components, from same manufacturer as weather barrier.

2.02 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed weather barrier and accessories shall withstand specified wind pressures, liquid water penetration, and water vapor pressures, without failure due to defective manufacture of products.
- B. High-Performance Installations:
 - 1. For installation with one of the following building envelope performance or structural characteristics:
 - a. Exceeding 65 mph equivalent structural load.
 - b. Exceeding 15 mph equivalent wind-driven rainwater infiltration.
 - c. Construction with gypsum or cement-based exterior sheathing.
 - d. Non-wood based primary structure such as: steel, light gage steel, masonry or concrete.

2.03 WEATHER BARRIER

- A. Commercial Building Wrap: ASTM E 2357 passed, ABAA (Air Barrier Association of America) evaluated air barrier assembly, and assembly water resistance per ASTM E 331; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested in accordance with ASTM E 84; UV stabilized for nine-month exposure; and acceptable to authorities having jurisdiction.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont Safety & Construction: E. I. du Pont de Nemours and Company; **Tyvek® CommercialWrap®**

2. System Description, Single-Layer Weather Barrier: Single-layer weather barrier, including flashing and sealing of penetrations and seams.
3. Air Permeance, Product: Not more than 0.001 cfm/sq. ft. at 1.57 lbf/sq. ft. when tested in accordance with ASTM E 2178.
4. Air Permeance, Assembly: Not more than 0.04 cfm/sq. ft. at 1.57 lbf/sq. ft. when tested in accordance with ASTM E 2357 and evaluated by ABAA.
5. Water Penetration Resistance, Product: Hydrostatic head resistance greater than 7.7 feet in accordance with AATTC 127.
6. Water Penetration Resistance, Assembly: Assembly wall specimen described in ASTM E 2357 to water resistance in accordance with ASTM E 331 to 12.5 lbf/sq. ft..
7. Water-Vapor Permeance: Not less than 23 perms per ASTM E 96/E 96M, Desiccant Method (Procedure A) or not less than 28 perms per ASTM E 96/E 96M, Water Method (Procedure B).
8. Water-Vapor Permeance: Not less than 30 perms per ASTM E 96/E 96M, Desiccant Method (Procedure A) or not less than 46 perms per ASTM E 96/E 96M, Water Method (Procedure B).
9. Allowable UV Exposure Time: Not less than nine months when tested in accordance with ASTM G 155 (Accelerated Weathering).
10. Flame Propagation Test: Materials and construction shall be as tested in accordance with NFPA 285.
11. Heat and Visible Smoke Release Rates: Maximum rates in accordance with NFPA 285.
 - a. Peak Heat Release: 13,217 Btu/sq. ft.
 - b. Total Heat Release: 1762 Btu/sq. ft.
 - c. Effective Heat of Combustion: 7744 Btu/lb
12. Weather barrier system to have a VOC content of 30 g/L or less.

2.04 WEATHER BARRIER FLASHING

- A. Conformable Weather Barrier Flashing: Composite flashing material composed of micro-creped, polyethylene laminate with a 100 percent butyl-based adhesive layer; AAMA 711 Class A (no primer), Level 3 thermal exposure, 176 deg F for 7 days.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont Safety & Construction: E. I. du Pont de Nemours and Company; FlexWrap™ NF:
 2. Conformability: Able to create a seamless sill pan extending up the jambs without cuts, patches, or fasteners.
 3. Water Penetration: No leakage at 15 psf per ASTM E 331.

4. Low Temperature Adhesion: Exceeds minimum value of 1.5 lb./in. at 25 degrees F as Class A (without primer use).
 5. Adhesion After Water Immersion: Exceeds minimum value of 1.5 lb./in., after AAMA 800, Sections 2.4.1.3.1/2.4.1.4.3, Test B.
- B. Strip Flashing: Composite flashing material composed of spunbonded polyethylene laminate with 100 percent butyl-based, dual-sided, adhesive layer; AAMA 711, Class A (no primer), Level 3 thermal exposure, 176 deg F for 7 days.
1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont Safety & Construction: E. I. du Pont de Nemours and Company; **StraightFlash™** or comparable product by one of the following:
 2. Water Penetration: No leakage at 15 psf per ASTM E 331.
 3. Low Temperature Adhesion: Exceeds minimum value of 1.5 lb./in. at 25 deg F as Class A without primer use.
 4. Adhesion After Water Immersion: Exceeds minimum value of 1.5 lb./in., after AAMA 800, Sections 2.4.1.3.1/2.4.1.4.3, Test B.

2.05 WEATHER BARRIER ACCESSORIES

- A. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by weather barrier manufacturer for sealing joints and penetrations in commercial building wrap.
1. Basis-of-Design Product: DuPont Safety & Construction: E. I. du Pont de Nemours and Company; Tyvek® Tape.
- B. Fasteners with Self-Gasketing Washers: Commercial building wrap manufacturer's recommended pneumatically or hand-applied fasteners with **1-inch-]** **[2-inch-]** diameter, high-density polyethylene cap washers with UV inhibitors.
1. Basis-of-Design Product: DuPont Safety & Construction: E. I. du Pont de Nemours and Company; Tyvek® Wrap Caps.
- C. Primer for Flashings: Synthetic rubber-based product; spray applied. Strengthen adhesive bond at low temperature applications between weather products such as self-adhered flashing products, commercial building wraps, and common building sheathing materials.
1. Basis-of-Design Product: DuPont Safety & Construction: E. I. du Pont de Nemours and Company, DuPont™ Adhesive Primer.
 2. Peel Adhesion Test: Passes in accordance with ASTM D 3330, Test Method F, for the following.
 - a. Peel Angles: 0, 25, 72, and 180 degrees.
 - b. Substrates: Concrete masonry units (CMU), exterior gypsum sheathing, oriented strand board (OSB), aluminum, and vinyl.
 3. Chemical Compatibility: Pass; AAMA 713.
 4. Flame Spread Index: 5; ASTM E 84.
 5. Smoke Development Index: 0; ASTM E 84.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements.
- B. Verify that substrate and surface conditions are in accordance with commercial weather barrier manufacturer recommendations prior to installation.
- C. Verify that surfaces to receive weather barrier flashing are clean, dry, and free of frost.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 COMMERCIAL BUILDING WRAP INSTALLATION

- A. General: Comply with weather barrier manufacturer's written instructions and warranty requirements.
- B. Cover exposed exterior surface of sheathing with weather barrier securely fastened to framing immediately after sheathing is installed.
 - 1. Maintain continuity of air and water barrier assemblies.
 - 2. Install weather barrier horizontally starting at lower portion of wall surface.
 - 3. Provide minimum 6 inches overlap at horizontal- and vertical-wrap seams in a shingle manner to maintain continuous downward drainage plane and air and water barrier.
- C. Seams: Seal seams with building wrap tape per manufacturer's recommended installation instructions.
 - 1. Shiplap horizontal seams in weather barrier to facilitate proper drainage.
- D. Fasteners: Use weather barrier manufacturer's recommended fasteners to secure weather barrier and install fasteners according weather barrier manufacturer's installation guidelines.
 - 1. Do not use temporary fasteners to permanently attach weather barrier.
 - 2. Do not place fasteners with gasketing washers where weather barrier flashing will be installed.
 - 3. Install fasteners with gasketing washers through flashing where recommended by manufacturer.

3.03 WEATHER BARRIER FLASHING INSTALLATION

- A. Installation: Remove wrinkles and bubbles, reposition weather barrier as necessary to produce a uniform, smooth surface.
 - 1. Ensure that ambient and substrate surface temperatures are acceptable in accordance with manufacturer instructions and recommendations.
 - 2. Wipe surfaces to remove moisture, dirt, grease and other debris that could interfere with adhesion.

3. Apply weather barrier manufacturer's recommended primer over concrete, masonry, and glass-mat gypsum wall sheathing substrates to receive weather barrier flashing.
 4. Lap weather barrier flashing a minimum of **2 inches** onto weather barrier.
 5. Apply pressure over entire surface using roller or firm hand pressure
- B. Penetrations: Apply weather barrier manufacturer's recommended weather barrier flashing patches behind fastening plates, such as brick-tie base plates, metal-flashing clips, and metal channels.
1. Seal weather barrier around each penetration with weather barrier manufacturer's recommended self-adhered flashing product or sealant. Integrate products with flanges into the weather barrier.
- C. Terminations: Provide minimum 2 inches overlap using strip flashing on adjoining overhang and base of wall systems to maintain continuous downward drainage plane.
1. Secure weather barrier with fasteners and weather-barrier flashing.

3.04 DRAINAGE MATERIAL INSTALLATION

- A. Install drainage material with grooves or channels running vertically in compliance with manufacturer's written instructions.

3.05 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to train installers and observe subject test-wall areas and installations.

3.06 CLEANING

- A. Immediately remove release paper and scrap from work area and dispose of material in accordance with requirements of **Section 01 70 00 – Execution and Closeout**,

3.07 PROTECTION

- A. Protect installed weather barrier from the following:
1. Damage from cladding, structure, or a component of the structure.
 2. Contamination from building site chemicals, premature deterioration of building materials, or nonstandard use or application of products.
 3. Foreign objects or agents, including the use of materials incompatible with weather barrier products.
 4. UV exposure in excess of products' stated limits.

END OF SECTION

SECTION 07 26 13 – MOISTURE CONTROL SYSTEM

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes the furnishing and application of moisture control systems and self-leveling underlayments for the reduction of moisture vapor transmission and alkalinity control for interior concrete slabs requiring the installation of the following floor systems:
 - 1. Resilient Tile Flooring
 - 2. Carpet

1.02 RELATED SECTIONS

- A. Section 01 20 00 – Prices and Payment Procedures: Unit price for performing Work specified in this Section.
- B. Section 01 40 00 – Quality Requirements.
- C. Section 01 45 23 – Concrete In-Situ Relative Humidity, Anhydrous Calcium Chloride and pH Testing: Testing requirements.
- D. Section 03 54 16 – Hydraulic Cement Underlayment.
- E. Section 09 65 00 – Resilient Flooring: Resilient flooring installation requirements.
- F. Section 09 68 13 – Tile Carpeting: Carpet installation requirements.

1.03 REFERENCES

- A. American Society of Testing Materials:
 - 1. ASTM D7234 – Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
 - 2. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
 - 3. ASTM F1869-10 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 - 4. ASTM F2170-09 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probes.
- B. ICRI, International Concrete Repair Institute.

1.04 TESTING

- A. Before installation of the finish floor materials over the concrete slabs, anhydrous calcium chloride testing per ASTM F1869-10, in-situ relative humidity testing per ASTM F2170-09

and pH testing shall be performed by the Owner's Testing Lab to determine the level of water vapor transmission in the slab and the type of moisture reduction system required. Refer to Section 01 45 23 for testing procedures.

- B. The Owner's Testing Lab shall coordinate the test with the General Contractor's project scheduling to allow sufficient time to test, submit their findings and install the moisture control system before the installation of the finish flooring materials.

1.05 SUBMITTALS

- A. General: Submit in accordance with Section 01 33 00 – Submittal Procedures.
- B. Product Data: Provide product data for each type of product and process specified which shall include the following:
 - 1. Manufacturer's specifications.
 - 2. Manufacturer's installation instructions.
 - 3. Independent test data.
 - 4. Certification requirements.
 - 5. Warranty information.
- C. The installer of the moisture control system shall submit the following tests obtained from the General Contractor:
 - 1. Test results from the anhydrous calcium chloride testing according to ASTM F1869-10.
 - 2. Test results from the in-situ relative humidity testing according to ASTM F2170-09.
 - 3. Test results from the pH test.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installation of the Moisture Control System shall be by a manufacturer-approved installer with experience in surface preparation and application of the materials specified.
 - 2. Approved installer shall have not less than five (5) years of experience installing the moisture control system specified.
- B. Manufacturer's Qualifications:
 - 1. The manufacturer shall have not less than three (3) years of experience in manufacturing the same moisture control system. The moisture control system shall be specifically formulated and marketed internationally for moisture control

and alkalinity control without change of formulation or system design for a minimum period of three (3) years.

2. Manufacturer shall provide the Owner with their standard 15-year warranty at no additional cost.
3. Manufacturer shall provide Independent lab test reports documenting performance per the following:
 - a. ASTM E96 – Water Vapor Transmission (dry and wet methods). Performance shall be documented at a minimum 90 percent water vapor transmission reduction compared to untreated durable concrete.
- B. The Moisture Control System shall be installed only over concrete surfaces that have been properly mechanically prepared to a minimum surface profile of ICRI CSP #3 and which have an RH value of 100 percent or less when measured in accordance with ASTM F2170.
- C. The moisture control system shall comply with ASTM F3010 – Standard Practice for Two Component Resin Based Membrane Flooring Moisture Mitigation Systems for Use Under Resilient Floor Covering.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to the job site in their original unopened containers, clearly labeled with the manufacturer's name and brand designation.
- B. Store products in an approved ventilated dry area, protect from moisture, freezing and direct sunlight.

1.08 WARRANTY

- A. Manufacturer's Warranty: Warrant vapor emission control treatment against manufacturing defects and improper installations for a period of 15 years.
 1. Cover costs of treatment materials, cementitious compounds and labor costs of application and preparation.
 2. Extend warranty to flooring material, adhesive and installation labor for same period against moisture vapor emission and alkalinity-related failure.
 3. Provide warranty underwritten by product liability insurance carrier having a minimum "A" rating from Best or equivalent rating system in the amount of \$5,000,000 per occurrence and naming Owner, Architect and Contractor as co-insured.
 4. Warranty may not exclude concrete slabs containing silica or silicate compounds.

1.10 SITE CONDITIONS

- A. Do not apply moisture control system to unprotected surfaces or surfaces with standing water.

- B. Do not apply moisture control system below 50 degrees F surface temperature or where the temperature is expected to fall below 50 degrees F within 24 hours from time of application.
- C. Allow for continuous ventilation and indirect air movement at all times during application and curing process.

PART 2 PRODUCTS

2.01 MANUFACTURERS/PRODUCTS

- A. Moisture control systems which may be incorporated in the Work shall be the product of a single manufacturer:
 - 1. Manufacturer: Allied Construction Technologies, Inc.
 - a. Products
 - 1) Moisture control system: AC Tech 2170, two component, fluid applied 100 solids epoxy based moisture control system.
 - a) VOC content: 0 g/L < 100 g/L.
 - 2) Underlayment primer: AC Tech 2170 SLP self-leveling primer.
 - a) VOC content: 0 g/L < 100 g/L.
 - 3) Portland-cement-based underlayment system: Self-leveling underlayment concrete system recommended by AC Tech.
 - a) VOC content: 0 g/L < 100 g/L.
 - 2. Manufacturer: Ardex Engineered Cements
 - a. Products
 - 1) Moisture control system: Ardex MC Plus, two-coat moisture control system consisting of a primer and sealer.
 - a) VOC content: 0 g/L < 100 g/L.
 - 2) Underlayment primer: Ardex P82 Ultra primer.
 - a) VOC content: 0 g/L < 100 g/L.
 - 3) Portland-cement-based underlayment system: Ardex K15 Premium self-leveling underlayment concrete.
 - a) VOC content: 0 g/L < 100 g/L.
 - 3. Manufacturer: Koster American Corporation.

- a. Products:
 - 1) Moisture control system: VAP 1 2000 System.
 - a) VOC content: 10 g/L < 100 g/L.
 - 2) Underlayment primer: VAP 1 06 primer.
 - a) VOC content: 0 g/L < 100 g/L.
 - 3) Portland-cement-based underlayment system: VAP 1 Level Pro self-leveling underlayment or Mapei Ultraplan 1 Plus.
 - a) VOC content: 0 g/L < 100 g/L.
- B. Materials: Provide all required materials necessary for a complete installation over the concrete surface where the vapor emissions, the relative humidity and pH levels of the concrete are in conformance with the flooring manufacturer's requirements and the concrete surface is suitable to receive the finish floor materials.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Pre-Installation Moisture Testing: Conduct pre-installation concrete moisture-vapor emissions, relative humidity and alkalinity testing on all interior slab areas to receive finish flooring.
- B. Examine concrete substrates with Installer present for compliance with requirements for installation of concrete moisture-vapor and alkalinity control system. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Inspect all surfaces with regard to their suitability to receive the moisture control system with the manufacturer's representative.
- B. The concrete shall be clean, and free of all oil, grease, dirt, curing compounds and any substance that might act as a bond breaker.
 - 1. Verify surfaces to be treated with the moisture control system have not been previously treated with other materials such as underlayments, screeds or penetrating sealers. Notify manufacturer's representative of these conditions prior to application of the moisture control system.
- C. Shotblast all floors to a concrete surface profile of #3 or #4 and clean surfaces to remove all residue off the concrete. Fibers used to reinforce the concrete shall be burned off, scraped and vacuumed. Remove all fibers, after shotblasting, leaving no fibers on the concrete surface. Acid etching and the use of sweeping compounds and solvents are not permitted as means of preparing the substrate.

1. Shotblast a small area and verify with the specific floor applicator that the surfaces are fit to receive the specified flooring system without application of an underlayment.
- D. Repair concrete prior to moisture vapor reduction system installation using materials recommended by moisture system control manufacturer.
- E. Joint and Crack Preparation:
 1. Moving Joints: Do not bridge moving joints with the moisture control system.
 2. Saw Cuts, Control Joints and Non-Moving Cracks: Fill all non-moving joints and cracks with material recommended by manufacturer of the moisture control system.

3.03 APPLICATION

- A. Mix and apply moisture control system following the printed instructions from the manufacturer.
- B. Apply self-leveling cementitious underlayment and primer to a smooth and level surface, after installation of the moisture control system. Install to a thickness of 1/8 inch.

3.04 PROTECTION

- A. Protect each coat during the required cure time from any kind of traffic, water and contaminants.

END OF SECTION

SECTION 07 90 00 – JOINT PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preparing substrate surfaces.
- B. Sealant and joint backing.
- C. Summary.
 - 1. Exterior joints in vertical surfaces, indicated below:
 - a. Joints between EIFS and stone.
 - b. Other joints indicated.
 - 2. Interior joints in vertical surfaces and horizontal non-traffic surfaces as indicated below:
 - a. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - b. Other joints as indicated.

1.02 REFERENCES

- A. American Society for Testing and Materials:
 - 1. ASTM C510 – Standard Test Method for Staining and Color Change of Single and Multi-Component Joint Sealants.
 - 2. ASTM C639 – Standard Test Method for Rheological (Flow) Properties of Elastomeric Sealants.
 - 3. ASTM C661 – Standard Test Method for Indentation Hardness of Elastomeric Sealants by Means of a Durometer.
 - 4. ASTM C679 - Standard Test Method for Tack-Free Time of Elastomeric Sealants.
 - 5. ASTM C717 – Terminology of Building Seals and Sealants.
 - 6. ASTM C719 - Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement. (Hockman Cycle)
 - 7. ASTM C793 - Standard Test Method for Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants.
 - 8. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.

9. ASTM C834 – Standard Specification for Latex Sealants.
 10. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
 11. ASTM C1135 – Standard Test Method for Determining Tensile Adhesion Properties of Structural Sealants.
 12. ASTM C1183 – Standard Test Method for Extrusion Rate of Elastomeric Sealants.
 13. ASTM C1193 – Standard Guide for Use of Joint Sealants.
 14. ASTM C1246 – Standard Test Method for Effects of Heat Aging on Weight Loss, Cracking and Chalking of Elastomeric Sealants After Cure.
 15. ASTM C1247 – Standard Test Method for Durability of Sealants Exposed to Continuous Immersion in Liquids.
 16. ASTM C1248 – Standard Test Method for Staining of Porous Substrate by Joint Sealants.
 17. ASTM C1311 – Standard Specification for Solvent Release Sealants.
 18. ASTM C1330 – Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
 19. ASTM C1382 – Test Method for Determining Tensile Adhesion Properties of Sealants When Used in Exterior Insulation and Finish Systems (EIFS) Joints.
 20. ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
 21. ASTM D624 – Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
 22. ASTM D1056 – Standard Specification for Flexible Cellular Materials – Sponge or Expanded Rubber.
 23. ASTM D2202 – Standard Test Method for Slump of Sealants.
 24. ASTM D2240 – Rubber Property Durometer Hardness.
 25. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.
- B. SWRI (Sealant, Waterproofing and Restoration Institute) – Sealant and Caulking Guide Specification.

1.03 ADHESION, COMPATIBILITY AND STAIN TESTS

- A. The General Contractor shall provide to sealant manufacturers, samples of all substrates which are in contact with sealant, regardless of whether adhesion must be achieved.
- B. For substrates which must support adhesion, submit to the Architect, for record only, sealant manufacturers' reports of adhesion tests conducted in accordance with ASTM C794.
- C. For exterior insulation and finish system (EIFS) substrates which must support adhesion, submit to the Architect for record only, sealant manufacturer's reports of adhesion test conducted in accordance with ASTM C1382.
- D. For stone (marble, granite, limestone, sandstone), submit to the Architect, for record only, sealant manufacturers' reports of stain tests for sealants and primers conducted in accordance with ASTM C1248.
- E. For all test results, submit manufacturers' recommendations for application and quality control procedures.

1.04 SUBMITTALS

- A. Refer to Section 01 33 00- Submittal Procedures, Article 1.02, Paragraph B for submittal requirements.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten years of documented experience.
- B. Applicator: Company specializing in performing the work of this section with minimum 5 years of documented experience.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to project site in original, unopened containers or bundles with labels indicating manufacturer, product name and designations, color, expiration period for use, pot life curing time and mixing instructions for multicomponent requirements.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants or other causes.

1.09 PROJECT CONDITIONS

- A. Joint width: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.
- B. Joint substrate conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from the joint substrates.
- C. Temperature: Do not proceed with installation of joint sealants when ambient and substrate temperature conditions are outside the limits by joint sealant manufacturer.

PART 2 PRODUCTS

2.01 MATERIALS – GENERAL

- A. Compatibility: Provide joint sealants, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and applications, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide color of exposed to view joint sealants to comply with the following:
 - 1. At masonry, provide colors to match masonry and mortar colors.
 - 2. Provide selections made by architect from manufacturer's full range of standard colors for products of type indicated. Provide custom colors where the manufacturer's standard colors do not match masonry.

2.02 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing Elastomeric sealant that complies with ASTM C920 and other requirements indicated on each Elastomeric joint sealant data sheet at the end of this section, including those requirements referencing ASTM C920 classifications for type, grade, class and uses.
 - 1. Additional Movement Capability: Where additional movement capability is specified in Elastomeric joint sealant data sheet, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C920 for uses indicated.
- B. Products: Subject to compliance with requirements, provide one of the products specified in each Elastomeric joint sealant data sheet.

2.03 LATEX JOINT SEALANTS

- A. General: Provide manufacturer's standard one-part, non-sag, non-staining, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for

exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.

- B. Acrylic Latex Sealant: Provide product complying with ASTM C834.
- C. Products: Subject to compliance with requirements provide one of the following:
 - 1. Acrylic-Latex Sealant
 - a. "AC-20," Pecora Corp.
 - 1) VOC content: 31 g/L.
 - b. "Tremflex 834," Tremco
 - 1) VOC content: 11 g/L.

2.04 JOINT SEALANT BACKING

- A. General: Provide sealant backings of materials and type that are non-staining, are compatible with joint substrates, sealants, primers and other joint fillers, and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding, strips of flexible plastic foam, of material indicated below and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 - 1. Closed-cell polyethylene foam rod, nonabsorbent to liquid, water and gas, non-outgasing in unruptured state, for porous joint substrates.
 - 2. Open-cell polyurethane foam rod, for non-porous joint substrates.
- C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape.

2.05 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.
- B. Cleaners for Non-Porous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent non-porous surfaces and formulated to promote optimum adhesion of sealants with joint substrates.

- C. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination and Project Condition.
- B. Verify that substrate surfaces and joint openings are ready to receive work.
- C. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

- A. Surface cleaning of joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Masonry
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal
 - b. Glass
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on pre-construction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

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

3.03 INSTALLATION

- A. Install sealant in accordance with manufacturer's printed instructions, except where more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C1193 for use of joint sealants as applicable to materials, applications and conditions indicated.
- C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
 - 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture or tear joint fillers.
 - c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
 - 2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.
- D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability to install sealants at the same time sealant backings are installed.
- E. Complete horizontal joints prior to vertical joints. Lap vertical sealant over horizontal sealant.
- F. Tooling of Non-Sag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, eliminate air pockets and ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
 - 1. Provide concave joint configurations per Figure 8A in ASTM C1193, unless otherwise indicated.

3.04 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so

that they are without deterioration or damage at time of substantial completion. If despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that the repaired installations are indistinguishable from original work.

3.05 CLEANING

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

JOINT SEALANT SCHEDULE

DESIGNATION	JOINT SEALERS	DESCRIPTION OF JOINT CONSTRUCTION AND LOCATION WHERE SEALANT IS TYPICALLY APPLIED.
ES-1	One-Part Neutral Cure Silicone Sealant	A. Exterior Joints in Vertical Surfaces at:
ES-2	Not Used	Not Used
ES-3	Not Used	Not Used
ES-4	One-Part Acid Curing Mildew- Resistant Silicone Sealant	Sealing around shower enclosures, sinks, urinals, bathroom fixtures, waterproofing rimless sinks
ES-5	Not Used	Not Used
ES-6	Not Used	Not Used
AES	Acrylic Sealant	Interior joints in field painted vertical and overhead surfaces, at perimeter of hollow metal frames, in gypsum drywall, in non- movement concrete block joints and all other joints not indicated otherwise.
SRC-S	Not Used	Not Used
Preformed Foam Sealant		Not Used

ELASTOMERIC JOINT SEALANT DATA SHEET

ELASTOMERIC JOINT SEALANT DESIGNATION:

ES-1 – Sealing Joints in EIFS

BASE POLYMER: Neutral-Curing Ultra Low-Modulus Silicone

TYPE: S (Single Component)

GRADE: NS – (Non-Sag)

CLASS: 100/50

ADDITIONAL MOVEMENT CAPABILITIES: +100% / -50%

USE RELATED TO EXPOSURE: NT – (Non-Traffic)

USES RELATED TO JOINT SUBSTRATES: M, G and A and as applicable to O substrates indicated

- *EIFS to EIFS, EIFS to perimeter of metal frames, EIFS to masonry, EIFS to concrete.

COMPLIANCE:

1. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
2. ASTM C1382 – Test Method for Determining Tensile Adhesion Properties of Sealants When Used in Exterior Insulation and Finish System (EIFS) Joints.
3. Sealant – Waterproofing and Restoration Institute Sealant Validation.

*** Verify sealant and backer rod compatibility with EIFS manufacturer. If sealant specified is not compatible with EIF system, provide and install sealant approved for use with approved EIF system. Provide sealant in accordance with EIF manufacturer's warranty requirements. Coordinate with Section 07 24 19.**

PRIMER: As recommended by sealant manufacturer for proper adhesion to joint substrate.

BACKER RODS: As recommended by sealant manufacturer, compatible with joint substrates, sealant, primer and other joint fillers.

ACCEPTABLE MANUFACTURERS AND PRODUCTS:

Subject to compliance with requirements of Contract Documents, provide product by one of the manufacturers named below. If not named, submit a substitution according to conditions of the Contract and appropriate Division 1 sections.

1. Dow Corning; 790
 - a. Acceptable for use by Dryvit, Sto Corp., TEIFS. Provide testing per ASTM C1382.
 - b. VOC content: 43 g/L.
2. Pecora Corp.; 890 NST
 - a. Tested per ASTM C1382 with Dryvit, Parex, Sto Corp.
 - b. VOC content: 98 g/L.

3. Tremco Inc.; Spectrem 1
 - a. Tested per ASTM C1382 with Dryvit, Sto, Senenergy, TEIFS.
 - b. VOC content: 0 g/L.

ELASTOMERIC JOINT SEALANT DATA SHEET

ELASTOMERIC JOINT SEALANT DESIGNATION:

ES-4 – Sealing Around Showers, Tubs, Sinks
and Plumbing Fixtures

BASE POLYMER: Acid-Curing Silicone

TYPE: S – (Single Component)

GRADE: NS – (Non-Sag)

CLASS: 25

ADDITIONAL MOVEMENT CAPABILITIES:

USE RELATED TO EXPOSURE: NT – (Non-Traffic)

USES RELATED TO JOINT SUBSTRATES: G, A and O Substrates as listed:

PRIMER: As recommended by sealant manufacturer for proper adhesion to joint substrates.

BACKER RODS: As recommended by sealant manufacturer compatible with joint substrates, sealant, primer and other joint fillers.

COMPLIANCE:

1. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.

ACCEPTABLE MANUFACTURER/PRODUCTS:

Subject to compliance with requirements of Contract Documents, provide product by one of the manufacturers named below. If not named, submit a substitution according to conditions of the Contract and appropriate Division 1 sections.

1. Dow Corning; 786 silicone mildew-resistant
 - a. VOC content: 33 g/L.
2. Pecora Corp.; 898 sanitary silicone
 - a. VOC content: 40 g/L.
3. Tremco Inc.; Tremsil 200
 - a. VOC content: 35 g/L.

END OF SECTION

SECTION 08 12 14 – STANDARD STEEL FRAMES

PART 1 GENERAL

1.01 SUMMARY

A. This Section Includes:

1. Non-Rated Frames.
 - a. Door frames.

B. Related Sections:

1. Section 08 14 16 – Flush Wood Doors.
2. Section 08 71 00 – Door Hardware.
3. Section 09 22 16 – Non-Structural Metal Framing: Securing steel frames to metal studs.
4. Section 09 90 00 – Painting and Coating.

1.02 REFERENCES

A. American National Standards Institute:

1. ANSI/DHI A115 – Specifications for Hardware Preparations in Standard Steel Doors and Frames.
2. ANSI/DHI A115.1G – Installation Guide for Doors and Hardware.
3. ANSI A250.3 – Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames.
4. ANSI A250.4 – Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings.
5. ANSI A250.6 – Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
6. ANSI A250.7 – Nomenclature for Steel Doors and Steel Frames.
7. ANSI A250.8-SDI-100 – Recommended Specifications for Standard Steel Doors and Frames; 2003 (R2008).
8. ANSI A250.10 – Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
9. ANSI A250.11 – Recommended Erection Instructions for Steel Frames (Formerly SDI-105).

B. ASTM International:

1. ASTM A568 – Standard Specification for Steel Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
2. ASTM A591 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. ASTM A1008 – Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

C. NAAMM/HMMA – Hollow Metal Manufacturers Association:

1. HMMA 820 TN03 – Guidelines for Glazing of Hollow Metal Transoms, Sidelights and Windows.

D. SDI – Steel Door Institute:

1. SDI 111 – Recommended Details and Guidelines for Standard Steel Doors and Frames and Accessories.
2. SDI 112 – Zinc-Coated (Galvanized/Galvannealed) Standard Steel Doors and Frames.
3. SDI 117 – Manufacturing Tolerances for Standard Steel Doors and Frames.
4. SDI 122 – Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
5. SDI 124 – Maintenance of Standard Steel Doors and Frames.

1.03 SUBMITTALS FOR REVIEW

- A. Section 01 33 00 – Submittal Procedures: Procedures for submittals.
- B. Product Data: Indicate frame configuration and finishes.
- C. Shop Drawings: Indicate frame elevations, reinforcement, anchor types and spacings, location of cut-outs for hardware, and finish.
- D. Certificates: Product certificates signed by manufacturer certifying material compliance with specified requirements.
- E. Installation Instructions: Manufacturer's printed installation instructions.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of ANSI A250.8-2003 (R2008).

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum 5 years of documented experience.

1.06 DELIVERY, STORAGE AND PROTECTION

- A. Section 01 60 00 – Product Requirements: Transport, handle, store and protect products.
- B. Accept frames on site in manufacturer's packaging. Inspect for damage.
- C. Frames shall be stored under cover on 4" wood sills on floors in a manner that will prevent rust and damage. Do not use non-vented plastic or canvas shelters, which create humidity and promote rusting. Frames shall be stored in a vertical position, five units maximum in a stack. Provide 1/4" space between frames to promote air circulation.

1.07 PROJECT CONDITIONS

- A. Section 01 30 00 – Administrative Requirements: Coordination and Project Conditions.
- B. Coordinate the work with frame opening construction, door and hardware installation.
- C. Sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.

PART 2 PRODUCTS

2.01 FRAME MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide product by one of the manufacturers listed below. If not named, submit as a substitution according to Conditions of the Contract and appropriate Division 1 sections.
 - 1. Amweld Building Products, LLC.
 - 2. Ceco Door/Assa Abloy.
 - 3. Curries Company/Assa Abloy.
 - 4. Deansteel Manufacturing Company.
 - 5. Door Components.
 - 6. Mesker.
 - 7. MPI.
 - 8. Pioneer.
 - 9. Republic Builders Products.
 - 10. Security Metal Products, Inc.

11. Steelcraft.

2.02 MATERIALS

- A. Frames and frame anchors for each of the levels and models specified shall be provided to meet the requirements of the performance levels specified. The material used in manufacturing these products and components shall comply with ANSI A250.8. Hardware reinforcing on frames shall comply with ANSI A250.6. The physical performance levels shall be in accordance with ANSI A250.4.
- B. Cold-rolled steel shall conform to ASTM designations A1008 – Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability and A568 – Standard Specification for Steel Sheet, Carbon and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.

2.03 FRAMES

- A. Provide metal frames for doors, transoms, sidelights, windows (borrowed lights) and other openings, according to ANSI A250.8-2003 (R2008), and of types and styles as shown on Drawings and schedules. Conceal fastenings, unless otherwise indicated.
 - 1. Interior Frames:
 - a. Material: Cold-rolled steel conforming to ASTM A1008 and ASTM A568.
 - b. Minimum material thickness: 0.053 inches (16 gauge).
- B. Door Silencers: Drill stops to receive 3 silencers on strike jambs of single-door frames.
- C. Plaster Guards: Provide minimum 0.0179 inch thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

2.04 FABRICATION

- A. Corner joints shall have all contact edges closed tight with faces mitered and stops either butted or mitered.
 - 1. Welded Frames: Full profile welded, also specified as fully welded or continuously welded.
 - a. Weld miter joints between head and jamb faces completely along their length either internally or externally.
 - b. Internally weld perimeter profile joints full length of soffit stops and rabbets with hairline seams on external meeting surfaces. Grind and finish face joints smooth.
 - c. Face joints at meeting mullions or between mullions and other frame members shall be completely externally welded on the faces only. All welds shall be ground and finished smooth.

2. Welded frames shall be provided with two temporary steel spreader bars, welded to the jambs at each rabbet of door openings, for shipping and handling purposes only. These temporary spreader bars shall be removed and setting spreaders, supplied by the installer shall be used for installation of the frame. Refer to ANSI A250.11 – Recommended Erection Instructions for Steel Frames.
- B. Fabricate jambs and heads straight and uniform throughout their lengths; square and free of defects, warps or buckles.
- C. Fabricate frames with hardware reinforcement plates welded in place. Provide mortar guard boxes.
- D. Prepare frames for silencers. Provide three single silencers for single doors on strike side.
- E. When shipping limitations or site access so dictate, or when advised by the contractor responsible for coordination or installation, frame product for large openings shall be fabricated in sections designated for assembly in the field by others. Alignment plates or angles shall be installed at each joint. Such components shall be the same material and thickness as the frame. Field joints shall be made in accordance with approved Submittal Drawings and shall be field welded by others.
- F. Floor Anchors:
1. Floor anchors shall be provided with two holes for fasteners and shall be secured inside jambs with at least four (4) spot welds per anchor.
 2. Where specified or scheduled, adjustable floor anchors, providing not less than 2 inches (50.8 mm) height adjustment, shall be fastened in place with at least four (4) spot welds per anchor.
 3. For applications that do not permit the use of a floor anchor, an additional jamb anchor shall be substituted at a location not to exceed 8 inches (204 mm) from the base of the jamb.
 4. Floor anchor shall be of same material and thickness as frame.
- G. In cases where electrically or electronically operated hardware is required and indicated on the approved hardware schedule, conduit, hardware enclosures and/or junction boxes shall be provided. Access plates, where required, shall be the same material and thickness as the frame product and shall be fastened with not less than four (4) #8-32 machine screws or #6 sheet metal screws at a spacing not to exceed 12 inc. on center.
- H. Tolerances:
1. Face Widths, Door Stop Heights and Jamb Depths: 0.031 inch.
 2. Throat Openings: 0.063 inch.
 3. Door Rabbets: 0.016 inch.

2.05 FINISHING

A. Steel:

1. Remove weld slag and splatter from exposed surfaces.
2. Fill and sand all tool marks, abrasions and surface blemishes to present smooth uniform surfaces.
3. On exposed surfaces where zinc-iron alloy coating has been removed during fabrication, factory apply rust inhibitive touch-up primer.
4. Fully cure primer prior to shipment.

2.06 SHOP PRIMER

- A. Prime Finish: Frames shall be thoroughly cleaned, and chemically treated to insure maximum paint adhesion. All surfaces of the frame exposed to view shall receive a factory applied coat of rust inhibiting primer, either air-dried or baked-on. The finish shall meet the requirements for acceptance stated in ANSI A250.10 "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames."
- B. Apply primers to frames after fabrication. Coordinate primer with field-applied finish coatings as specified in Section 09 90 00 for compatibility, with finish coats.

2.07 HARDWARE PREPARATION

- A. Prepare frames for hardware specified elsewhere; comply with DHI A115 series standards; adjust locations to allow for specified clearances and size tolerances, with maximum variation from template dimensions of plus 0.015 inch and minus 0.
- B. Fully Templated Mortise Hardware: Factory blank, reinforce, drill and tap frames in accordance with approved shop drawings and templates provided by hardware supplier.
1. Factory prepare templated holes 0.5 inch diameter and larger, except mounting and through bolt holes.
 2. Factory prepare templated holes less than 0.5 inch diameter when required for the function of the device (for knobs, levers, cylinders, thumb or turn pieces) or when these holes over-lap function holes.
- C. Mortised Hardware Not Fully Templated: Factory blank and reinforce frames; drill and tap on site.
- D. Reinforce frames in accordance with Table 4 of ANSI A250.8-2003 (R2008).

2.08 FRAME ANCHORAGE

- A. Frame Anchors: Provide anchors appropriate to floor, wall and frame construction.
1. Provide fasteners, anchor bolts, and expansion shell anchors as required.
- B. Standard Frames:

1. Dry Wall Type:
 - a. Frame product for installation in dry-wall partitions shall be provided with steel stud jamb anchors of suitable design, not less than 0.042 inch thickness, securely welded inside each jamb. Jamb anchors shall be placed a maximum of 18 inches from top and bottom of openings. The minimum number spaced at maximum 32 inches on center, near hinges and directly opposite on strike jambs, provided on each jamb, based on the overall frame height, shall be as follows:
 - 1) Up to 60 inches: 3 anchors.
 - 2) Greater than 60 inches up to 90 inches: 4 anchors.
 - 3) Greater than 90 inches up to 96 inches: 5 anchors.
 - 4) Greater than 96 inches: 5 anchors plus one for each 24 inches or fraction thereof, spaced at 24 inches maximum between anchors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.

3.02 INSTALLATION

- A. General: Install steel frames and accessories according to Shop Drawings, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions of ANSI A250.11 and DHI A115.IG, unless otherwise indicated.
- C. Set frames plumb, square, aligned, without twist and at correct elevation, within the following tolerances:
 1. Plumbness: Not more than 0.063 inch out of plumb, measured using a line from the intersection of vertical members and the head to the floor.
 2. Squareness: Not more than 0.063 inch difference between diagonal measurements between corners.
 3. Alignment: Not more than 0.063 inch measured on jambs, through a horizontal line parallel to the plane of the wall.
 4. Twist: Not more than 0.063 inch measured at face corners of jambs, on parallel lines perpendicular to the plane of the wall.
- D. Brace frames rigidly in position while partitions are being constructed.

1. Remove temporary steel shipping jamb spreaders.
 2. Install wood spreaders at mid-point of frame rabbet height to maintain frame widths.
 3. Provide vertical support at center of head for openings exceeding 48 inches in width.
 4. Remove wood spreaders after product has been built-in.
- E. Place frames before constructing enclosing walls and ceilings.
- F. Secure anchorages and connections to adjacent construction.
- G. Install hardware in accordance with ANSI A115.1G, manufacturer's templates and instructions.
- H. Keep steel surfaces free of bonding materials, and sealers; clean surfaces immediately following installation.
- I. Touch up damaged surfaces and exposed field welds with rust inhibitive primer:
1. Finish exposed field welds to present a smooth uniform surface.
 2. Follow recommendations of final paint finish manufacturer.
- J. Damaged work will be rejected and shall be replaced at no additional cost to the owner.
- K. Coordinate installation of frames with hardware specified in Section 08 71 00 and doors in Section 08 14 16.

3.03 ADJUSTING

- A. Adjust operable parts for correct clearances and function.
- B. Adjust hinge sets, locksets and other hardware. Lubricate using a suitable lubricant compatible with door and frame coatings.

3.04 CLEANING AND PROTECTION

- A. Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions before Owner's acceptance.
- B. Remove from project site and legally dispose of construction debris associated with this work.
- C. Protect installed products and finished surfaces from damage during construction.

END OF SECTION

SECTION 08 14 16 – FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This Section includes the following flush wood doors, fire-rated and non-rated:
 - 1. Solid core doors with plastic laminate faces.
 - 2. Factory finishing of flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.02 RELATED SECTIONS

- A. Section 08 12 14 – Standard Steel Frames.
- B. Section 08 71 00 – Door Hardware.

1.03 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A115 – W Series, Wood Door Hardware Standards..
- B. Door and Hardware Institute:
 - 1. DHI-WDHA-3 – Recommended Hardware Locations for Wood Doors.
- C. National Electrical Manufacturers Association:
 - 1. NEMA LD3 – High Pressure Decorative Laminates.
- D. Window and Door Manufacturers Association:
 - 1. ANSI/WDMA 1.S.1A-13 – Industry Standard for Architectural Wood Flush Doors.

1.04 SUBMITTALS FOR REVIEW

- A. Section 01 33 00 – Submittals: Procedures for submittals.
- B. Product Data: For each type of door indicate details of core and edge construction, trim and factory-finishing specifications.
- C. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, and factory finishing criteria.
- D. Construction Samples: Submit four samples of door construction, 5 by 5 inch in size, cut from top corner of door.

- E. Finishing Samples: Submit a set of 3 illustrating the range of color and grain of the specified door face material, minimum 6 x 6 inch in size illustrating:

- 1. Plastic laminate door faces: Color, texture and pattern.

- F. Manufacturer's full lifetime warranty.

1.05 SUBMITTALS FOR INFORMATION

- A. Section 01 33 00 - Submittals: Procedures for submittals.
- B. Manufacturer's Installation Instructions: Indicate special installation instructions.

1.06 QUALITY ASSURANCE

- A. Quality Standard: Comply with the following standard:
 - 1. Meet or exceed ANSI/WDMA 1.S.1 A-13 Industry Standard for Architectural Wood Flush Doors.
- B. Single-Source Responsibility: Obtain doors from one source and by a single manufacturer.

1.07 DELIVERY, STORAGE AND PROTECTION

- A. Section 01 60 00 – Product Requirements: Transport, handle, store and protect products.
- B. Deliver, store, protect and handle products under provisions of WDMA and manufacturer's care and handling instructions.
- C. Store doors flat on a level surface in a dry, well-ventilated building. Doors shall be kept at least 4 inches off the floor and shall have protective coverings under the bottom door and over the top. Covering shall protect doors from dirt, water and abuse, and shall allow for air circulation under and around the stack.
- D. Doors shall not be exposed to direct light (artificial or natural). Wrap individual doors with opaque wrapping.
- E. Do not subject doors to extremes of heat and or humidity. Do not allow doors to come in contact with water. HVAC systems shall be operational and balanced, providing a temperature range of 50 to 90 degrees F and 30% to 50% relative humidity.
- F. When handling doors, always lift and carry. Do not drag across other doors or surfaces.
- G. Each door shall be marked on top rail with door opening number.

1.08 PROJECT CONDITIONS

- A. Coordinate the work with door opening construction, door frame and door hardware installation.
- B. Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas

during the remainder of the construction period to comply with the following requirements applicable to Project's geographical location:

1. Deliver, store, protect and handle products under provisions of WDMA and manufacturer's care and handling instructions.

1.09 WARRANTY

- A. General Warranty: Door manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup or twist) more than 1/4 inch in a 42-by-84-inch section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span, or do not conform to tolerance limitations of referenced quality standards.
 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.
 2. Warranty shall be in effect during the following period of time after date of Substantial Completion.
 - a. Solid Core Interior Doors: "Full Life of Original Installation."

PART 2 PRODUCTS

2.01 MANUFACTURERS/PRODUCTS

- A. Basis of Design: Contract Documents are based on manufacturer and product named below to establish a Standard of Quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and do not change concept as expressed in Contract Documents as judged by Architect.
 1. Basis of Design, Plastic Laminate Wood Doors:
 - a. Manufacturer/Product: Masonite Architectural, Aspiro Series | Marshfield-Algoma, Interior Solid Core Flush Laminate-Faced (HPDL) Doors – Choice Laminate.
 - 1) Non-rated: Aspiro Series, Structural Composite Lumber, No added Urea-Formaldehyde, FSC Certified (extra heavy-duty performance level), Model A-SCLC-B-NR.
- B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide product by one of the manufacturers below. If not named, submit as substitution according to Conditions of the Contract and appropriate Division 1 section.
 1. Eggers Industries, Architectural Door Division.

2. VT Industries.

2.02 WORKMANSHIP

- A. Comply with ANSI/WDMA 1.S.1A-13.

2.03 PERFORMANCE STANDARD

- A. Comply with ANSI/WDMA I.S. 1A-13 Extra Heavy Duty, Performance Duty Level.
- B. Cross band required for fire approval and to meet ANSI/WDMA 1.S 1A-13 required performance duty level.

2.04 DOOR TYPES (PLASTIC LAMINATE)

- A. Door designation per ANSI/WDMA 1.S.1A-13.
- B. Flush Interior Doors (Non-Rated): SCLC-HPDL-5, Environmental Structural Composite Lumber Core Door with decorative laminate each side (5-ply), 1-3/4 inches thick.

2.05 MATERIALS

- A. Door Construction Aesthetic Grade:
 1. Except as may be otherwise shown on the drawings, fabricate the work of this Section to ANSI/WDMA 1.S.1A-13 "Custom A Grade."

2.06 FABRICATION

- A. Door Core Construction: Comply with the following requirements:
 1. Non-Rated: Extra Heavy Duty Performance Level Environmental Structural Composite Lumber Core.
- B. Vertical Edges (Stiles)
 1. Non-Rated (Plastic Laminate):
 - a. Manufacturer's standard laminated hardwood edge or SCL.
 - b. Edges, same laminate as door facing, applied after face.
 - c. Joints: No joints allowed.
- C. Horizontal Edge (Rails)
 1. Mill option structural composite lumber or hardwood lumber.
- D. Adhesive:
 1. Type I or Type II.
- E. Machining for non-rated doors:
 1. Factory fit and machine doors for frames and finish hardware in accordance with

hardware requirements and dimensions.

F. Plastic laminate:

1. Colors, Patterns and Finishes: As indicated on list of finishes.
2. Faces: NEMA LD-3, HGS (nominal 0.048 inch) high-pressure decorative laminate.

2.07 FABRICATION

A. Fabricate flush wood doors to comply with following requirements:

1. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels:
 - a. Comply with clearance requirements of referenced quality standard for fitting.
2. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3 recommended hardware locations for wood flush doors. Comply with final hardware schedules, door frame Shop Drawings, ANSI A115.W Series Standards and hardware templates.
 - a. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory machining.

2.08 FACTORY FINISHING

- A. General: Comply with ANSI/WDMA 1.S.1A-13 standard's requirements for factory finishing.
- B. Finish wood doors at factory.
- C. Plastic Laminate: As specified.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine installed door frames prior to hanging door:
 1. Verify that frames comply with indicated requirements for type, size, location and swing characteristics and have been installed with plumb jambs and level heads.
 2. Reject doors with defects.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Hardware: For installation see Section 08 71 00 – Door Hardware.

- B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and referenced quality standard and as indicated.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Laminated Doors: Restore finish before installation, if fitting or machining is required at the job site.
- E. Do not install doors until the HVAC system is operating.

3.03 ADJUSTING AND PROTECTION

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Refinish or replace doors damaged during installation.
- C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 08 31 13 – ACCESS DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-rated access doors.
- B. Provide for access to controls, valves, traps, dampers, cleanouts and similar items requiring operation behind inaccessible finished surfaces.
- C. Coordinate exact locations with various trades to assure proper placement of access doors and panels.

1.02 RELATED SECTIONS

- A. Section 09 90 00 – Painting and Coating: Field paint finish.

1.03 SUBMITTALS

- A. Refer to Section 01 33 00 -Submittal Procedures Article 1.02, Paragraph B for submittal requirements.

1.04 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain access doors for entire project from one source from a single manufacturer.
- B. Size Variations: Obtain Architect/Engineer acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.
- C. Coordination: Furnish inserts and anchoring devices that must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

1.06 COORDINATION

- A. Section 01 30 00 – Administrative Requirements: Requirements for coordination.
- B. Verification: Obtain specific locations and sizes for required access doors from trades requiring access to concealed equipment, and indicate on submittal schedule.

1.07 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 – Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of access units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Contract Documents are based on manufacturer and products named below to establish a Standard of Quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and do not change concept as expressed in Contract Documents as judged by Architect.

1. Basis of Design Selections:
 - a. Manufacturer: Milcor Inc.
 - b. Products:
 - 1) Access Door Style "DW"

B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide product by one of the manufacturers named below. If not named, submit as substitution according to Conditions of the Contract and appropriate Division 1 sections.

1. SESCO Products.
2. J.L. Industries.
3. Larsens Manufacturing Company.
4. Nystrom Building Products.

2.02 ACCESS UNITS – GYPSUM BOARD WALLS AND CEILINGS

A. At gypsum board openings: Milcor Access Door Style "DW":

1. 3203-014, Door size 14 inches by 14 inches.
2. 3203-019, Door size 24 inches by 24 inches.

B. Fabrication:

1. Fabricate frames of 16-gauge steel.
2. Fabricate door panels of 14-gauge steel.
3. At drywall access doors provide galvanized drywall bead.
4. Weld, fill, and grind joints to assure flush, square unit.
5. Hardware:
 - a. Hinges: Double-acting concealed spring type.
 - b. Locks: Key-operated cylinder lock with two keys.

2.03 FINISHES

A. Base Metal Protection: Prime coat units with baked on primer for wall and ceiling units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Ensure that rough openings for door and frame are correctly sized and located.

3.02 LOCATION

- A. Coordinate with plumbing and HVAC Drawings for equipment which requires access. Items which require access include, but are not limited to, valves, traps, drains, cleanouts and fire dampers. Refer to Schedule at the end of this Section.

3.03 INSTALLATION

- A. Install units according to printed manufacturer's instructions.
- B. Install frames plumb and level in opening. Secure rigidly in place.
- C. Position unit to provide convenient access to concealed work requiring access.

3.04 SCHEDULE

- A. Minimum Sizes: Coordinate with mechanical specifications and with the specific project requirements.
- B. Walls:
 - 1. In unrated walls, 14 inches by 14 inches: Plumbing valves, reset buttons, control manometers, etc.
 - 2. In unrated walls, 24 inches by 24 inches: Plumbing fittings at toilets, mechanical filter banks, access hatches, areas requiring work access for the unit replacement, etc.

END OF SECTION

SECTION 08 58 00 - ALUMINUM INTERIOR SLIDING SERVICE WINDOW

PART 1 GENERAL

1.01 SUMMARY

- A. This section includes:
 - 1. Aluminum, heavy-duty interior sliding service windows as indicated in drawings and in sections.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's technical product data substantiating that products comply.
- B. Shop drawings: Submit for fabrication and installation of windows. Include details, elevations and installation requirement of finish hardware and cleaning.
- C. Certification: Provide printed data in sufficient detail to indicate compliance with the contract documents.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver windows crated to provide protection during transit and job storage
- B. Inspect windows upon delivery for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts should be removed and replaced.
- C. Store windows at building site under cover in dry location.

1.04 PROJECT CONDITIONS

- A. Field measurements: Check opening by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1.05 WARRANTY

- A. All material and workmanship shall be warranted against defects for a period of one (1) year from the original date of purchase.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER'S

- A. Basis of design: Design is based on aluminum, interior sliding service window manufactured by **C.R. Laurence Co., Inc.**

2.02 MATERIALS

- A. Frames: 4" Aluminum frame modules shall be constructed of 6063-T5 extruded aluminum. Replacement and servicing of glass shall be from the clerk side of the window by means of an access panel in the top header and does not require the removal of the frame from the opening. Window glides on top-hung heavy-duty ball bearing slides. Poly-pile weather stripping and self-latching handle. Overall frame sizes are to be in accordance with the contract drawings.
- B. Finish: All aluminum to be clear anodized.
- C. Glazing: The glazing vinyl supplied is for ¼" in thickness. Glass not included, to be supplied by others.
- D. Options: Keyed lock, and burglar bar.
- E. Models: 'DW' Series (XOX). X = sliding panel, O = fixed panel, as viewed from clerks side.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install window in accordance with manufacturer's printed instructions and recommendations. Repair damaged units as directed (if approved by the manufacturer and the architect) or replace with new units.

3.02 CLEANING

- A. Clean frame and glazing surfaces after installation, complying with requirements contained in the manufacturer's instructions. Remove excess glazing sealant compounds, dirt or other substances.

3.03 PROTECTION

- A. Institute protective measures required throughout the remainder of the construction period to ensure that all the windows do not incur any damage or deterioration, other than normal weathering, at the time of acceptance.

END OF SECTION

SECTION 08 71 00 – FINISH HARDWARE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the supply and installation of the finish hardware.
- B. Related Sections
 - 1. Division 8 – Openings.
 - 2. Division 26 - Electrical
 - 3. Division 28 - Electronic Safety and Security
 - 4. Section 28 31 00 - Fire Detection and Alarm

1.02 REFERENCES:

- A. Documents and Institutes that shall be used in estimating, detailing and installing the items specified.
 - 1. International Building Code – Current/Adopted Edition
 - 2. ICC/ANSI A117.1 – Accessible and Usable Building and Facilities – Current/Adopted Edition
 - 3. ANSI - American National Standards Institute
 - 4. BHMA – Builders Hardware Manufacturers Association
 - 5. Texas Accessibility Standards – Current Adopted Edition

1.03 SUBMITTALS

- A. Comply with pertinent provisions of Section 01 33 00.
- B. Finish Hardware Schedule to be in vertical format to include:
 - 1. Heading #/Hardware Set
 - 2. Door #, Location, Hand, Degree of Opening, Door Size and Type, Frame Size and Type, Fire Rating
 - 3. Quantity, type, style, function, product, product number, size, fasteners, finish and manufacturer of each hardware item.
 - 4. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
 - 5. Keying schedule.

6. Title Sheet, Index, Abbreviations, Manufacturers List, Template List and Templates.
 7. Mounting locations for hardware.
 8. Explanation of abbreviations, symbols and codes contained in schedule.
- C. Product Data: Provide product data in the form of a binder, manufacturer's technical product fact sheets for each item of hardware. Include whatever information may be necessary to show compliance with requirements, including instructions for installation and for maintenance of operating parts and finish.
- D. Wiring Diagrams: Provide Riser/Elevation and Point to Point Wiring Diagrams for all openings with electrified hardware. Include all information that is necessary for coordination with other trades.
- E. Samples: Provide samples as requested by owner or architect with Heading # and Door# marked on boxes. All samples will be returned to the contractor and used on doors for which they were marked.
- F. Templates: Provide templates of finish hardware items to each fabricator of doors, frames and other work to be factory or shop prepared for the installation of hardware.
- G. Keying Schedule: A keying schedule shall be submitted using keyset symbols referenced in DHI manual "Keying Systems and Nomenclature." The keying schedule shall be indexed by door number, keyset, hardware heading number, cross keying instructions and special key stamping instructions.
- H. Operations and maintenance data: At the completion of the job, provide to the owner two copies of an Owner's operation and maintenance manual. The manual shall consist of a labeled hardcover three ring binder with the following technical information:
1. Title page containing: Project name, address and phone numbers. Supplier's name, address and phone numbers.
 2. Table of Contents.
 3. Copy of final Finish Hardware Schedule and Keying Schedule
 4. Maintenance instruction for each item of hardware.
 5. Catalog pages for each product.
 6. Installation Instructions and Parts List for all Locks, Exit Devices and Door Closers.

1.04 QUALITY ASSURANCES

- A. Substitutions: Request for substitutions shall not be accepted within this project.
1. Architect, Owner and Hardware Consultant have selected one (1) specified and two (2) equals listed hereinafter in the Hardware Schedule. By this selection

process they have established three (3) equal products for competitive pricing, while insuring no unnecessary delays by a substitution process. If any specified product is listed as a "No Substitution" product, this product will be supplied as specified, with no alteration or request of substitution. The reason for this is to comply with the uniformity established at this project. Parts and supplies are inventoried for these particular products for ease and standardization of replacement.

- B. Supplier Qualifications: Supplier shall be recognized architectural finish hardware supplier, with warehousing facilities, who have been furnishing hardware in the project vicinity for a period of not less than 2 year and who is or employs a DHI Certified AHC or person with a minimum of 10 years of experience as a hardware supplier. This person shall be available at reasonable times during the course of the work for consultation about products hardware requirements, to the owner, architect and contractor.
- C. Installer Qualifications (Mechanical Hardware): All finish hardware shall be installed by the finish hardware installer with a minimum of at least two (2) years documented experience. Installer shall attend a pre-installation meeting between the contractor, finish hardware supplier, hardware manufacturer's representative for locks, closers and exit devices, all door / frame suppliers. The finish hardware installer shall be responsible for the proper installation and function of all doors and hardware.
- D. Installer Qualifications (Electrified Hardware): All electrified finish hardware (power, load, switch, conductor and monitoring device) shall be installed by a Electronic Access Control installer licensed by the Texas Department of Public Safety. The electrified finish hardware installer shall have a minimum of at least two (2) years of documented experience. Installer shall attend a pre-installation meeting between the contractor,
 - 1. Finish hardware supplier, electrical contractor, fire alarm contractor, security contractor, hardware manufacturer's representative for locks, closers and exit devices, all door/frame suppliers. The electrified finish hardware installer shall be responsible for the proper installation and function of all doors and hardware. Installation shall include wiring all electrified products (including the required wire to the power supply and/or junction box).

1.05 DELIVERY, STORAGE AND HANDLING

- A. Marking and packaging: Mark each item or package separately, with identification related to hardware set number, door number and keyset symbol.
- B. Delivery:
 - 1. Deliver individually packaged and properly marked finish hardware at the proper time and location to avoid any delays in construction or installation.
 - 2. At time of delivery, inventory hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- C. Storage: Store hardware in enclosed, dry and locked area.

1.06 WARRANTY

- A. All finish hardware products shall be covered by a 1-year factory warranty from the date of substantial completion of the project. Exit devices shall carry a 3-year warranty. Mechanical door closers shall carry a 10-year warranty.
- B. Supply warranty verification to the owner for all products that provide factory warranty.

1.07 MAINTENANCE:

- A. Maintenance Service
 - 1. None
- B. Extra Materials:
 - 1. All extra screws, fasteners, and all special installation tools furnished with the hardware shall be turned over to the owner at the completion of the job.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Manufacturer	Abbreviation	Website
Falcon	FAL	www.falconlock.com
Glynn Johnson	GLY	www.glynn-johnson.com
Ives	IVE	www.ives.ingersollrand.com
Schlage	SCH	www.schlage.com
Von Duprin	VON	www.vonduprin.com

2.02 MATERIALS

- A. Screws and Fasteners:
 - 1. All closers and exit devices provided for exterior doors and hollow metal doors shall be provided with thru-bolts.
 - 2. All finish hardware shall be installed to manufacturer's recommendations, using screws, attachments and installation tools provided with the hardware. No other screws or attachments are acceptable.
 - 3. All other products to meet door and frame conditions.
- B. Hinges:
 - 1. Template: Provide templated units only.
 - 2. Exterior: All exterior hinges shall be stainless steel base and finish.
 - 3. Interior: All interior hinges steel based satin chrome finish.
 - 4. Exit devices: All hinges on doors with exit devices shall be heavy weight.

5. Electric Hinge: Provide 8 wire.
6. Provide non-removable pins for outswinging doors that are locked or are lockable.
7. All hinges shall be ball bearing.
8. All hinges shall be five knuckle.
9. All hinges shall be full mortise.
10. Size: Provide 4-1/2 by 4-1/2 hinges on doors up to 3'-0" in width. Provide 5 by 4-1/2 hinges on door from 3'-2" to 4'-0" in width. Reference manufacturer's catalog for all other sizes.
11. Number of Hinges: Provide number of hinges indicated but not less than three hinges for door leaf for doors 90 inches or less in height and one additional hinge for each 30 inches of additional height.
12. The width of hinge shall be sufficient to clear all trim.
13. Supply from the following list of manufacturers:
 - a. Ives (5BB/5BBHW)
 - b. Hager (BB1279, BB1191, BB168, BB1199)
 - c. Bommer

C. Cylindrical Locks/Latches

1. Provide cylindrical locksets that comply with ANSI A156.2, Series 4000, Grade 1; tested to exceed 3,000,000 cycles. Functions as listed in Hardware Sets.
2. Provide cylindrical locksets that meet ANSI A117.1, Accessibility Code.
3. Provide cylindrical locksets that meet UL A label; to have a minimum listing for single doors 4 feet by 8 feet.
4. Provide cylindrical locksets that comply with California Fire Safety Code; lever return to within 1/2 inch of the door where applicable.
5. Lockset to have the ability to incorporate either a rigid or free-wheeling lever when in locked mode where shown in hardware sets.
6. Chassis to be field-changeable to free-wheeling lever.
7. Chassis to be one-piece, modular assembly.
8. Chassis to be multi-functional; interchange of function assembly without disassembly of lockset.
9. Spindle to be deep-draw manufactured. Manufacturers utilizing stamped spindles are not acceptable.

10. Spring cage to have double compression springs. Manufacturers utilizing torsion springs are not acceptable.
11. Spindle and spring cage (internal) to be one-piece integrated assembly.
12. Levers to be bi-directional, independent assemblies.
13. Lever to be free-wheeling when locked where shown in hardware sets.
14. Levers are to be solid. Manufacturers utilizing fillers of any kind are not acceptable.
15. Levers are to be plated to match BHMA finishes.
16. Levers to have grooved tactile warnings on back side of lever where shown in hardware sets. Manufacturers that insert devices and/or apply materials for warning are not acceptable.
17. Anti-rotation plate to be interlocking to lock chassis. Manufacturers utilizing anti-rotation plates with bit-tabs are not acceptable.
18. Thru-bolts to be a minimum of 1/4 inch in diameter.
19. Thru-bolts to secure anti-rotation plate without sheer line. Manufacturers utilizing fully threaded thru-bolts are not acceptable.
20. Adjustment plate to be threaded for door thickness adjustment.
21. Adjustment plate to adjust for doors from 1-5/8 inch thickness to 2-1/8 inch thickness.
22. Adjustment plate to have visual chassis marking for doors 1-3/4 inch thick.
23. Latchbolt to be steel with minimum 1/2 inch throw deadlatch on keyed and exterior functions; 3/4 inch throw anti-friction latchbolt on pairs of doors.
24. Strike to be ANSI curved lip, 1-1/4 inches by 4-7/8 inches, 16 gauge, with 1-inch-deep box construction.
25. Supply from the following list of manufacturers: Schlage – ND Sparta (no substitution)

D. Exit Devices

1. All exit device types on this project should be manufactured by the same manufacturer.
2. Exit devices are to be architectural grade touch bar type. Mechanism case to be smooth (35/98)
3. Exit devices shall meet ANSI A156.3, 1994, Grade 1. All exit devices are UL listed for Accident Hazard or Fire Exit Hardware.

4. All lever trim to match lock trim in design and finish.
5. Dogging: All non-rated devices are to be provided with dogging. Cylinder dogging as shown in hardware sets.
6. Exit devices are to be supplied and installed with thru-bolts for exterior, hollow metal doors, or as required for application.
7. Mullion shall be removable. Keyed removable as shown in hardware sets
8. Provide proper power supply for exit devices as required.
9. Delayed egress exit devices should have 60-second delayed egress.
10. For all interior application on hollow metal and wood doors the delayed egress should be built into the exit device.
11. Push pads shall be metal; no plastic inserts allowed.
12. Exit devices shall have a flush end cap.
13. Exit devices shall be ordered with the correct strike for application.
14. Exit devices shall be order in the proper length to meet door width.
15. Exit devices shall have a fluid dampener that decelerates the pushpad on its return stroke and eliminates most notes associated with exit device operation.
16. Exit devices shall have deadlatching.
17. Install exit devices with fasteners supplied by exit device manufacturer.
18. Provide glass bead kits as required.
19. Provide proper concealed vertical rods for wood or hollow metal doors as required.
20. Supply from the following list of manufacturers:
 - a. Von Duprin 35/98 Series (Smooth)
 - b. Monarch/Falcon 24/25 Series
 - c. Detex

E. Door Closers

1. All door closers on this project should be manufactured by the same manufacturer.
2. Door closers shall meet the minimum requirements of the 1990 ADA act, in lieu of ANSI Standard A156.4 and ANSI, Grade 1 on interior fire-rated openings.

3. Door closers shall be furnished with standard cover. Provide full cover as shown in hardware sets.
4. Size in accordance with the manufacturers recommendations for door size and condition.
5. Door closers shall be furnished with backcheck, delayed action, hold-open and advanced backcheck as listed in the Hardware Sets.
6. Door closers shall be mounted out of the line of sight wherever possible (i.e., room side of corridor doors, etc.) with parallel arm mounting on out swinging doors.
7. Provide and mount closer top jamb or on brackets and/or drop plates, where special conditions call for it.
8. All closer installation shall include thru bolts on exterior, hollow metal doors or where required for application.
9. Door closers shall be cast iron.
10. Door closers shall be certified to exceed ten million full load operating cycles by a recognized independent testing laboratory.
11. Door closers shall be plated to match locks and exit devices.
12. Door closers shall be handed.
13. Concealed closers shall be provided for public areas and those areas with aesthetic considerations.
14. Supply from the following list of manufacturers:
 - a. Falcon SC71/SC81

F. Door Protection Plates

1. Protective plates shall meet ANSI A156.6 requirements for .050 thickness.
2. Protection plates should be fabricated from stainless steel.
3. Kickplates shall be 10 inches by 2 inches less than door width on single door and 1 inch less than door width on pair of doors or as indicated in hardware sets. Beveled three edges.
4. Provide kickplate on all wood doors with closers, unless not required for aesthetic reasons.
5. Supply from the following list of manufacturers:
 - a. Ives (8400)
 - b. Rockwood
 - c. Trimco

G. Door Stops and Holders:

1. Wall and Floor Stops: Supply wall stops where needed to protect doors or door hardware. When wall conditions do not permit use of wall stop provide floor stops with risers as needed to adjust for floor conditions.
2. Overhead Stops: Where wall or floors stops are not applicable provide concealed or surface overhead stops. Provide concealed in public, jury or judges area. Provide surface in all others.
3. Exterior Stops: Provide security floor stop.
4. Supply from the following list of manufacturers:
 - a. Ives
 - b. Glynn Johnson
 - c. Trimco

H. Silencers

1. Provide silencers on all doors without seal. 3 for single doors and 2 for pairs.
2. Provide silencers as required for frame conditions.
3. Supply from the following list of manufacturers:
 - a. Ives (SR64/SR65)
 - b. Rockwood
 - c. Trimco

2.03 FINISHES

<u>CATEGORY</u>	<u>FINISH</u>
Butts	
Interior Non Labeled	652
Interior Labeled	652
Interior Corrosive Area	630
Exterior	630
Locks/Latches	626
Cylinders	626
Exit Devices	626
Door Closers	626
Protective Plates	630
Door Stops and Holders	626
Overhead Stops/Holders	626

2.04 KEYING

- A. General: Finish Hardware Supplier shall meet in person with owner to finalize keying requirements and match existing Restricted and Patented Master Key System for the project.
- B. Cylinders: All cylinder/cores on this project should be manufactured and providing in the same keyway.
- C. Cylinders: Provide the correct and quantity of cylinders for all applications.
- D. Keys: Provide nickel silver keys only. Furnish 3 change keys for each lock: 6 control keys: 12 construction master keys: 6 master keys for each master system and 6 grandmaster keys for each grandmaster key system. Deliver all keys to owners' representative.
- E. Cores and keys shall be provided with identification stamping.
- F. Provide construction keying/construction cores for this project with constructions keys.

2.05 KEY CONTROL:

- A. Key Management: Key control shall be provided, by supplying a complete key storage and management system. Each key shall be fully cut, indexed, tagged and installed on cabinet hooks by the lock supplier and shipped with the locks. Key cabinet provided shall be wall-mounted type with capacity plus 50 percent.

PART 3 EXECUTION

3.01 EXAMINATION:

- A. Examine doors, frames and related items for conditions that would prevent the proper application of any finish hardware items. Do not proceed with installation until all defects are corrected.

3.02 INSTALLATION

- A. Follow Door and Hardware Institute Publication for:
 - 1. Recommended Location for Architectural Hardware for Standard Steel Doors and Frames.
 - 2. Recommended Location for Builder's Hardware for Custom Steel Doors and Frames.
 - 3. Recommended Locations for Architectural Hardware for Wood Flush Door.
- B. Follow ANSI A117.1-1998 Accessible and Usable Building and Facilities
- C. Review mounting locations with Architect.
- D. Pre-installation meeting required with attendees to include Architect, Contractor, Mechanical Hardware and Electrified Hardware Installer, Finish Hardware Supplier and Manufacturer's Representative for exit device, locks and closers before installation begins.

3.03 FIELD QUALITY CONTROL

- A. After installation has been completed, obtain the services of an Architectural Hardware Consultant to check for proper installation of finish hardware, according to the finish hardware schedule and keying schedule. In addition, check all hardware for adjustments and proper operation.

3.04 ADJUST AND CLEAN

- A. Adjust, clean and inspect all hardware, to ensure proper operation and function of every opening. Replace items, which cannot be adjusted to operate freely and smoothly as intended for the application made.

3.05 PROTECTION

- A. The General Contractor shall use all means at his disposal to protect all finish hardware items from abuse, corrosion and other damage until the Owner accepts the project as complete.

3.07 TRAINING

- A. After installation has been completed, provide training to the Owner on the operation of finish hardware and programming of any access control items.

3.06 HARDWARE SCHEDULE

- A. These hardware set shown below are for use as a guideline. Provide hardware as required to meet the requirements of the openings, security, and code requirements. No extra costs will be allowed because of changes or correction necessary to facilitate the proper installation and designed use of any finish hardware.

GENERAL NOTES:

(These referenced notes supersede all instruction per individual HW Sets to follow)

1. VERIFY/COORDINATE EXACT "ACCESS CONTROL/OPERATOR FUNCTION" FOR EACH OPENING AT SECURITY ACCESS CONTROL "COORDINATION MEETING" (PRIOR TO ORDERING MATERIALS). NOTE: MEETING SHALL INCLUDE ALL RELATED TRADES, SUBCONTRACTORS, ARCHITECT AND OWNER.
2. RISER DIAGRAMS/OPERATIONAL DESCRIPTIONS SHALL BE PREPARED (AND SUBMITTED FOR APPROVAL) AS A RESULT OF THE SECURITY ACCESS CONTROL "COORDINATION MEETING"
3. Provide NRP hinges at all outswinging locking doors – exterior and interior.
4. Provide Wall/Floor stops as appropriate (in the proper height/length) at all opening locations.
6. Provide OH Stops at all openings where floor/wall stops are inappropriate.

HW SET: 01 SGL OFFICE LOCK

DOOR NUMBER:

114 118

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	ENTRANCE LOCK	ND53HD SPA	626	SCH
1	EA	SFIC EV B CORE ONLY	80-037	626	SCH
1	EA	FLOOR/WALL STOP	FS13/WS407CCV (AS REQD)	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 02 SGL PANIC DEVICE (CARD READER)

DOOR NUMBER:

101

EACH TO HAVE:

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	POWER TRANSFER	EPT-10	689	VON
1	EA	PANIC HARDWARE	RX-99L E996L #17 SNB	626	VON
1	EA	SFIC EV B CORE ONLY	80-037	626	SCH
1	EA	RIM CYLINDER	80-159	626	SCH
1	EA	SURFACE CLOSER	SC81 RW/PA SNB	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR/WALL	FS13/WS407CCV (AS REQD)	626	IVE
1	EA	POWER SUPPLY	PS904	GRY	VON
3	EA	SILENCER	SR64	GRY	IVE
	EA	CARD READER BY SECURITY CONTRACTOR			
		BALANCE BY SECURITY CONTRACTOR			

OPERATION DESCRIPTION: DOOR UNLOCKED BY VALID CARD AT CARD READER. FREE EGRESS.

HW SET: 03 SGL PASSAGE (EXAM ROOMS)

DOOR NUMBER:

102	103	104	107	108	109
111	116	117	119	120	

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND70HD SPA	626	SCH
1	EA	SFIC EV B CORE ONLY	80-037	626	SCH
1	EA	OVERHEAD STOP	900S SNB	630	GLY
1	EA	FLOOR/WALL	FS13/WS407CCV (AS REQD)	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

NOTE: PROVIDE (2PR) HINGES @ DOORS OVER 3FT IN WIDTH
PROVIDE OH STOPS WHERE REQUIRED

END OF SECTION

SECTION 08 80 00 – GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass and glazing for service window.

1.02 RELATED SECTIONS

- A. Section 08 58 00 – Aluminum Interior Sliding Service Windows.

1.03 REFERENCES

- A. American Society of Civil Engineers:
 - 1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures.
- B. ASTM International:
 - 1. ASTM C162 – Standard Terminology of Glass and Glass Products.
 - 2. ASTM C864 – Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks and Spaces.
 - 3. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
 - 4. ASTM C1036 – Standard Specification for Flat Glass.
 - 5. ASTM C1048 – Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
 - 6. ASTM C1172 – Standard Specification for Laminated Architectural Flat Glass.
 - 7. ASTM C1193 – Standard Guide for Use of Joint Sealants.
 - 8. ASTM E1300 – Standard Practice for Determining the Minimum Thickness and Type of Glass Required to Resist a Specific Load.
- C. Glass Association of North America:
 - 1. GANA (GM) – FGMA Glazing Manual; Glass Association of North America.
- D. Consumer Products Safety Commission, CPSC 16 CFR 1201 – Safety Standard for Architectural Glazing.

1.04 SUBMITTALS

- A. Refer to Section 01 33 00 – Submittal Procedures Article 1.02, Paragraph B for submittal requirements.

1.05 QUALITY ASSURANCE

- A. Glazing Standards: Comply with recommendations of GANA Glazing Manual except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.
- B. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with testing requirements of CPSC 16 CFR Part 1201 for category II materials.
 - 1. Identification of Safety Glazing: Each pane of safety glazing installed in hazardous locations shall be identified in accordance with the building code.
- C. Single-Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.
- D. Qualifications:
 - 1. Manufacturer, Flat Glass Materials: Minimum five (5) years of documented experience producing glass products specified in this section.
 - 2. Installer: Minimum five (5) years of documented experience installing products specified in this section, and approved by fabricator.

1.06 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on Shop Drawings.

1.7 COORDINATION

- A. Coordinate the Work with glazing service window frames.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Glass Manufacturers: Subject to compliance with requirements, provide products of one of the following manufacturers:
 - 1. Manufacturers of Flat Glass Materials:
 - a. Vitro Architectural Glass
 - 2. Manufacturers offering equivalent products include but are not limited to:
 - a. AGC Flat Glass

b. Pilkington

3. Substitutions: Section 01 60 00 – Product Requirements.

2.02 GLASS FABRICATORS

A. Subject to compliance with requirements, provide products on one of the following fabricators:

1. Fabricators of Flat Glass Materials:

- a. Cristacurva
- b. Oldcastle Glass
- c. Tristar Glass Inc.
- d. Trulite

2.03 GLASS PRODUCTS – GENERAL

A. Primary Glass Standard: Provide primary glass which complies with ASTM C1036 requirements, including those indicated by reference to type, class, quality and if applicable, form, finish, mesh and pattern.

B. Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish and pattern.

C. Tempered Glass Standard: Provide tempered glass which complies with ASTM C1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.

1. Safety Glass: Furnish tempered glass conforming to CPSC 16 CFR 1201, Category II at locations where safety glass is required by the Code. Refer to the contract documents for the applicable code and year.

D. Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.

E. Provide the same exterior tinted glass from the same manufacturer.

2.04 GLASS COMPONENTS

A. Safety Glass (Type SG): Conform to CPSC 16 CFR 120, Category II.

1. Clear tempered glass (Type SG-CT): ASTM C1048, Kind FT fully tempered, Condition A, uncoated, Type 1 transparent flat, Class 1 clear, quality q3 glazing select; with horizontal tempering, 1/4 inch thick.

a. Manufacturer: Vitro Architectural Glass

- 1) Visible light transmittance: 89%
- 2) Shading coefficient: 0.94
- 3) Solar heat gain coefficient: 0.81
- 4) Summer U: 0.93
- 5) Winter U: 1.02

2.05 MISCELLANEOUS GLAZING MATERIAL

- A. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
- C. Setting Blocks: ASTM C864, neoprene, 80 to 90 Shore A durometer hardness; length 4 inches, width of glazing rabbet space less 1/16 inch, height required for glazing method, pane weight and pane area.
- D. Spacer shims: ASTM C864, neoprene, 50 to 60 Shore A durometer hardness; length 3 inches, one half height of glazing stop, thickness required for application, one face self-adhesive.
- E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions and ready to receive glazing.

3.02 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

3.03 GLAZING – GENERAL

- A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass from edge damage during handling and installation as follows:
 1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.

2. Remove damaged glass from Project site and legally dispose of offsite. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.
- C. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- D. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- E. Provide spaces for glass sizes larger than 50 united inches (length plus height) as follows:
 1. Locate spacers inside, outside and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and comply with system performance requirements.
 2. Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- F. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.
- G. Set glass lites in each series with uniform pattern, draw, bow and similar characteristics.

3.04 INSTALLATION

- A. Installation of glazing in service windows is specified in Section 08 58 00.

3.05 CLEANING

- A. Clean work under provisions of Section 01 70 00.
- B. Remove glazing materials from finish surfaces.
- C. Remove labels after work is complete.
- D. Clean glass.

3.06 PROTECTION OF FINISHED WORK

- A. After installation, mark pane with an "X" by using removable plastic tape or paste.

END OF SECTION

SECTION 09 21 16 – GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Moisture and Mold Resistant Paper Faced Gypsum Board.
- B. Trim Accessories.
- C. Acoustic Insulation.
- D. Mold and Moisture Resistant Joint Treatment.

1.02 RELATED SECTIONS

- A. Section 05 40 00 – Cold-Formed Metal Framing: Securing gypsum wallboard to metal framing.
- B. Section 06 10 53 – Miscellaneous Carpentry: Wood blocking for support of fixtures, equipment and trim.
- C. Section 06 16 43 – Gypsum Sheathing: Glass-faced sheathing.
- D. Section 07 21 16 – Blanket Insulation: Thermal insulation.
- E. Section 07 90 00 – Joint Protection.
- F. Section 08 31 13 – Access Doors and Frames: Metal access panels.
- G. Section 09 22 16 – Non-Structural Metal Framing: Metal stud framing for walls, partitions, furring, soffits and ceilings.
- H. Section 09 90 00 – Painting and Coating: Painting gypsum wall board.

1.03 REFERENCES

- A. ASTM International:
 - 1. ASTM C475 – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - 2. ASTM C665 – Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 3. ASTM C840 – Standard Specification for Application and Finishing of Gypsum Board.
 - 4. ASTM C954 – Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. to 0.112 in. in Thickness.

5. ASTM C1002 – Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
6. ASTM C1396 – Standard Specification for Gypsum Board.
7. ASTM D3273 – Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environment Chamber.
8. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

B. Gypsum Association (GA):

1. GA-214 – Recommended Specification: Levels of Gypsum Board Finish.
2. GA-216 – Recommended Specifications for the Application and Finishing of Gypsum Board.

1.04 SUBMITTALS

1. Refer to Section 01 33 00 – Submittal Procedures Article 1.02 Paragraph B for submittal requirements.

1.05 QUALITY ASSURANCE

- A. Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.
- B. Perform work in accordance with GA-214, GA-216 and ASTM C840.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the project site with manufacturer's labels intact and legible. Handle materials with care to prevent damage to edges or surfaces.
- B. Store materials indoors under cover, stacked flat to prevent sagging and off the floor, protected from weather, direct sunlight, surface contamination and damage from construction traffic or other causes.
- C. Store adhesives in dry area and protect against freezing.

1.07 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.
- B. Maintain a room temperature of not less than 40 degrees F for mechanical attachment of gypsum board. For finishing of gypsum board, maintain not less than 50 degrees F (10 degrees C) for 48 hours before application and continuously after until dry. Do not exceed 95 degrees F (35 degrees C) when using temporary heat sources.
- C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid

drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

PART 2 PRODUCTS

2.01 GYPSUM BOARD PRODUCTS

- A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.

Note: The use of gypsum wallboard imported, marketed or distributed by a foreign manufacturer will not be allowed.

1. Widths: Provide gypsum board in widths of 48 inches and minimum lengths of 120 inches.
- B. Moisture and Mold Resistant Paper Faced Gypsum Wall Board: Fire-resistive Type X, ASTM C1396 and as follows:
 1. Acceptable Manufacturers and Products: Subject to compliance with requirements of Contract Documents, provide products by one of the manufacturers listed below.
 - a. American Gypsum Company, LLC: M-Bloc 5/8 inch Type X with mold and moisture resistance.
 - b. National Gypsum Co.: Gold Bond XP Fire-Shield gypsum board.
 - c. United States Gypsum Co.: Sheetrock Brand Mold Tough panels, Firecode X.
 2. Edges: Tapered and featured (rounded or beveled) for prefilling.
 3. Thickness 5/8 inch, unless otherwise indicated.
 4. Moisture-resistant treated core with moisture and mold-resistant treated paper facings on front, back and long edges.
 - a. Board shall achieve a score of 10 per ASTM D3273.
 5. Use: Base layer at single layer application.

2.02 TRIM ACCESSORIES

- A. Accessories for Interior Installation: Cornerbead, edge trim and control joints complying with ASTM C1047 and requirements indicated below:
1. Material: Formed metal or plastic, with metal complying with the following requirement:
 - a. Steel sheet zinc coated by hot-dip process or rolled zinc.
 2. Shapes indicated below by referenced to Fig. 1 designations in ASTM C1047:

- a. Cornerbead on outside corners, unless otherwise indicated.
- b. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead at window openings, door openings, casements and where indicated.
- c. One-piece control joint formed with V-shaped slot and removable strip covering slot opening equal to USG 093.

2.03 JOINT TREATMENT MATERIALS

- A. General: Provide joint treatment materials complying with ASTM C475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.
- B. Joint Tape for Gypsum Board:
 1. At moisture and mold resistant paper faced gypsum wallboard provide 2 inch wide 10 by 10 glass fiber mesh tape.
- C. Setting-Type Joint Compounds manufactured to ASTM C475 for moisture and mold resistant paper faced gypsum wallboard: Factory-packaged, mold and moisture resistant, job-mixed, chemical-hardening powder products formulated for uses indicated.
 1. Where setting-type joint compounds are indicated as a taping compound only or for taping and filling only, use formulation that is compatible with other joint compounds applied over it.
 2. Prefilling: At open joints, rounded or beveled panel edges, damaged surfaces, and laminating gypsum boards together.
 3. Moisture and mold resistant paper faced gypsum wallboard scheduled for painting:
 - a. Embedding and first coat: For embedding glass fiber tape and first coat on joint fasteners and trim flanges, use setting-type taping compound.
 - b. Fill coat: For second coat use setting-type, sandable topping compound.
 - c. Finish coat: For third coat, use setting-type, sandable topping compound.
- D. Skim Coat: For level 5 finish provide the following material or approved equivalent:
 1. USG Sheetrock Brand Tuff-Hide primer surfacer.

2.04 ACOUSTIC INSULATION

- A. ASTM C665, Type 1; friction fit type, unfaced, cut to fit stud spacing.
 1. Thickness:
 - a. 3 1/2 inches at 3 5/8 inch metal studs.
 2. Facing: Unfaced.
 3. Flame/smoke properties: 25/450 in accordance with ASTM E84.

4. Material shall be formaldehyde free.
5. Products/Manufacturer:
 - a. Certaineed sustainable insulation CertaPro Acoustatherm Batts, Certaineed Corporation.
 - b. Unfaced formaldehyde-free batt insulation, Johns Manville.
 - c. EcoBatt with ECOSE Technology thermal/acoustical insulation, Knauf Insulation.
 - d. EcoTouch Pink Fiberglass Insulation, Owens Corning
 - e. Substitutions per Section 01 60 00.

2.05 MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.
- B. Gypsum Board Screws: Self-drilling, self-tapping steel screws.
 1. For steel framing less than 0.03 inch thick, comply with ASTM C1002.
 2. For steel framing from 0.033 inch thick to 0.112 inch thick, comply with ASTM C954.
 3. Provide Type S or Type S-12 screws, rust resistant, lengths as required to suit application as noted below:
 - a. Where securing one layer of 5/8 inch Type "X" gypsum wallboard to framing: Provide 1 inch long steel screws unless noted otherwise.
- C. Sealant:
 1. ASTM C920, Type S, Grade NS, Class 25, Use NT, Use 1, Use M, Use G. Flexible mildew-resistant 100% silicone sealant, complying with SCAQMD Rule 1168, Adhesive and Sealant Applications, amended January 7, 2005.
 2. Manufacturers/products:
 - a. Laticrete/Latasil VOC content 37.16 g/L < 250 g/L.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, and structural framing, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 EXISTING WORK

- A. Extend existing gypsum board installations using materials and methods specified.

3.03 APPLYING AND FINISHING GYPSUM BOARD – GENERAL

- A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C840, GA-214, and GA-216.
- B. Confirm sound-attenuation blankets have been installed where indicated prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- C. Install ceiling board panels perpendicular to framing members spaced at 16 inches o.c. and across framing to minimize the number of abutting-end joints and to avoid abutting-end joints in the central area of each ceiling. Stagger abutting-end joints of adjacent panels not less than one framing member. Install gypsum and/or tile backer board panels on ceiling before wall/partition board application.
- D. Install gypsum panels with face side out. Do not install imperfect, damaged or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- E. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.
- F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach gypsum panels to framing provided at openings and cutouts.
- H. Form and install control and expansion joints at locations indicated and as follows with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels:
 - 1. Partitions, walls and wall furring: Install joints in partitions, walls and wall furring with runs exceeding 30 feet. Distance between control joints shall not exceed 30 feet, and control joints shall be installed where an expansion joint occurs in the base exterior wall.
 - 2. At all door frames, provide control joints at each corner of the door frame and extend joints from top of frame up to bottom of structure/ deck. At all door frames located in interior partitions, locate control joints on both sides of partitions. At door frames on exterior walls provide control joints on interior side.
 - 3. At all window frames, provide control joints at each corner, starting at the floor line and extending up to the structure. At all window frames located in interior partitions, locate control joints on both sides of partitions and extend up to bottom of structure/deck.
- I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chassis that are braced internally.
 - 1. Except where concealed application is indicated or required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq.

ft. in area.

2. Fit gypsum panels around ducts, pipes and conduits.
 3. Where partitions intersect steel beams, steel joists, and other structural members projecting below underside of roof decks, cut gypsum panels to fit profile formed by beams, joists, and other structural members; allow 1/2 inch wide joints to install sealant. Where partitions intersect the bottom of floor/roof slabs and decks, cut gypsum wallboard to the profile of the deck; allow 1/2 inch wide joints to install sealant.
- J. At non-rated, non-load-bearing partitions that extend to the underside of the floor/roof deck, isolate perimeter of the gypsum board partitions at structural abutments and floor/roof deck, as detailed. Provide 1/2 inch wide spaces at these locations. Seal joints between items covered with cementitious fireproofing, abutting structural surfaces, floor/roof deck etc. with acoustical sealant, unless otherwise noted.
- K. Where STC-rated gypsum board assemblies are indicated, seal construction at perimeters, behind control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C919 and manufacturer's recommendations for location of edge trim and closing off sound flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
- L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
1. Space screws a maximum of 12 inches o.c. for vertical applications.

3.04 GYPSUM BOARD APPLICATION METHODS

- A. Single-Layer Application: Install gypsum wallboard panels as follows:
1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels vertically (parallel to framing), and provide panel lengths that will minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of board.
- B. Moisture and Mold Resistant Paper Faced Gypsum Wallboard:
1. Unless otherwise noted install the following system at all interior metal stud partition walls and interior side of exterior walls.
 - a. For the first 10 feet 0 inches install a layer of moisture and mold resistant paper faced impact resistant gypsum board. Above this install a layer of moisture and mold resistant paper faced gypsum board up to the underside of the floor/roof deck unless noted otherwise.
 - b. Refer to Part 2 for multiple layer applications.

C. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows:

1. Fasten with screws.

3.05 INSTALLING TRIM ACCESSORIES

- A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length and spacing of fasteners.
- B. Install cornerbead at all external corners.
- C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
 1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
- D. Install control joints according to ASTM C840 and manufacturer's recommendations and in specific locations approved by Architect for visual effect.

3.06 ACOUSTIC INSULATION

- A. Install insulation in accordance with insulation manufacturer's instructions.
 1. Place acoustic insulation in partitions tight within spaces, around cut openings, behind electrical and mechanical items within or behind partitions, and tight to items passing through partitions.
- B. Install insulation where shown on the Drawings.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

3.07 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects and elsewhere as required to prepare gypsum board surfaces for decoration.
- B. Prefill open joints, rounded or beveled edges and damaged areas using setting-type compound.
- C. Apply joint tape over gypsum board joints, except those with trim accessories having flanges not requiring tape.
- D. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.
- E. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.
 1. Level 1 for ceiling plenum areas, concealed areas and where indicated, unless a

higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.

2. Level 4 for walls and ceilings exposed to view.
 3. Level 5 for walls exposed to view where epoxy, gloss and semi-gloss paints are applied to gypsum board surfaces.
- F. Use the following joint compound combinations as applicable to the finish levels specified.
1. Sandable Setting Type: Embedding and First Coat: Sandable setting-type joint compound. Fill (Second) coat: Sandable setting-type joint compound. Finish (Third) Coat: Sandable setting-type joint compound.
- G. Level 1:
1. All joints and interior angles shall have tape set in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.
- H. Level 4 finish for all surfaces to be painted.
1. All joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles.
 2. All fastener heads and accessories shall be covered with three separate coats of joint compound.
 3. All joint compounds shall be smooth and free of tool marks and ridges.
- I. Level 5 finish for all surfaces to be painted with epoxy, gloss and semi-gloss paint systems.
1. All joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles.
 2. All fastener heads and accessories shall be covered with three separate coats of joint compound.
 3. All joint compounds shall be smooth and free of tool marks and ridges.
 4. Skim coat all surfaces using material specified .
 - a. Apply primer-surfacer in accordance with manufacturers written instructions using spray equipment approved by manufacturer.
 - b. Thoroughly mix primer surfacer. Do not thin.
 - c. Apply primer-surfacer to a minimum wet film thickness of 15 mils. Do not apply in excess of 20 mils wet film thickness.

3.08 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Architect will conduct an above-ceiling observation prior to installation of gypsum board ceilings and report any deficiencies in the Work observed.

Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.

1. Notify Architect one week in advance of the date and the time when the Project, or part of the Project, will be ready for an above-ceiling observation.
2. Prior to notifying Architect, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of eighty percent (80%) of lighting fixtures, powered for operation.
 - b. Installation, insulation and leak and pressure testing of water piping systems.
 - c. Installation of air duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control air tubing.
 - f. Installation of ceiling support framing.

3.09 CLEANING AND PROTECTION

- A. Promptly remove any residual joint compound from adjacent surfaces.
- B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.
- C. Remove and replace panels that are wet, moisture damaged and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 22 16 – NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Interior (drywall) non-load-bearing non-structural framing.
- B. Accessories.

1.02 RELATED SECTIONS

- A. Section 01 33 00 – Submittal Procedures.
- B. Section 01 60 00 – Product Requirements: Product substitution procedures.
- C. Section 06 10 53 – Miscellaneous Carpentry: Securing wood blocking to steel studs.
- D. Section 09 21 16 – Gypsum Board Assemblies: Securing gypsum wall board to framing
- E. Section 10 28 00 – Toilet, Bath and Laundry Accessories: Supporting toilet accessories off steel stud framing.

1.03 REFERENCES

- A. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- B. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot Dip Process.
- C. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- D. ASTM A1003 – Standard Specification for Steel Sheet, Carbon Metallic and Non-Metallic-Coated for Cold-Formed Framing Members.
- E. ASTM C645 – Standard Specification for Non-Structural Steel Framing Members.
- F. ASTM C754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- G. ASTM C1002 – Standard Specification for Steel Drill Screws for Application of Gypsum Panel Products on Metal Plaster Bases.
- H. American Welding Society:
 - 1. AWS D1.1 – Structural Welding Code – Steel.
 - 2. AWS D1.3 – Structural Welding Code – Sheet Steel.
- I. National Association of Architectural Metal Manufacturers:
 - 1. NAAMM ML/SFA 540 – Lightweight Steel Framing Systems Manual.

- J. SSPC: The Society for Protective Coatings:
 - 1. SSPC Paint 20 – Zinc-Rich Primers (Type I – Inorganic and Type II – Organic).
 - K. Steel Stud Manufacturers Association:
 - 1. SSMA – Product Technical Information.
 - M. AISI – (American Iron and Steel Institute) “North American Specification for the Design of Cold-Formed Steel Structural Members,” Current Edition.
 - N. FS TT-P-645 – Primer, Paint, Zinc-2 Chromate, Alkyd Type.
 - O. Anti-Corrosive Coating Standards:
- 1.04 PERFORMANCE REQUIREMENTS – INTERIOR (DRYWALL) NON-LOAD-BEARING STEEL STUD FRAMING
- A. Maximum Allowable Deflection: L/240 span, with a minimum load of 5 pounds per square foot applied perpendicular to walls.
 - B. Design framing system to accommodate deflection of building. Structure and construction tolerances:
 - 1. Vertical Deflection: 1/2 inch.
- 1.05 SUBMITTALS – INTERIOR (DRYWALL) NON-LOAD-BEARING NON-STRUCTURAL FRAMING
- A. Refer to Section 01 33 00 – Submittal Procedures: Article 1.02, Paragraph B for submittal requirements.
- 1.06 QUALITY ASSURANCE – INTERIOR (DRYWALL) NON-LOAD-BEARING NON-STRUCTURAL FRAMING
- A. Single-Source Responsibility for Steel Framing: Obtain steel framing members from a single manufacturer, unless otherwise noted.
 - 1. Furnish framing materials in accordance with SSMA – Product Technical Information.
 - B. Perform work in accordance with ASTM C754.
 - C. Installer qualifications: Company specializing in performing the work of this Section with minimum 5 years of experience.
- 1.07 DELIVERY, STORAGE AND HANDLING
- A. Protect metal framing from corrosion, deformation and other damage during delivery, storage and handling.
 - B. Store metal framing, protect with a waterproof covering and ventilate to avoid condensation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers for Interior (Drywall) Studs: Subject to compliance with requirements, provide metal framing by one of the following:

1. Allied Studco
2. Allsteel & Gypsum Products Inc.
3. California Expanded Metal Products Co.
4. Clark/Western
5. Cemco Steel Framing and Metal Lath
6. Consolidated Fabricators, Corp.
7. Craco Metal Manufacturing, LLC
8. Custom Stud, Inc.
9. Design Shapes in Steel
10. Dietrich Industries, Inc.
11. LFB Engineered Systems, Inc/Lennar Homes of California, Inc.
12. Marino/Ware – A Division of Ware Industries
13. MBA Building Supplies, Inc.
14. Olmar Supply dba Denmar Steel
15. Quail Run Building Materials, Inc.
16. SCAFCO Corporation
17. Southeastern Stud & Components, Inc.
18. Steel Construction Systems
19. Steeler, Inc.
20. The Formetal Co., Inc.
21. The Steel Network, Inc.
22. United Metal Products, Inc.

B. Basis-of-Design Product: The design for connecting devices for interior (drywall) framing is based on The Steel Network, Inc.

Subject to compliance with requirements, provide named product or a comparable product by:

1. Dietrich Industries, Inc.

2.02 INTERIOR (DRYWALL) FRAMING

- A. General: Provide steel framing members complying with the following requirements:

1. Provide G60 hot-dip galvanized coating where framing members are in direct contact with masonry or concrete surfaces.
2. Protective Coating: ASTM A653, G40 hot-dip galvanized coating.

- B. Steel Studs and Runners: ASTM C645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:

1. Thickness: 30 mil (20 gauge), unless otherwise noted.
2. Depth: As indicated.
3. Track: 1-1/4 inches. Gauge of track to match stud gauge unless otherwise noted.

- C. Deflection Clips: 1-1/2 inches by 3 inches slotted leg by 33 mils VertiClip SLD angle or VertiTrack VTD as manufactured by The Steel Network. Width of clip to match depth of stud. Clip shall be manufactured from steel conforming to ASTM A653A, Grade 50, Class 1, 50 KS1 minimum yield strength, 65 KS1 minimum tensile strength, G-60 hot-dipped galvanized coating. Clips shall be designed for positive attachment to structure and stud web using step bushing to provide frictionless vertical movement. Provide clips with attached bushing and screws. At sloping beams and roof deck, bend horizontal leg as required so that vertical leg remains plumb. Use only deflection connection products that comply with ICC Acceptance Criteria AC261 such as Report No. ESR-1903 (or equivalent). Site fabricated clips are not permitted.

1. Alternate Deflection Track: VertiTrack VT Slotted Track as manufactured by The Steel Network. Substitutions permitted according to the Conditions of the Contract and appropriate Division 01 Sections. At fire rated partitions provide a top runner that allows the partition head to expand and contract with movement of the structure while maintaining continuity of the fire-resistance-rated assembly indicated, in thickness not less than indicated for studs and in a width to accommodate depth of the studs. Comply with UL 2079. Refer to Section 07 84 00 Firestopping for approved fire stop materials

- a. Material: ASTM A1003/A1003M Structural Grade 50 Type H, ST50H: 50ksi minimum yield strength, 65ksi minimum tensile strength, 33mil minimum thickness (20 gauge, 0.0346" design thickness) with ASTM A653/A653M G90 hot dipped galvanized coating.

- D. Flat Steel Plate: Steel sheet complying with ASTM A653 or ASTM A568 with minimum base metal thickness as follows:

1. Thickness:
 - a. 54 mils, (16 gauge) 33 ksi steel.

2. Width: 6 inches, unless noted otherwise.
 3. Length: 10 feet.
- E. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.
- F. Clip Angles: 30 mils, (20 gauge) 33 ksi steel. Size as shown on Drawings.
- G. Bridging:
1. Bridging: BridgeBar 75 as manufactured by The Steel Network or approved equal.
- H. Utility Angles: Used to connect, reinforce and secure metal stud framing.
1. Size: As shown on Drawings.
 2. Thickness: 30 mils, (20 gauge) unless otherwise noted on Drawings.

2.03 ANCHORS, CLIPS AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36, zinc coated by the hot-dip process according to ASTM A123.
- B. Powder-Actuated Anchors: Federal Specification FF-P-395b. Manufactured from AISI 1062 or 1065 steel, austempered to a minimum core hardness of 50 to 54 HRC and zinc plated in accordance with ASTM B 633. Provide fasteners listed or approved by one or more of the following and of type, diameter and length as required by structural design calculations:
1. Underwriters Laboratory.
 2. Factory Mutual.
 3. International Code Council (ICC).
- C. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws. Provide screw type and size as required by structural design calculations for the specific condition and thickness of materials being joined.
1. Head Type: Low profile head beneath sheathing, manufacturer's standard elsewhere.

2.04 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

2.05 FABRICATION

- A. Fabricate metal framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
 - 1. Fabricate framing assemblies in jig templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten metal framing members by screw fastening as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Locate mechanical fasteners and install according to metal framing manufacturer's instructions with screw penetrating jointed members by not less than 3 exposed screw threads.
 - 4. Fasten other materials to metal framing by bolting, or screw fastening according to manufacturer's recommendations.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or distortion.
- C. Fabrication Tolerances: Fabricate assemblies to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that building framing components are ready to receive work.
- B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION – GENERAL

- A. Install metal framing and accessories plumb, square, true to line and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten metal framing members by screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Locate mechanical fasteners and install according to metal framing manufacturer's instructions with screw penetrating jointed members by not less than 3 exposed screw threads.

- B. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.
- C. Provide temporary bracing and leave in place until framing is permanently stabilized.
- D. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.
- E. At all locations where multiple studs and tracks occur, fasten studs and tracks together at maximum 24 inch o.c.

3.03 INSTALLATION – INTERIOR (DRYWALL) STEEL FRAMING

- A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of drywall construction. Do not proceed with installation until satisfactory.
- B. Steel Framing Installation Standard: Install steel framing to comply with ASTM C754 and with ASTM C840 requirements that apply to framing installation.
- C. Install supplementary framing, blocking and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."
 - 1. Coordinate with Section 06 10 53 – Miscellaneous Carpentry for rigid wall backing plates as locations specified.
- D. Isolate steel framing from building structure and underside of roof deck at locations indicated to prevent transfer of loading imposed by structural movement. Comply with details shown on Drawings.
- E. Do not bridge building control and expansion joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.
- F. Install runners (tracks) at floors, ceilings and structural walls and columns where gypsum board stud assemblies abut other construction.
 - 1. Where studs are installed directly against concrete walls, install asphalt felt strips or foam gaskets between studs and wall.
- G. Installation Tolerances: Install each steel framing and furring member so that fastening surface do not vary more than 1/8 inch (3 mm) from the plane formed by the faces of adjacent framing.
- H. Extend partition framing full height to structural supports, underside of roof deck, except where partitions are indicated to terminate above suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 - 1. At deflection clips, cut studs 1/2 inch short of full height to provide perimeter relief.

- I. Install steel studs in sizes and at spacings indicated.
 - 1. Single-Layer Construction: Space studs 16 inches o.c., unless otherwise indicated.
- J. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.
- K. Frame door, borrowed light, and cased openings with minimum two studs and one nested track. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames.
 - 1. At jambs install two channel shaped metal studs and one metal track. The metal track shall be nested within the metal stud as shown. Boxed stud and track shall be screw attached together using #10-16 screws at maximum 24 inches o.c. Attach second stud to boxed stud/track using #10-16 screws at maximum 24 inches o.c.
 - a. Material gauge of studs and track: 30 mil, (20 gauge).
 - 2. At the frame head, provide a steel track for openings up to 3'-0" wide. For openings wider than 3'-0" provide box header.
 - 3. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint.
- L. Frame openings, other than door openings, to comply with details indicated or, if not indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.
- M. Coordinate installation of wood bucks, anchors and wood blocking with electrical and mechanical work to be placed within or behind stud framing.
- N. Blocking: Coordinate with Section 06 10 53 – Miscellaneous Carpentry.
- O. Coordinate placement of insulation in stud spaces made inaccessible after stud framing erection.
- P. Bridging: At partitions in which wallboard is installed on one side only and where shown on Drawings, install bridge bar to each stud.

3.04 TOLERANCES

- A. Maximum Variation from Plumb, Level and True Position: 1/8 inch in 10 feet.

3.05 SCHEDULE (NOTE: Table was taken from the SSMA Product Technical Information, Limiting Wall-Heights Table – Non-Composite for Interior Non-Structural Framing)

TYPICAL INTERIOR (DRYWALL) STUD SCHEDULE, BASED ON PERFORMANCE REQUIREMENTS

A.	Stud	Spacing	Height Limitation
	162S125-30	12"	9'-2"

162S125-30	16"	8'-4"
250S125-30	12"	12'-9"
250S125-30	16"	11'-7"
362S125-30	12"	16'-6"
362S125-30	16"	15'-0"
600S125-30	12"	25'-5"
600S125-30	16"	22'-11"

END OF SECTION

SECTION 09 51 13 – ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical ceiling panels.
- C. Wire hangers, fasteners, main runners, cross tees, wall angle moldings and perimeter trim.

1.02 RELATED SECTIONS

- A. Section 23 37 00 – Air Outlets and Inlets: Air diffusion devices in ceiling system.
- B. Section 26 51 00 – Interior Lighting: Light fixtures in ceiling systems.
- C. Section 27 51 16 – Public Address and Mass Notification Systems: Speakers in ceiling system.
- D. Section 28 31 00 – Fire Detection and Alarm: Fire alarm components in ceiling system.

1.03 REFERENCE STANDARDS

- A. ASTM A1008 – Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- B. ASTM A641 – Standard Specification for Zinc-Coated (Galvanized) Carbon steel Wire.
- C. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
- D. ASTM C423 – Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- E. ASTM C635 – Standard Specification for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- F. ASTM C636 – Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
- G. ASTM E84-94 – Standard Test Method for Burning Characteristics of Building Materials.
- H. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.
- I. ASTM E1414 – Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
- J. ASTM E1264 – Classification of Acoustical Ceiling Products.
- K. ANSI Standard S12.60 -2002. Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools.
- L. CISCA – Acoustical Ceilings: Use and Practice.

M. Greenguard Environmental Institute

1. Greenguard Indoor Air Quality Certified.

1.04 SUBMITTALS

- A. Refer to Section 01 33 00 – Submittal Procedures Article 1.02 Paragraph B for submittal requirements.

1.05 QUALITY ASSURANCE

- A. Conform to CISCA Requirements.
- B. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years of recommended experience.
- B. Installer: Company specializing in performing work of this section with minimum five years of documented experience.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Maintain uniform temperature and humidity levels as recommended by the manufacturer prior to, during and after acoustical unit installation.

1.08 EXTRA MATERIALS

- A. Section 01 70 00 – Execution and Closeout Requirements.
- B. Provide 1 percent of total acoustical unit area of extra tile panels to Owner of each panel type specified.
- C. Provide 1 percent of exposed suspension system to Owner of each grid type specified.

1.09 SEQUENCING

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

1.11 WARRANTY

- A. Refer to each product specified for warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS – SUSPENSION SYSTEM

- A. Armstrong.

- B. USG.
- C. CertainTeed.

2.02 SUSPENSION SYSTEM MATERIALS

- A. Non-Fire-Rated Grid: ASTM C635, intermediate duty; hot-dipped galvanized. Exposed grid surface width shall be 15/16, "Prelude XL" as manufactured by Armstrong.
 - 1. Color: White.
- B. Wall Angle Molding: 7/8 inch hemmed angle molding.
- C. Support Channels and Hangers: Galvanized steel; size and type to suit application.
- D. Select wire diameter so that the stress at 3 times the hanger load (ASTM C635, Table 1, direct hung) will be less than the yield stress of wire with a minimum requirement of 12-gauge wire.
- E. Other accessories as noted on Drawings.

2.03 MANUFACTURERS – ACOUSTICAL UNITS

- A. Armstrong.
- B. USG.
- C. CertainTeed.

2.04 ACOUSTICAL CEILING PANELS

- A. Acoustical Ceiling Panels conforming to ASTM E1264 and as follows:
 - 1. ACT 1: 24 inches by 24 inches by 3/4 inch anti-microbial panels, Armstrong Ultima Square Lay-In, Item No. 1910.
 - a. Composition: Mineral Fiber
 - b. NRC: 0.70
 - c. CAC: 35
 - d. LR: 0.90
 - e. Sag Resistant: Humiguard+
 - f. Anti-Microbial: BioBlock+
 - g. Color: White
 - h. Recycled Materials:
 - 1) 67 percent pre-consumer
 - 2) 4 percent post-consumer
 - i. VOC formaldehyde: Free of formaldehyde-based resins.
 - j. Grid: Install ceiling panels with Armstrong "Prelude XL" Grid System.
 - k. Products from the following manufacturers may be submitted:
 - 1) USG: Mars ClimaPlus, Item No. 86185. Grid system to be DONN DX Suspension System.

- 2) CertainTeed: Symphony M, Item No. 1222-OVT-1. Grid system to be 15/16 inch Classic Stab.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 – Administrative Requirements.
- B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION – LAY-IN GRID SUSPENSION SYSTEM

- A. Install suspension systems to comply with ASTM C635 and ASTM C636, with hangers supported only from building structural members. Locate hangers not more than 4'-0" on center along main runner direct-hung suspension system with additional hangers at ends of suspension members, at light fixtures, and 6 inches from vertical surfaces, leveling to tolerance of 1/8 inch in 12'-0".
- B. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices that are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperatures.
- C. Do not tie framing to HVAC ductwork or sprinkler piping.
- D. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, counterplaying or other equally effective means.
- E. Install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.
- F. Screw-attach moldings to substrate at intervals not over 16 inches on center, and not more than 3 inches from ends, leveling with ceiling suspension system to tolerance of 1/8 inch in 12'-0". Miter corners accurately and connect securely.
- G. Form expansion joints where shown.

3.03 LAY-IN CEILING PANELS

- A. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members.
- B. Arrange and orient directionally-patterned units (if any) in a manner shown by reflected ceiling plans.
- C. Install in level plane and straight line courses, in accordance with Drawings and manufacturer's printed instructions.
- D. Seal joints in acoustical units around ducts, pipes, electrical outlets, etc., with acoustical sealant.
- E. Cutting Acoustic Units:

1. Cut to fit irregular grid and perimeter edge trim.

F. Where or round obstructions occur, install preformed closures to match perimeter molding.

3.04 ADJUST AND CLEAN

A. Clean soiled or discolored unit surfaces after installation. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Touch up scratches, abrasions, voids and other defects in painted surfaces. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage. Remove and replace damaged or improperly installed units.

END OF SECTION

SECTION 09 65 00 – RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient Tile Flooring:
 - 1. Vinyl Composition Tile.
- B. Resilient Base.
- C. Resilient Accessories.

1.02 RELATED SECTIONS

- A. Section 01 45 23 – Concrete In-Situ Relative Humidity and pH Testing.
- B. Section 07 26 13 – Moisture Control System.

1.03 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 2. ASTM E648 – Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source.
 - 3. ASTM E662 – Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
 - 4. ASTM F1066 – Standard Specification for Vinyl Composition Floor Tile.
 - 5. ASTM F1861 – Standard Specification for Resilient Wall Base.
 - 6. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probes.
- B. National Fire Protection Association:
 - 1. NFPA 253 – Standard Method of Test for Critical Radiant Flux for Floor Covering Systems Using a Radiant Heat Energy Source.
 - 2. NFPA 258 – Test Method for Specific Density of Smoke Generated by Solid Materials.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 33 00 – Submittal Procedures.

- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
- C. Samples:
 - 1. Submit two samples, 6 by 6 inch in size illustrating color and pattern for each floor material for each color specified.
 - 2. For accessories: Manufacturer's standard-size samples, but not less than 12 inches long, of each accessory color and pattern specified.
- D. Quality Assurance Submittals: Submit the following:
 - 1. Copies of the bond and moisture test results. A diagram of the area showing the location and results of each test shall be submitted.
 - 2. Manufacturer's Instructions: Current published manufacturer's installation and maintenance instructions.
- E. Submit a certificate from each flooring manufacturer specified indicating that the installer is qualified to install the specified product.

1.05 QUALITY ASSURANCE

- A. Flooring products shall be tested in accordance with ASTM E84, ASTM E648 and ASTM E662 with fire performance characteristics as follows:
 - 1. Critical Radiant Flux per ASTM E648: .45 watts/cm², Class 1.
 - 2. Smoke Density per ASTM E662: Less than 450.
- B. Installer qualifications: Engage installer that is certified by floor covering manufacturer as competent in the technique for installing flooring materials.
 - 1. Installer shall have a minimum of five (5) years of experience installing specified products.
 - 2. The flooring installer shall provide an effective project manager to manage the installers and ensure that all of the required procedures are followed, documented and that the installation guides are followed as required.
- C. Manufacturer's Field Services: Upon Architect's request, each flooring manufacturer shall provide field services consisting of product use, recommendations, and periodic site visits for inspection of installation in accordance with manufacturer's instructions.
 - 1. Site Visits: Minimum of three visits.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00 – Product Requirements.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperatures in spaces where products will be installed for time period before, during and after installation as recommended by manufacturer.

1.08 MAINTENANCE DATA

- A. Submit under provisions of Section 01 70 00 – Execution and Closeout Requirements.
- B. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping and re-waxing.

1.09 EXTRA MATERIALS

- A. Furnish to the Owner not less than one roll and/or full box, unopened, of each class, wearing surface, color, pattern and size of flooring installed.
- B. Furnish to the Owner 10 linear feet for each 500 linear feet of each different type and color of wall base installed.

1.10 SEQUENCING AND SCHEDULING

- A. Install flooring and accessories after other finishing operations, including painting, have been completed.
- B. Do not install flooring products over cementitious underlayment until the slabs have cured and are sufficiently dry to bond with adhesive as determined by flooring manufacturer's recommended bond and moisture test.

1.11 WARRANTY

- A. Flooring products shall be warranted within the specified term and conditions after the date of substantial completion:
 - 1. Warranty Period commencing on the Date of Substantial Completion:
 - a. Vinyl Composition Tile: 5-year warranty.
 - b. Rubber Base: 1-year manufacturing and workmanship warranty.

1.12 PRE-INSTALLATION MEETINGS

- A. Conduct a pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide the products identified in the "List of Finishes" on the Drawings and specified in each Product Data Sheet at end of this Section.

2.02 RESILIENT TILE

- A. Vinyl Composition Floor Tile: Products complying with ASTM F1066, Class 2 (non-asbestos formulated), and with requirements in Vinyl Composition Floor Tile Product Data Sheet at end of this section.

2.03 RESILIENT WALL BASE

- A. Rubber Wall Base Thermoset Vulcanized Rubber (Type TS): Products complying with F1861, Group 1, and requirements specified in the Rubber Wall Base Product Data Sheet at end of this Section.

2.04 RESILIENT ACCESSORIES

- A. Vinyl Accessories: Products complying with requirements specified in Vinyl Accessory Product Data Sheet at end of this section.
- B. Provide tapered vinyl moldings to match rubber base as recommended by flooring manufacturer for both edges and transitions of flooring materials specified. Provide vertical lip on molding of a maximum of 1/4 inch. Provide bevel change in level between 1/4 and 1/2 inch with a slope no greater than 1:2.

2.05 INSTALLATION ACCESSORIES

- A. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.
- B. Trowelable Underlayments and Patching Compounds: Latex-modified, Portland cement based formulation provided or approved by flooring manufacturer for applications indicated.
- C. Adhesives: Water-resistant type recommended by flooring manufacturer to maintain flooring warranty.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify concrete floors are dry to a maximum moisture content allowed by flooring manufacturer, and exhibit negative alkalinity, carbonization, or dusting.
- B. Perform all of the following tests, bond and moisture test and relative humidity test on all floors scheduled to receive resilient flooring. Refer to Section 01 45 23 for testing requirements. If any one of the tests specified fails, the concrete is not sufficiently dry for the installation of the resilient flooring products scheduled. The general contractor shall immediately notify the architect of the results of the tests.
 - 1. Bond and Moisture Test: Use this test to determine if the concrete is sufficiently dry as well as to determine the compatibility of resilient flooring adhesives to concrete subfloors after removal of old adhesives, curing agents, breaker compounds, dust inhibitors, oil, grease, paint, varnish and other special surface treatments or conditions. Using the flooring material and recommended adhesives, install 3 feet by 3 feet panels spaced approximately 50 feet apart throughout the subfloor area. Select areas next to walls, columns or other light traffic areas. Tape edges of panels to prevent edge drying of adhesive.

If the panels are securely bonded after a period of 72 hours, you may conclude that the subfloor surface is dry and sufficiently clean of foreign material for satisfactory installation of the resilient flooring. Material can be considered "securely bonded" if an unusual amount of force is required to lift it from the subfloor.

2. Relative Humidity Test Methods: Perform humidity testing using in situ probes in accordance with ASTM F2170.

Before performing the tests, the buildings permanent HVAC system shall have been running for a minimum of 90 days.

- a. **For the first 1,000 square feet perform three tests.**
- b. **For each additional 1,000 square feet perform 1 test per 1,000 square feet.**

3. The surface of the concrete must have a pH of 9 or less.

C. Relative Humidity Levels: In accordance with manufacturer's requirements.

D. Verify floor and lower wall surfaces are free of substances that may impair adhesion of new adhesive and finish materials.

1. Concrete floors with curing, hardening and breaking compounds shall be abraded with mechanical methods only to remove compounds. Use Blastrac or similar equipment.

E. Comply with ASTM F710 and manufacturer's recommendations for surface preparation.

1. Concrete floors with steel troweled (slick) finish shall be properly roughened up (sanded) to ensure suitable adhesion.

3.02 PREPARATION

A. Acclimate the flooring in a secure storage area per the manufacturer's recommendations.

B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes and other defects with subfloor filler to achieve smooth, flat, hard surface.

1. Do not proceed with the Work until the surface has been properly prepared. Flooring installer shall immediately notify the Contractor of any deficiencies in the floor substrate.

C. Prohibit traffic until filler is cured.

D. Vacuum clean substrate.

E. Apply primer to surfaces, where required by flooring manufacturer.

3.03 GENERAL INSTALLATION – RESILIENT FLOORING

A. Comply with floor covering manufacturer's installation directions and other requirements indicated that are applicable to each type of floor covering installation included in Project.

B. Where demountable partitions and other items are indicated for installing on top of

finished resilient floor, install flooring before these items are installed.

- C. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- D. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.
- E. Install edge strips at unprotected or exposed edges, where flooring terminates and where indicated. Secure resilient strips by adhesive.
- F. Extend resilient flooring into toe spaces, door reveals, closets and similar openings without interrupting floor pattern.
- G. At movable partitions, install flooring under partitions without interrupting floor pattern.
- H. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.
- I. Install resilient flooring on covers for telephone and electrical ducts and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly adhere edges to perimeter of floor around covers and to covers.
- J. Install feature strips and floor markings where indicated. Fit joints tightly.
- K. Adhere resilient floor covering to flooring substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks or other surface imperfections in completed tile installation.
- L. Use full spread of adhesive applied to substrate in compliance with flooring manufacturer's directions including those for trowel notching, adhesive mixing and adhesive open and working times.

3.04 INSTALLATION – TILE FLOORING

- A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths at perimeter that equal less than one-half of a tile. Install tiles square with room axis, unless otherwise indicated.
- B. Match tiles for color and pattern by selecting tiles from cartons in sequence as the manufacturer recommends. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles in pattern with respect to location of colors, patterns, and sizes as indicated on Drawings.
 - 2. If pattern is not identified on Drawings, lay tiles per manufacturers recommendations.

3.05 INSTALLATION – BASE AND ACCESSORIES

- A. General: Install products specified in this section using methods indicated according to manufacturer's installation directions.
- B. Apply resilient wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms and areas where base is required. Install wall base in lengths as long as practicable. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 - 1. On irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
 - 2. Install inside and exterior corners before installing straight pieces.
 - 3. Form inside corners on job from straight pieces of maximum lengths possible by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to product snug fit to substrate.
 - 4. Form outside corners on job from straight pieces of maximum lengths possible by shaving back of base at point where bending will occur. Remove a strip perpendicular to length of base and only deep enough to produce a snug fit without bends whitening or removal of more than half the thickness of wall base.
- C. Place resilient accessories so they are butted to adjacent materials of type indicated and bond to substrates with adhesive. Install reducer strips at edges of flooring that otherwise would be exposed.

3.06 CLEANING

- A. Clean work under provisions of Section 01 70 00 – Execution and Closeout Requirements.
- B. Remove excess adhesive from floor, base and wall surfaces without damage.
- C. Clean all resilient products specified, in accordance with manufacturer's written instructions.
 - 1. Products that require a polish or wax should be done so according to the manufacturer's recommendations unless noted otherwise.
- D. The contractor shall provide its own equipment for floor care and take all precautions to secure area for safety and use appropriate signage such as "WET FLOOR" signs. Signs shall be in English and Spanish.

3.07 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01 70 00 – Execution and Closeout Requirements.
- B. Prohibit traffic on floor finish and stair treads for a duration as recommended by the manufacturer.
- C. Protect the flooring using plywood, Masonite or a similar product for the duration of the project as recommended by the flooring manufacturer.

3.08 PRODUCT DATA SHEET 1 – VINYL COMPOSITION FLOOR TILE

- A. Vinyl Composition Floor Tile Designation: VCT.
- B. Gauge: 1/8 inch.
- C. Reference Specifications: ASTM F1066, Comp.1 (non-asbestos), Class 2 (through pattern).
- D. Static Load Limit: In accordance with scheduled floor tile.
- E. Adhesive: Recommended by flooring manufacturer for substrate indicated and to maintain warranty.
- F. Colors and Patterns: As scheduled on the Drawings.

3.09 PRODUCT DATA SHEET 8 – RUBBER WALL BASE

- A. Rubber Wall Base Designation: RB.
- B. Gauge: 1/8 inch.
- C. Reference Specifications: ASTM F1861, Group 1 (solid), Style B (coved).
- D. Form: 4 inches high roll.
- E. Style: Cove with top-set toe.
- F. Adhesive: As recommended by manufacturer.
- G. Exterior Corners: Job formed only.
- H. Interior Corners: Job formed only.
- I. Colors and Pattern: As scheduled on the Drawings.

END OF SECTION

SECTION 09 68 13 – TILE CARPETING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes carpet tile and accessories.
- B. Related Sections:
 - 1. Section 01 45 23 – Concrete In-Situ Relative Humidity.
 - 2. Section 09 65 00 – Resilient Flooring.

1.02 REFERENCES

- A. Carpet and Rug Institute:
 - 1. CRI Carpet Installation Standard – Standard for Installation of Commercial Carpet.
 - 2. CRI Green Label Plus Testing Program.
 - 3. CRI Model Specifications for Commercial Carpets.
- B. Consumer Products Safety Commission:
 - 1. CPSC 16 CFR 1630 – Standard for the Surface Flammability of Carpets and Rugs.
- C. National Fire Protection Association:
 - 1. NFPA 253 – Standard Method of Test for Critical Radiant Flux for Floor Covering Systems Using a Radiant Heat Energy Source.
- D. California Department of Public Health (CDPH):
 - 1. Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Chambers (2004), including its 2004 addenda.

1.03 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures.
- B. Product Data: Submit data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Samples:
 - 1. Submit four carpet tiles illustrating color and pattern design for each carpet color selected.
 - 2. Exposed edge, transition and other accessory stripping: 12-inch-long samples.

- D. Manufacturer's Installation Instructions: Submit special procedures, perimeter conditions requiring special attention, and maintenance instructions.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 – Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.05 QUALITY ASSURANCE

- A. Surface Burning Characteristics:
 - 1. Floor Finishes: Comply with the following:
 - a. At exit enclosures, exit passageways and corridors, provide carpet tile complying with Class II, minimum 0.22 watts/sq cm when tested in accordance with NFPA 253.
 - 1) In Institutional Group I, provide carpet tile complying with Class I, minimum 0.45 watts/sq. cm. when tested in accordance with NFPA 253.
 - b. In all other areas, provide carpet tile which complies with DOC FF-1 "Pill Test" CPSC 16 CFR Part 1630.
- B. Texture Appearance Retention Rating: Rating classifications as determined by CRI Model Specifications for Commercial Carpets.
 - 1. Carpet Tiles to be greater than or equal to 3.0 TARR for Heavy Traffic Level Classification.

1.06 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with minimum five years of experience approved by manufacturer.
 - 1. Floor Covering Installation Contractors Association (FCICA) or International Certified Floorcovering Installers Association (ICFI) certified carpet installers.

1.07 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 – Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 – Product Requirements.
- B. Store materials in area of installation for 48 hours prior to installation.

- C. Maintain minimum 70 degrees F ambient temperature 3 days prior to, during and 24 hours after installation.
- D. Ventilate installation area during installation and for 3 days after installation.

1.10 EXTRA MATERIALS

- A. Section 01 70 00 – Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Supply 3 percent of total carpet tiles installed of each color and pattern selected.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide the products identified in the "List of Finishes" on the Drawings.

2.02 CARPET TILE

- A. Carpet Tile: Products meeting the testing and product requirements of the Carpet and Rug Institute Green Label Plus Program.

2.03 ACCESSORIES

- A. Subfloor Filler: Cementitious Type recommended by flooring material manufacturer.\
- B. Moldings and Edge Strips: Vinyl; color as selected.
- C. Adhesives: As recommended by the manufacturer and complying with SCAQMD (South Coast Air Quality Management District) Rule 1168, amended January 7, 2005 Adhesives and Sealant Applications.
 - 1. Maximum VOC content: 50 g/L.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.
- B. Verify floor surfaces are smooth and flat within tolerances specified in Section 03 30 00 – Cast-in-Place Concrete and are ready to receive work.
- C. Verify concrete floors are ready for carpet installation by testing for moisture emission rate and alkalinity. Obtain instructions when test results are not within specified limits.
 - 1. Relative humidity: In accordance with manufacturer's requirements.
 - 2. Alkalinity: pH range of 5-9.

3.02 PREPARATION

- A. It shall be the responsibility of the General Contractor to present the floors in a condition to receive the carpet.
- B. Surface to receive carpet tiles must be free of dirt, solvents, oil, grease, paint, plaster, moisture and other substances detrimental to proper performance of adhesive and carpet.
- C. Concrete Surfaces
 - 1. The General Contractor must submit to the floor covering installation contractor prior to installation a written report on the moisture and alkalinity condition of the concrete slab.
 - 2. Check to ensure there is no dusting. A primer may be needed to prevent dusting.

3.03 INSTALLATION

- A. Install carpet tile in accordance with manufacturer's written instructions and with CRI Carpet Installation Standard to maintain uniformity of direction and lay of pile. Refer to List of Finishes for installation method.
- B. Do not mix carpet from different cartons unless from same dye lot or otherwise noted.
- C. Butt carpet tile edges firmly together to form seams without gaps. Remove adhesive promptly from face of carpet.
- D. Where carpet meets dissimilar floor surface, proper edge molding shall be used.
- E. Install edge moldings where carpet edge is exposed and at transitions to other floor coverings. Edge moldings shall be securely anchored to substrate.

3.04 CLEANING

- A. Section 01 70 00 – Execution and Closeout Requirements: Final cleaning.
- B. Remove excess adhesive from floor, base and wall surfaces without damage.
- C. Clean and vacuum carpet surfaces.

3.05 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 – Execution and Closeout Requirements: Protecting installed construction.
- B. Do not permit traffic over unprotected floor surface.
 - 1. Cover carpeting in traffic areas with protective non-staining building paper. Do not use plastic sheeting.

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END OF SECTION

SECTION 09 90 00 – PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This Section includes surface preparation, painting and finishing of exposed interior and exterior items and surfaces.
 - 1. Surface preparation, priming and finish coats specified in this section are in addition to shop priming and surface treatment specified under other sections.
- B. Paint exposed surfaces whether or not colors are designated in “schedules,” except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available. Sherwin Williams Coatings listed at the end of this specification where used to establish the level of quality of the coating systems. The coating manufacturer shall match the colors identified in the finish schedule.
- C. Painting is not required on pre-finished items, finished metal surfaces, concealed surfaces, operating parts, and labels.
 - 1. Pre-finished items not to be painted include the following factory-finished components:
 - a. Acoustic materials.
 - b. Finished mechanical and electrical equipment.
 - c. Light fixtures.
 - d. Switchgear.
 - e. Distribution cabinets.
 - f. Plastic laminate wood doors.
 - i. Plastic laminate covered architectural casework.
 - 2. Concealed surfaces not to be painted include wall or ceiling surfaces in the following generally inaccessible areas:
 - a. Furred areas.
 - b. Pipe spaces.
 - c. Ceiling plenums, with the following exception: **The wall surface on the perimeter of the building above the ceiling shall be primed and painted as specified up to the bottom of the floor/roof deck.**
 - 3. Finished metal surfaces not to be painted include:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper.
 - e. Bronze or brass.
 - 4. Operating parts not to be painted include moving parts of operating equipment such as the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.

5. Labels: Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.02 RELATED SECTIONS

- A. Section 08 12 14 – Standard Steel Frames: Shop Primed, Field Painted.
- B. Section 22 05 53 – Identification for Plumbing Piping and Equipment.
- C. Section 23 05 53 – Identification for HVAC Piping and Equipment.
- D. Section 26 05 53 – Identification for Electrical Systems.
- E. Section 27 05 53 – Identification for Communication Systems.

1.03 REFERENCES

- A. Steel Structures Painting Council
 1. SP-1 Solvent Cleaning
 2. SP-2 Hand Tool Cleaning
 3. SP-3 Power Tool Cleaning
 4. SP-13 Nace No. 6 Surface Preparation for Concrete
- B. EPA Method 24

1.04 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.
- B. Product Data: Manufacturer's data sheets on each paint and coating product shall include:
 1. Product characteristics.
 2. Surface preparation instructions and recommendations.
 3. Primer requirements and finish specification.
 4. Storage and handling requirements and recommendations.
 5. Application methods.
 6. MSDS sheets listing VOC content in g/L.
- C. Samples: Upon selection of colors by the Architect, submit samples for Architect's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.
 1. On 12 inch by 12 inch hardboard, provide one sample of each paint color listed in the color schedule, with texture to simulate actual conditions. Resubmit samples as requested by Architect until acceptable sheen, color and texture are achieved. Samples shall be stepped to show primer, first coat and second coat.
 2. On actual wall surfaces and other interior building components, duplicate painted finishes of prepared samples as directed by Architect. On at least 100 square feet of surface as directed, provide full-coat finish samples until required sheen, color

and texture is obtained; simulate finished lighting conditions for review of in-place work.

3. Do not proceed with painting until materials and finishes are approved by Architect.

1.05 QUALITY ASSURANCE

- A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.
- B. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 1. Notify the Architect of problems anticipated using the materials specified.
- C. Material Quality: Provide the manufacturer's best quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.
 1. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude equal products of other manufacturers.
 2. Federal Specifications establish a minimum quality level for paint materials, except where other product identification is used. Provide written certification from the manufacturer that materials provided meet or exceed these criteria.
 3. Products that comply with qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to the Architect. Furnish material data and manufacturer's certificate of performance to Architect for proposed substitutions.
- D. All paints, primers and coatings used on the interior of the building (defined as inside of the weatherproofing system and applied onsite) shall comply with the following criteria:
 1. Architectural paints, coatings and primers applied to interior walls and ceilings: Do not exceed the VOC content limits established in Green Seal Standard GS-11, Paints, First Edition, May 20, 1993.
 - a. Flats or Primers: 50 g/L, minus water.
 - b. Non-Flats or Primers: 150 g/L, minus water.
 2. Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates: Do not exceed the VOC content limit established in Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition, January 7, 1997.
 - a. Gloss: 250 g/L, excluding water and tinting.
 - b. Semi-Gloss: 250 g/L, excluding water and tinting.
 - c. Flat: 250 g/L, excluding water and tinting.
- E. Chemical Component Restrictions: The manufacturer shall demonstrate that the following chemical compounds are not used as ingredients in the manufacture of the product:
 1. Halomethanes:
 - a. Methylene chloride
 2. Chlorinated ethanes:

- a. 1,1,1-trichloroethane
- 3. Aromatic solvents:
 - a. Benzene
 - b. Toluene (methylbenzene)
 - c. Ethylbenzene
- 4. Chlorinated ethylenes:
 - a. Vinyl chloride
- 5. Polynuclear aromatics:
 - a. Naphthalene
- 6. Chlorobenzenes:
 - a. 1,2-dichlorobenzene
- 7. Phthalate esters:
 - a. Di (2-ethylhexyl) phthalate
 - b. Butyl benzyl phthalate
 - c. Di-n-butyl phthalate
 - d. Di-n-octyl phthalate
 - e. Diethyl phthalate
 - f. Dimethyl phthalate
- 8. Miscellaneous semi-volatile organics:
 - a. Isophorone
- 9. Metals and their compounds:
 - a. Antimony
 - b. Cadmium
 - c. Hexavalent chromium
 - d. Lead
 - e. Mercury
- 10. Preservatives (anti-fouling agents)
 - a. Formaldehyde
- 11. Ketones:
 - a. Methyl ethyl ketone
 - b. Methyl isobutyl ketone
- 12. Miscellaneous volatile organics:
 - a. Acrolein
 - b. Acrylonitrile
- F. Packaging Requirements:
 - 1. Toxics in packaging:
 - a. The manufacturer shall demonstrate that paint cans and their components are not fabricated with lead.

1.07 DEFINITIONS

- A. Anti-corrosive Paints: Coatings formulated and recommended for use in preventing the corrosion of ferrous metal substrates.
- B. Paint: Liquid, liquefiable or mastic composition that is converted to a solid protective, decorative, or functional adherent film after application as a thin layer. These coatings are intended for on-site application to interior or exterior surfaces of residential, commercial, institutional or industrial buildings.
- C. Flat coatings are coatings that register a specular gloss of less than 15 on an 85 degree meter or less than 5 on a 60 degree meter, per ASTM D523.
- D. Non-flat coatings are coatings that register a specular gloss of 5 or greater on a 60 degree meter or a specular gloss of 15 or greater on an 85 degree meter, per ASTM D523.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Federal Specification number, if applicable.
 - 4. Manufacturer's stock number and date of manufacture.
 - 5. Contents by volume, for pigment and vehicle constituents.
 - 6. VOC content.
 - 7. Thinning instructions.
 - 8. Application instructions.
 - 9. Color name and number.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 degrees F (7 degrees C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.
- C. Provide coating systems which are VOC compliant as specified.

1.09 JOB CONDITIONS

- A. Section 01 60 00 – Product Requirements.
- B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint manufacturer.

- C. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F (10 degrees C) and 90 degrees F (32 degrees C).
- D. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F (7 degrees C) and 95 degrees F (35 degrees C).
- E. Do not apply paint in snow, rain, fog or mist, when the relative humidity exceeds 85 percent, at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.
- F. Provide lighting level of 80-foot candle measured mid-height at substrate surface.

1.10 EXTRA MATERIAL

- A. Provide one gallon of each different paint system and color with manufacturer's name and color clearly labeled on the top of each container.

1.11 PRE-PAINTING CONFERENCE

- A. Prior to finish painting interior, General Contractor shall schedule a "Pre-Painting Conference" to be attended by the Architect, Contractor, painting subcontractor and Manufacturer's Representative. (Manufacturer's Rep. to attend when required for special finishes.)
- B. Agenda to include submittal of color and finishes sample (RE: Article 1.04 "Submittals" and review of color schedule.
- C. Contractor to record discussions of conference including agreements and/or disagreements and distribute a copy of record to each party in attendance.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Contract Documents are based on manufacturer and product named below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and does not change concept as expressed in Contract Documents as judged by Architect.
 - 1. Basis of Design Product Selections: Sherwin-Williams.
- B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide product by one of the manufacturers named alphabetically below. If not named, submit as substitution according to Conditions of the Contract and appropriate Division 1 sections.
 - 1. Benjamin Moore and Co.
 - 2. Pratt & Lambert

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected.
 - 1. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

3.02 PREPARATION

- A. General Procedures: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in place that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.
 - 1. Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- B. Surface Preparation: Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing of problems anticipated with using the specified finish-coat material with substrates primed by others.
 - 3. Ferrous Metals: Clean non-galvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council.
 - a. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer and touch up with the same primer as the shop coat.
 - 4. Drywall: Surface must be clean and dry. All nail or screw heads must be set and spackled. Joints must be taped and covered with joint compound. Spackled fastener heads and tape joints must be sanded smooth and all dust removed prior to painting.
 - a. Where level 5 finish is provided, ensure finish is smooth and ready for priming and painting.
 - 5. Previously coated surfaces: Remove all surface contamination such as oil, grease, loose paint, mill scale, dirt, rust, mold, mildew, mortar efflorescence and scalers. Glossy surfaces of old paint films shall be clean and dull before painting. Clean and dull surface either by washing with an abrasive cleaner, or by washing and sanding. Spot prime bare areas with appropriate primer. Check for compatibility by applying a test patch of the specified system, coating an area of 3 square feet. Allow to dry for one week before testing adhesion as per ASTM D3359. If coating is incompatible, prepare surface in conformance with ASTM D4259.
- C. Materials Preparation: Carefully mix and prepare paint materials in accordance with manufacturer's directions.
 - 1. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.

2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and if necessary, strain material before using.
3. Use only thinners approved by the paint manufacturer, and only within recommended limits.

3.03 APPLICATION

- A. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
 1. Non-zinc coated architectural metals, steel frames shall have all coatings spray applied. Brush application is not acceptable.
- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, form release agents, sealers or conditions detrimental to formation of a durable paint film.
 1. Paint colors, surface treatments, and finishes are indicated in "schedules."
 2. Provide finish coats that are compatible with primers used.
 3. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce an even smooth surface in accordance with the manufacturer's directions.
 4. Apply additional coats when undercoats, stains or other conditions show through final coat of paint until paint film is of uniform finish, color and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
 5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convactor covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas as required to maintain the system integrity and provide desired protection.
 6. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
 7. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
 8. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 9. Sand lightly between each succeeding enamel or varnish coat.
 10. Prime metal surfaces that have been shop-primed and touch-up painted.
- C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pre-treated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure and where application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

- D. Minimum Coating Thickness: Apply materials at not less than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire system as recommended by the manufacturer.
- E. Mechanical and Electrical work: Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces.
- F. Prime Coats: Before application of finish coats, apply a prime coat of material as recommended by the manufacturer to material that is required to be painted or finished and has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears to assure a finish coat with no burn through or other defects due to insufficient sealing.
- G. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.
- H. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.04 CLEANING

- A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish and other discarded paint materials from the site.
- B. Upon completion of painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

3.05 PROTECTION

- A. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing and repainting, as acceptable to Architect.
- B. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 INTERIOR PAINT SCHEDULE

- A. General: Provide the following paint systems for the various substrates as indicated.
- B. Drywall (walls): Furnish sample on 2 feet by 2 feet piece of drywall for Architect to approve prior to application.
 - 1. Gypsum Drywall Systems:
 - a. Semi-gloss latex enamel: 2 finish coats over primer on properly prepared surface.
 - b. Texture: Level 5 Finish:
 - 1) Refer to Section 09 21 16 – Gypsum Board Assemblies for Level 5 finish.
 - 2) Refer to Section 09 21 16.23 – Gypsum Board Shaft Wall

Assemblies for Level 5 finish.

- c. Primer: VOC 0 g/L < maximum VOC content of 50 g/L.
 - a. Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer (B28W2600 Series) (4.0 mils wet, 1.5 mils dry).
 - d. First and Second Coats: VOC 0 g/L < maximum VOC content of 50 g/L.
 - 1) Sherwin-Williams ProMar 200 Zero VOC Latex Semi-Gloss (B31-2600 Series) (4 mils wet, 1.7 mils dry per coat).
2. Gypsum Drywall Systems, previously coated surfaces:
- a. Semi-gloss latex enamel: 2 finish coats over primer on properly prepared surface.
 - b. Primer (Verify compatibility of primer with existing paint system): **VOC 0 g/L < maximum VOC content of 50 g/L.**
 - 1) Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer (B28W2600 Series) (4.0 miles wet, 1.5 mils dry).
 - c. First and Second Coats: **VOC 0 g/L < maximum VOC content of 50 g/L.**
 - 1) Sherwin-Williams ProMar 200 Zero VOC Latex Semi-Gloss (B31-2600 Series) (4 mils wet, 1.7 mils dry per coat).
- C. Drywall (Ceilings): Furnish sample on 2' x 2' piece of drywall for Architect to approve prior to application.
1. Gypsum Drywall System:
- a. Texture: Level 5 finish where glass mat gypsum wall board is installed.
 - b. Flat latex: 2 finish coats over primer on properly prepared surface.
 - c. Primer: VOC 0 g/L < maximum VOC content of 50 g/L.
 - 1) Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer, (B28W2600 Series) (4.0 mils wet, 1.5 mils dry)
 - d. First and second coats: VOC: 0 g/L < maximum VOC content of 50 g/L.
 - 2) Sherwin-Williams ProMar 200 Zero VOC Flat Interior Latex (B30-2600 Series) (4.0 mils wet, 1.8 mils dry per coat)
- D. Metals
1. Ferrous Metals:
- a. Semi-Gloss Latex: 2 finish coats over primer on properly prepared surface.
 - b. Primer: VOC 96 g/L < maximum VOC content 100 g/L.

- a. Sherwin-Williams Pro Industrial Pro-Cryl Universal Water-Based Primer Non-Flat Primer (B66-310 Series) (5.0-10.0 mils wet, 2.0-4.0 mils dry).
- c. First and Second Coats: VOC 0 g/L < maximum VOC content 50 g/L.
 - 1) Sherwin-Williams Pro Industrial Acrylic Semi-Gloss (B66-650 Series) (6-12 mils wet, 2.5-4.0 mils dry per coat).

END OF SECTION

SECTION 10 26 00 – WALL PROTECTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Corner Guards.
2. Crash Rails/Bumper Guards/Chair Rails.
3. Semi-Rigid Protective Wallcoverings.

B. Related Sections:

1. Section 06 10 53 – Miscellaneous Carpentry.
2. Section 09 21 16 – Gypsum Board Assemblies.
3. Section 09 22 16 – Non-Structural Metal Framing: Backing plate and metal stud framing for securing corner guards.

C. References:

1. ANSI, American National Standards Institute.
2. ASTM, American Society for Testing and Materials.
3. NFPA, National Fire Protection Association.
4. UL, Underwriters Laboratory.
5. ADA, Americans with Disabilities Act.

1.02 PERFORMANCE REQUIREMENTS

A. Installed Wall Rail Component Assembly:

1. Handrails shall be designed to resist a load of 50 pounds per linear foot applied in any direction at the top and to transfer this load through supports to the structure.
2. Handrails shall be able to resist a single concentrated load of 200 pounds applied in any direction at any point along the top and to transfer this load through the supports to the structure. This load need not be assumed to act concurrently with 50 pounds per linear foot design loads.

B. Corner Guards: Resist lateral impact force of 100 lbs at any point without damage or permanent set.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01 33 00 – Submittal Procedures.
- B. Product data indicating compliance with specified requirements. Include physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.
- C. Shop Drawings showing methods of attachment to substrate and locations of wall protection.
- D. Samples: Submit one section of wall protection illustrating component design, configuration, selection of color, pattern and surface texture.
 - 1. 12 inch long samples of each type of handrail, wall and corner guard required. Include examples of joinery, corners, and field splices.
 - 2. 7 by 9 inch samples of each rigid sheet or panel type wall surface protection material required.
 - 3. Provide trim accessories in color to match wall protection. Provide sample for verification to architect prior to ordering.
- E. Manufacturer's Installation Instructions – Indicate installation rough-in measurements and instructions.
- F. Manufacturer's Certificate – Certify that products meet or exceed flame spread rating for surface finish.

1.04 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Proved UL classified wall protection assemblies with NFPA Class A fire rating. Comply with ASTM E 84 for the fire performance characteristics indicated below. Identify components with markings from testing and inspection organization.
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed: 450 or less.
- B. Single-Source Responsibility: Obtain wall surface protection system components from a single source.
- C. Deliver materials in original factory wrappings and containers, clearly labeled with manufacturer and brand name.
- D. Store materials in original undamaged packages and containers inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 - 1. Maintain room temperature within the storage area between 60 degrees F (16 degrees C) and 80 degrees F (27 degrees C) during the period plastic materials are stored. Keep materials out of direct sunlight to avoid excessive surface temperatures.
 - 2. Store rigid plastic corner guard, wall guard, and handrail covers in a horizontal position for a minimum of 72 hours, or until the plastic material attains the

ambient room installation temperature of between 65 degrees F (18 degrees C) and 75 degrees F (24 degrees C).

- E. Chemical and Stain Resistance: Provide wall protection system components with chemical and stain resistance in accordance with ASTM D1308.
- F. Color Consistency: Provide components matched in accordance with SAE J-1545-(Delta E) with a color difference no greater than 1.5 units using CIE Lab, CIE CMC, CIE LCh, Hunter Lab or similar color space scale systems.
- G. Impact Strength: Provide assembled wall protection units that have been tested in accordance with the applicable provisions of ASTM F476.

1.05 PROJECT CONDITIONS

- A. Maintain ambient temperature within building at not less than 65 degrees F (18 degrees C) or greater than 75 degrees F (24 degrees C) for a minimum 72 hours prior to beginning installation.
- B. Do not install wall surface protection system components until the space is enclosed, weatherproof and climate controlled.
- C. Do not install semi-rigid wall protection systems until temperature is stable and permanent lighting is in place.

1.06 MAINTENANCE

- A. Maintenance Instructions: Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.
- B. Replacement materials: Minimum 2 percent of each type, color, and pattern of wall surface protection materials and components. **Include accessory components as required. Replacement materials shall be from the same production run as installed materials. Package with protective coverings and appropriate labels.

1.07 FIELD MEASUREMENTS

- A. Verify field measurement prior to fabrication.

1.08 COORDINATION

- A. Coordinate Work with wall or partition sections for installation of concealed blocking or anchor devices.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Koroseal Wall Protection Systems. Drawings and specifications are based on manufacturer's literature from Koroseal Wall Protection Systems unless otherwise indicated.
- B. Substitutions: Under provisions of Section 01 60 00.

2.02 COMPONENTS

- A. Rigid Plastic Material: Extruded, textured, chemical- and stain-resistant, high-impact, acrylic modified vinyl plastic, thickness as indicated. Comply with specified requirements of ASTM D256 for impact resistance and ASTM E84 for flame spread and smoke developed characteristics. Color: As selected by Architect from the manufacturer's full range of standard colors.
- B. Aluminum Extrusions: ASTM B221 (ASTM B221M) for 6063-T6.
- C. Fasteners: Provide non-corrosive metal screws, bolts, and other fasteners compatible with aluminum components, hardware, anchors, and other items being fastened. Use theft-proof fasteners where exposed to view.

2.03 CORNER GUARDS

- A. Surface-Mounted, Resilient Plastic Corner Guards: CG1, EP1
 - 1. Cover: Rigid, impact-resistant plastic, minimum 0.078 inch (1.9mm) thick, in dimensions and profiles indicated.
 - 2. Retainer: Continuous, one-piece, extruded aluminum retainer, minimum 0.062 inch (1.6 mm) thick.
 - 3. CG1: G100 Series, 2 inch by 2 inch by 48 inches high; corner Radius: 1/4 inch.
 - 4. EP1: G110 Series, 2 inch by 2 inch by 48 inches high with high impact filler sheet.
 - 5. Accessories: Prefabricated aluminum retainer with concealed splices, mounting hardware and other accessories as required.
 - a. End Caps:
 - 1) Match plastic cover color.
 - 2) Field adjustable for close alignment with snap-on plastic covers.
 - 6. Color: As selected. Refer to Finish Schedule
 - 7. Screws: As recommended by the manufacturer.

2.04 WALL GUARDS

- A. Crash Rail Type Wall Guards: CR1.
 - 1. Cover: Extruded, rigid, impact-resistant plastic, minimum 0.078 inch (1.9 mm) thick, in profile indicated.
 - 2. Retainer:
 - a. Continuous, one-piece, extruded aluminum retainer, minimum 0.062 inch (1.6 mm) thick, with continuous vinyl cushion(s) or bumper(s) centered in the extrusion.
 - b. 2-inch-long extruded aluminum clips.

- c. Continuous vinyl cushion on aluminum retainer attached to 2 inch long extruded aluminum clips.
 - 3. C630 Series: 6 inches (150 mm) high, surface-mounted on 1/2 inch (13 mm) cushion spacers.
 - 4. Color: As selected. Refer to Finish Schedule.
- B. Chair Rail Type Wall Guard: CR2
 - 1. Model CH20, 2-1/8 inches chair rail with full-length vinyl cover and PVC retainer.
 - 2. Color: As selected. Refer to Finish Schedule.

2.05 IMPACT-RESISTANT WALLCOVERINGS

- A. Semi-rigid, Integrally colored Sheet Wallcovering: Semi-rigid, embossed, impact-resistant plastic sheets or roll stock. Comply with fire performance characteristics specified and be chemical- and stain-resistant.
 - 1. 500 Series: Solid Colors.
 - a. Sheet/Roll Thickness: 0.040 inch (1.0 mm) thick, Class I/A Fire-Rated.
 - 2. Color: As Selected. Refer to Finish Schedule.
 - 3. Screws: As recommended by manufacturer.
- B. Color Matched or Complimentary Accessory Moldings: Manufacturer's Standard.
 - 1. J-Molding: #82.
 - 2. Divider Bar: #87/88.
 - 3. Inside Corner: #83.
 - 4. Outside Corner: #85.
 - 5. Color: As selected.
- C. Color Matched Caulk: Manufacturer's Standard.
- D. Adhesive and Primer: As recommended by the manufacturer.
 - 1. Maximum VOC content: 50 g/L.

2.06 FABRICATION

- A. Comply with requirements indicated for design, dimensions, details, finish and member sizes, including wall thicknesses of components.
- B. Shop-assemble components to the greatest extent possible. Disassemble only as necessary for shipping and handling.

- C. Fabricate component with tight seams and joints with exposed edges rolled. Provide surfaces free of evidence of wrinkling, chipping, uneven coloration, dents and other imperfections. Fabricate members and fittings to produce flush, smooth and rigid hairline joints.
- D. Brackets, Flanges, Fittings and Anchors: Provide wall brackets, flanges, miscellaneous fitting and anchors for interconnection of members to other construction.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions in which wall surface protection components and wall protection systems will be installed.
- B. Complete finishing operations, including painting, before beginning installation of wall surface protection system materials.
- C. Wall surfaces to receive impact-resistant wallcovering materials shall be dry and free from dirt, grease, loose paint, and scale.
- D. Do not proceed with installations until unsatisfactory conditions have been corrected.
- E. Verify rough-in for components are correctly sized and located.

3.02 PREPARATION

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

3.03 INSTALLATION

- A. Install wall surface protection units plumb, level and true to line without distortions.
- B. Do not use materials with chips, cracks, voids, stains or other defects that might be visible in the finished work.
- C. Install aluminum retainers, mounting brackets, and other accessories in strict accordance with the manufacturer's instructions.
- D. Where splices occur in horizontal runs of over 20 feet (6 m), splice aluminum retainer and plastic cover at same locations along the run.
- E. Position surface-mounted corner guards atop wall base.
- F. Coordinate height of bumper/crash rail with Owner.
- G. Position top of corridor hand rail 36 inches (914.4 mm) from finished floor.
- H. Terminate rails 1 inch (25.4 mm) short of door openings, intersecting walls, corner guards and swing of corridor dual egress doors.
- I. Return rails to wall.

- J. Where handrail is used in conjunction with sheet goods terminate top of sheets at Center Line of handrail.
- K. Install rigid vinyl wallcovering sheets with texture running in the same direction for uniform appearance.
- L. Coordinate installation of vinyl fabric wall covering with corner guard frame and cover.

3.04 ERECTION TOLERANCES

- A. Maximum Variation from Required Height for Horizontal Rails: 1/4 inch (6mm).
- B. Maximum Variation from Level or Plane for Visible Length for Horizontal Rails: 1/4 inch (6 mm).

3.05 CLEANING

- A. Clean plastic covers and accessories using a standard non-ammonia-based household cleaning agent.
- B. Clean metal components in accordance with the manufacturer's recommendations.
- C. Remove excess adhesive in manner recommended by manufacturer.

3.06 PROTECTION

- A. Protect installed materials to prevent damage by other trades.

END OF SECTION

SECTION 10 28 00 – TOILET, BATH AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Washroom accessories.
- B. Attachment hardware.

1.02 RELATED SECTIONS

- A. Section 06 10 53 – Miscellaneous Rough Carpentry: Wood backing.
- B. Section 09 22 16 – Non-Structural Metal Framing: Wood and steel backing.

1.03 REFERENCES

- A. ASTM International:
 - 1. ASTM A125/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 2. ASTM A153/A153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 3. ASTM A269 – Standard Specification for Seamless and Welded Austentic Stainless Steel Tubing for General Service.
 - 4. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 5. ASTM A666 – Standard Specification for Austentic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 6. ASTM B456 – Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

1.04 SUBMITTALS

- A. Refer to Section 01 33 00 – Submittal Procedures Article 1.02, Paragraph B for submittal requirements.

1.05 REGULATORY REQUIREMENTS

- A. Conform to ADA (Americans with Disabilities Act) code for access for the handicapped.

1.06 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on product data.

1.07 COORDINATION

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ASI.
- B. Bobrick Washroom Equipment, Inc.
- C. Bradley Inc.
- D. Substitutions: Under provisions of Section 01 60 00.

2.02 MATERIALS

- A. Sheet Steel: ASTM A366.
- B. Stainless Steel Sheet: ASTM A666, Type 304.
- C. Adhesive: Two-component epoxy type, waterproof.
- D. 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.

2.03 FABRICATION

- A. Weld and grind joints of fabricated components, smooth.
- B. Form exposed surfaces from single sheet of stock, free of joints. Form surfaces flat without distortion. Maintain surfaces without scratches or dents.
- C. Shop assemble components and package complete with anchors and fittings.
- D. Provide steel anchor plates, adapters and anchor components for installation.

2.04 KEYING

- A. Master key all accessories; supply 6 keys to Owner.

2.05 FINISHES

- A. Galvanizing: ASTM A123 to 1.25 oz/sq.yd. Galvanize ferrous metal and fastening devices.
- B. Shop Primed Ferrous Metals: Pre-treat and clean, spray apply one coat primer and bake.

- C. Chrome/Nickel Plating: ASTM B456, Type SC 2 satin finish.
- D. Stainless Steel: No. 4 satin luster finish.
- E. Back paint components where contact is made with building finishes to prevent electrolysis.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that site conditions are ready to receive work and dimensions are as instructed by the manufacturer.
- B. Verify exact location of accessories for installation.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions and ADA.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. At all specified "handicapped" lavatories, provide molded insulation at P-traps and hot and cold-water angle valves.

3.04 SCHEDULE (Note: Toilet accessories listed are based on products from Bobrick unless otherwise indicated.)

- TA-1 Not Used
- TA-2 Not Used
- TA-3 Not Used
- TA-4 Not Used
- TA-5 Not Used
- TA-6 Not Used
- TA-7 Surface mounted soap dispenser: OFCI.
- TA-8 Not Used

TA-9	Not Used
TA-10	Not Used
TA-11	Not Used
TA-12	Not Used
TA-13	Not Used
TA-14	Robe Hook: B-7671
TA-15	Not Used
TA-16	Not Used
TA-17	Surface-Mounted Paper Towel Dispenser: OFCI.
TA-18	Not Used
TA-19	Not Used
TA-20	Not Used
TA-21	Not Used
TA-22	Not Used

END OF SECTION

SECTION 10 44 00 – FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

- A. This Section Includes the Following:
 - 1. Fire extinguisher cabinets, non-rated.
 - 2. Fire extinguishers.

1.02 RELATED SECTIONS

- A. Section 09 22 16 – Non-Structural Metal Framing: Rough opening in metal stud walls.

1.03 REFERENCES

- A. National Fire Protection Association:
 - 1. NFPA 10 – Standard for Portable Fire Extinguishers.

1.04 SUBMITTALS

- A. Refer to Section 01 33 00 – Submittal Procedures Article 1.02, Paragraph B.

1.05 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain fire extinguisher cabinets from one source from a single manufacturer.

1.06 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 – Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit test, refill or recharge schedules and re-certification requirements.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 – Product Requirements: Environmental conditions affecting products on site.
- B. Do not install extinguishers when ambient temperatures are capable of freezing extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

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

1. J.L. Industries.
2. Larsens Manufacturing Co.
3. Modern Metal Products by Muckle.
4. Walter Kidde, Division of Kidde, Inc.
5. Watrous Inc.

Model numbers listed in the schedule at the end of this section are based on Larsens Manufacturing Co., Architectural Series.

2.02 FIRE EXTINGUISHER CABINETS

- A. General: Provide fire extinguisher cabinets where indicated.
- B. Construction: Manufacturer's standard enameled steel box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld all joints and grind smooth. Miter and weld perimeter door frames.
- C. Cabinet Type: Suitable for mounting conditions indicated, of the following types:
1. Semi Recessed: Cabinet box (tub) semi recessed in walls of sufficient depth to suit style of trim indicated. Total recessed depth for box shall not exceed 4" for non-rated FEC-1 cabinets. Cabinet trim may not project more than 4" from wall surface.
- D. Trim Style: Fabricate trim in one piece with corners mitered, welded and ground smooth.
1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (back bend).
 - a. Rolled edge semi-recessed with 2-1/2" backbend depth.
 - b. Trim Metal: Enameled steel.
- E. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.
1. Enameled Steel: Manufacturer's standard finish.
- F. Door Style: Full flush opaque panel of material indicated.
- G. Identify fire extinguisher in cabinet with "**FIRE EXTINGUISHER**" lettering vertically on door in die-cut letters, red in color.

- H. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide concealed or continuous-type hinge permitting door to open 180 degrees. Provide recessed handle and "Larsen Loc."

2.03 FINISHES FOR FIRE EXTINGUISHER CABINETS – GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by application of strippable, temporary protective covering prior to shipment.

2.04 STEEL FIRE EXTINGUISHER CABINET FINISHES

- A. Surface Preparation: Solvent-clean surfaces in compliance with SSTs-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncooked steel in compliance with CPC-SP 5 (White Metal Blast Cleaning) or CPC-SP 8 (Pickling).
- B. Baked Enamel Finish: Immediately after cleaning and pretreatment, apply manufacturer's standard 2-coat baked enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's instructions for application and baking to achieve a minimum dry film thickness of 2.0 mils.
 - 1. Color and Gloss: As selected by Architect from manufacturer's standard choices for color and gloss, paint exterior and interior of cabinet.

2.05 FIRE EXTINGUISHER

- A. General: Provide fire extinguishers for each cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard, that comply with authorities having jurisdiction.
- B. Multipurpose Dry Chemical Type, (MP10): UL-rated 4-A: 80B:C, 10-lb nominal capacity, in enameled steel container.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation.
 - 1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

2. Securely fasten fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.

3.02 SCHEDULE

A. Provide the following:

1. Non-Fire-Rated Fire Extinguisher Cabinet (**FEC-1**): Larsens **2409-6R**. Manufacture cabinet with 2-1/2" return trim. Mount bottom of cabinet at 2'-0" above finished floor. Provide and install an **MP10** fire extinguisher in each cabinet.
 - a. Provide one FEC-1. Architect to provide location.

END OF SECTION

SECTION 12 24 13 – MANUAL WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Manually operated, roll-up fabric interior window shades including mounting and operating hardware.

1.02 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01 33 00 - Submittal Procedures.
- B. Product Data: Manufacturer's data sheets on each product specified, including:
 - 1. Preparation instructions and recommendations.
 - 2. Installation and maintenance instructions.
 - 3. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
 - 4. Storage and handling requirements and recommendations.
 - 5. Mounting details and installation methods.
- C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.
- D. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings, field verified window dimensions, quantities, type of shade, controls, fabric and color, and include opening sizes and key to typical mounting details.
- E. Selection Samples: For each finish product specified, two complete sets of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.
- F. Verification Samples: For each finish product specified, two complete sets of shade components, unassembled, demonstrating compliance with specified requirements. Shade fabric sample and aluminum finish sample as selected, representing actual product, color, and patterns. Mark face of material to indicate interior faces.
- G. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.
- H. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years of experience in manufacturing products comparable to those specified in this section.
- B. NFPA Flame-Test: Passes NFPA 701. Materials tested shall be identical to products proposed for use.
- C. Mock-Up: Provide a mock-up of one of each type roller shade assembly specified for evaluation of mounting, appearance and accessories.
 - 1. Locate mock-up in window(s) designated by Architect.
 - 2. Do not proceed with remaining work until mock-up is accepted by Architect.
 - 3. Mock-up may remain in place upon acceptance by Architect.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver window shades until building is enclosed and construction within spaces where shades will be installed is substantially complete.
- B. Deliver products in manufacturer's original, unopened, undamaged containers with labels intact.
- C. Label containers and shades according to Window Shade Schedule.
- D. Store products in manufacturer's unopened packaging until ready for installation.

1.6 SEQUENCING

- A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.
- B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.07 PROJECT CONDITIONS

- A. Install roller shades after finish work and ambient temperature, humidity and ventilation conditions are maintained at levels recommended for project upon completion.

1.08 WARRANTY

- A. Hardware and Shade Fabric: Manufacturer's standard twenty-five year limited warranty.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

- A. Basis of Design: Contract Documents are based on manufacturer and product named below to establish a Standard of Quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and do not change concept as expressed in Contract Documents as judged by Architect.
 - 1. Basis of Design Selections:
 - a. Manufacturer: Draper, Inc.
 - b. Product: Manual FlexShade XD
- B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide product by one of the manufacturers named below. If not named, submit as substitution according to Conditions of the Contract and appropriate Division 1 sections.
 - 1. Manufacturer: MechoShade Systems.

2.02 MANUALLY OPERATED WINDOW SHADES

- A. Manually Operated Window Shades with Independent Control: Manually operated, vertical roll-up, fabric window shade with components necessary for complete installation.
 - 1. Centered bead chain exit allows for right or left hand operation without field modification.
 - 2. Fabric spline attachment and new heavy-duty clutch design. Metal tube, with stainless steel bead chain clutch operator on right side, standard, as seen from facing the window inside the room. Left side operator available. Chain tension device included.
 - 3. Operating Mechanism: Stainless steel bead chain clutch standard (ivory, grey, black, white or brown polyester available at no extra charge).
 - 4. 1/8" steel brackets with reinforcement ribs. Brackets and clutch integrated rotational bearing for ease of operation and noise reduction. Minimum of 5 recessed rivets securing clutch to bracket, 7 on idler. One-piece machined steel primary post 9 mm/.354 diameter. Decorative endcap covers with mechanical attachment included.
 - 5. Mounting: Wall or ceiling mounting available for brackets only.
 - 6. Headbox Ceiling/Wall style: Aluminum fabrication with removable closure, endcaps and back and top cover piece:
 - a. Finish: Clear anodized.

2.03 FABRIC

- A. Light-Filtering Fabrics:

1. SheerWeave Series PW3500 by Phifer: Vinyl-coated polyester yarn with manufacturer's standard anti-microbial protection woven into 2x2 basket-weave pattern.
 - a. PW3500 shall be GREENGUARD® Children & Schools.
2. Fire Rating: NFPA 701 TM#1(small scale)/NFPA 101 (Class A Rating)/NFPA 701-TM#2 large scale.
3. Bacteria and Fungal Resistance: ASTM G21 and ASTM G22.
4. Openness Factor: 5%.
5. Fabric Thickness: 0.036".
6. Fabric Weight: 19.20 ounces per square yard.

Color and pattern: As selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install roller shades level, plumb, square and true. Allow proper clearances for window operation hardware.

3.03 TESTING AND DEMONSTRATION

- A. Demonstrate operation of shades to Owner's designated representatives.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch up, repair or replace damaged products before Substantial Completion.

3.05 SCHEDULES

- A. Provide window shades at all exterior window in work station 106 and exam room 107.

END OF SECTION

SECTION 21 00 01 – BASIC FIRE PROTECTION REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Basic Fire Protection Requirements specifically applicable to Division 21 sections, in addition to Division 1 - General Requirements.

1.02 REFERENCES

- A. All references in Division 21 to codes, standards or other publications shall be the latest edition / version, unless noted otherwise.
- B. FM – Factory Mutual Approval Guide.
- C. International Fire Code
- D. NFPA 13 – Standard for the Installation of Sprinkler Systems.
- E. NFPA 25 – Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- F. NFPA 70 – National Electrical Code.
- G. NFPA 72 – Fire Alarm and Signaling Code.
- H. NFPA 101 – Life Safety Code
- I. NFPA 241 – Standard for Safeguarding Construction, Alteration, and Demolition Operations.
- J. UL – Fire Equipment Directory.
- K. UL 199 – Automatic Sprinklers.

1.03 PLANS

- A. These specifications are accompanied by plans indicating typical layouts, pipe and equipment location, etc. The plans and these specifications are complimentary each to the other and what is called for by one shall be as binding as if called for by both. Should there be a conflict between Drawings and specifications regarding a material shown of work described or detailed then the material of work having the greater value shall be provided.
- B. The plans as prepared are in general diagrammatic. The Contractor shall carefully lay out his work at the site to conform to the architectural, mechanical, electrical and structural conditions to provide grading of piping, to avoid all obstructions and to conform to details of installation as shown on the plans and supplied by the manufacturers of the equipment to be installed, and thereby to provide an integrated satisfactorily operating installation. **The General Contractor must coordinate the work of all trades.** All necessary offsets in piping, fittings, ductwork, etc. required to avoid interferences between piping, equipment, structural and architectural work are not shown but shall be furnished and

installed by the contractor without additional expense to the Owner.

- C. This project contains several different type of ceiling finishes, ceiling heights, elevation changes, high volumes, etc. The contractor shall coordinate all pipe routing to keep piping concealed above ceilings wherever possible. Where fire protection piping will be exposed in spaces with no ceilings, the piping shall be routed as high and close to structure as possible. The exact routing and location of exposed piping shall be reviewed by and acceptable to the Architect and Engineer. Exposed elevation change is not acceptable and shall be subject to removal, at the contractor's expense, unless coordinated with the A/E. The contractor shall carefully coordinate pipe routing and sprinkler head locations with all trades.
- D. These specifications and plans accompanying same are intended to cover systems which will not interfere with the design of the building, which will fit into the available spaces, and which will insure complete and satisfactory systems. Each contractor shall, therefore, carefully examine the plans and the building and shall be responsible for the proper fitting of his material and apparatus into the building.
- E. Contractor's attention is directed that all equipment he proposes to furnish shall fit into the spaces allocated for same on the plans. It shall be the Contractor's responsibility to furnish data to evidence that sufficient space can be provided for the installation of proposed equipment and that adequate access will exist for servicing and maintenance of equipment. Should changes become necessary during construction, the contractor shall make such necessary changes at his (the Contractor's) own expense.
- F. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention no later than five (5) days prior to the bid date. Otherwise, the Contractor shall be responsible for any and all changes and additions that may be necessary to accommodate his particular apparatus or equipment.

1.04 CHANGES

- A. Any changes from the plans necessary to make this work conform to the building as it is constructed, to make this work fit the work of other trades or to make this work conform to the rules of city and municipal bodies having jurisdiction shall be made by this contractor at no additional cost to the Owner. However, no changes shall be made from the work described on the plans and these specifications except on written order from the Architect.
- B. If any changes are required other than those mentioned above and the changes involve extra work on the part of the contractor, no charges for this extra work shall be allowed unless authorized in advance of the work by a written order from the Owner and/or Architect stating the charges to be made for the work.
- C. Proposed use of item or equipment other than that specified or indicated may require redesign of structure, partitions, foundations, piping, wiring, or other parts of mechanical, electrical, or architectural layout. Redesign, new drawings, and detailing required shall be prepared and submitted to Architect/Engineer for approval.
- D. Where approved deviation requires different quantity, size and arrangement of wiring, conduit, equipment, etc. from that specified or indicated, provide such items and all other additional equipment required by system at not additional cost to the Owner.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protection:

1. All work, equipment and materials shall be protected at all times to prevent damage or breakage either in transit, storage, installation or testing. All openings shall be closed with caps or plugs during installation.
2. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the owner has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
3. Damaged equipment or material shall be replaced with new as determined and directed by the Architect or Engineer. In particular, piping insulation which becomes saturated will be rejected and must be removed from the job site. Such repair or replacement shall be at no additional cost to the Owner.
4. Protect interiors of new equipment and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.
5. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.

B. Cleanliness of Piping and Equipment Systems:

1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.
2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
3. Clean interior of all tanks prior to delivery for beneficial use by the Owner.
4. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.06 EXISTING FACILITIES

- A. All piping, valves, fittings, switches, starters, conduit boxes and/or any other items of mechanical or electrical equipment which are not in service at the completion of this contract shall be removed.
- B. Where an existing service to existing building requires disconnection to facilitate installation of this work, this Contractor shall include in his bid the cost of such disconnecting, re-routing and re-connecting. Where any existing facilities which are to remain occupied are affected by disconnection, re-routing or re-connection, then such disconnecting, re-connecting and re-routing shall be done in such a manner so as not to interrupt any service to the building, including but not limited to, sanitary sewer, domestic

water, fire protection, alarm, communications, natural gas, refrigerant piping and electrical power. Satisfactory arrangements shall be made with local authorities and/or the various utility companies involved.

1. Impairment tags shall be posted on all system control valves, each fire department connection and other locations required by the AHJ, indicating which systems, or part thereof, has been removed from service.
 2. The method of disconnecting, re-routing and re-connecting shall be as shown on the submitted shop Drawings, or if not shown on the submitted shop Drawings, subject to the approval of the Architect and Owner.
- C. Unless noted otherwise, all equipment and material indicated or specified to be removed shall become the property of the Owner and shall be removed from the site at the discretion of the Owner.
- D. This Contractor shall carefully coordinate work in and around existing services and equipment and adjoining rooms to remodel areas. Coordinate shutdown, removal, capping and turn-on of existing services with the facilities' engineering department and General Contractor to provide continuous (uninterrupted) service throughout the construction period. This Contractor shall refer to the architectural plans and specifications and thoroughly familiarize himself with the construction phasing in remodel areas before beginning work.
- E. Where existing ceilings are removed during demolition and construction period, the sprinkler head layout shall be modified and heads changed to upright type to provide fire sprinkler protection above duct work, lights, etc. that have been left exposed, as required by the AHJ

1.07 SUBSTITUTIONS

- A. The materials, products and equipment described and specified establish a standard of quality, function, dimension and appearance to be met by any proposed substitutions.
- B. Reference Section 01 60 00 – Product Requirements.

1.08 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. The Contractor shall furnish copies of the manufacturer's literature and Drawings describing all proposed equipment and materials indicated in the specifications. The proposed use of the exact equipment and materials specified shall not change this requirement of including literature describing the proposed equipment. Manufactured items proposed for use, whether specified or proposed for substitution, shall be the current, catalogued product of the manufacturer, and replacement parts shall be available.
- C. Manufacturer's regular catalog sheets will not be acceptable under this requirement unless they indicate completely all of the specification requirements and submittal page labeling criteria stated above. Where drawings cover several sizes or types of construction they shall clearly indicate the size or type of construction to be used on the project. In cases where several sizes of the same type of equipment are required to be

furnished, the submittal shall include a schedule identifying each piece of equipment, complete with all capacity information needed to compare every submitted item with its respective specified item.

- D. Brochures shall contain a certification that the equipment or materials are suitable for conditions shown and specified; that the equipment or materials are believed to be in conformity with the plans and specifications, except as may be specifically described and that approval is recommended. The certification shall be signed by the Contractor. Brochures received not in conformity with these requirements will be returned for required actions. Any deviation from the requirements of the specifications shall be clearly noted and marked for the Engineer's consideration.
- E. Approval of the brochures, or any part of the contents therein, shall not eliminate responsibility for compliance with the plans and specifications, unless specific attention has been called in writing to proposed deviations at the time of transmittal of the brochures and such deviations have been approved, nor shall it eliminate the requirements or the responsibilities, if there are errors of any sort in the data submitted.
- F. Detailed coordination drawings showing proposed fire protection piping layout as well as HVAC ducts and diffusers, HVAC piping, plumbing piping, electrical conduit, light fixtures and other ceiling elements must be submitted for approval prior to proceeding with any installation.
- G. Contractor shall submit a copy of all permits and all inspection results from local authorities as well as result dates and notes from all test performed on the fire protection systems.

1.09 INTERFERENCES AND COOPERATION

- A. The plans are generally diagrammatic and the Contractor shall coordinate the work of the different trades so that interferences between piping, equipment, structural and architectural work will be avoided. Not all offsets in piping, ductwork, etc., are shown. The Contractor shall cooperate with the General Contractor and all other contractors to coordinate their work to avoid interferences and delays and arrange all parts of the work to harmonize in service and appearance with all other parts.
- B. The General Contractor shall coordinate the work of all trades. The various systems to be installed shall follow the normal, common sense priority of systems installation with the highest system to lowest system installation as follows:
 - 1. HVAC ductwork shall be installed up and against building (floor/roof) structural members.
 - 2. Sanitary waste and storm drainage piping system shall begin horizontal routing as high as possible between structural members.
 - 3. Electrical conduit shall be installed up, and against building structure, running parallel with HVAC ductwork and offsetting up into structural bay (void) or below HVAC ductwork to obtain a change in direction or branch take-off.
 - 4. HVAC heating and chilled water supply and return piping, domestic hot and cold water supply and hot water circulating return piping, and medical gas piping shall be installed beside and below the HVAC ductwork and electrical conduit.

5. Fire sprinkler piping system shall be installed below all other systems and components. The fire sprinkler piping shall not conflict with the installation or removal of ceiling system components or tile. The fire sprinkler system piping layout and installation shall be coordinated by the fire sprinkler contractor and the General Contractor with all other trades performing work in the affected area, to avoid conflict with the installation or removal of any other systems components, or to prevent ready access to valves, equipment of the other trades. Do not install sprinkler piping until ductwork mains are in place.

- C. Provide an overhead coordination submittal per Section 01 30 00. The submittal shall include all structural, plumbing, mechanical, electrical, and fire protection components.

1.10 MATERIALS AND WORKMANSHIP

- A. All materials shall be new, of the quality specified and free of any defects. Manufacturer's names are listed to establish a standard of quality and construction.
- B. The Contractor will be responsible for transportation of his materials to the job and for their storage and protection until the final acceptance of the job.
- C. Contractor shall furnish all necessary scaffolding, tackle, tools and appurtenances of all kinds and all labor required for the safe and expeditious execution of his contract.

1.11 PERMITS AND INSPECTIONS

- A. The Contractor will be responsible for all permits and inspections required by law for the completion of his work. Cost of all permits and inspections shall be paid for by the Contractor. The Contractor shall obtain and pay for all certificates of approval which must be delivered to the Architect before final acceptance of the job. All materials and labor furnished by the Contractor shall be in strict accordance with the rules and requirements of the National Board of Fire Underwriters, state and municipal regulations and other authorities who may have lawful jurisdiction over the work being done. One (1) copy of all permits obtained under this contract and all inspections performed and/or certificates of acceptances, approval or beneficial occupancy received for this work, shall be forwarded to the Engineer.
- B. Each contractor shall be responsible for coordinating their work with the General Contractor and scheduling progress inspections through the General Contractor to allow for the following inspections to be performed without impeding the progress of construction. Generally, the Contractor shall plan for inspections to occur two (2) weeks prior to the scheduled concealment of work in the area of inspection.

1.12 EXAMINATION OF SITE

- A. All Contractors submitting proposals for this work shall first examine the site and all conditions thereon and therein. All proposals shall take into consideration conditions as may affect the work under this contract. They shall satisfy themselves as to existing grades and the actual formation, and soil conditions.
- B. They shall verify all service locations, depths, sizes, etc. No information given on the plans shall relieve the Contractor of this responsibility.

1.13 QUALITY ASSURANCE

- A. Perform Work in accordance with the codes listed on the drawings, the local authority having jurisdiction, the Owner's Insurance carrier and the Architect/Engineer. As the minimum standard for the level of quality, in all cases the greater quantity or better quality shall be the first consideration for the basis of an acceptable product or process. The local authority having jurisdiction, the Architect and the Engineer shall have the final authority on the approval and/or use of any product or process specified or submitted for substitution. The greater quality and/or value specified herein for the system(s) and various components and installation procedures shall take precedence over the minimum requirements of the herein before mentioned codes or that of NFPA 13, NFPA 14 or NFPA 24 in all instances.
- B. Equipment and Components: Bear UL and FM label or marking.
- C. Welding Materials and Procedures: Perform to ASME Code.
- D. Valves: Bear UL/FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- E. Piping: All piping installed on this project shall bear the complete ASTM and Manufacturer's marking. Labeling and identification requirements as required by ASTM. All installed piping 3'-0" or greater in length shall be readily identifiable per ASTM labeling criteria. Piping not bearing this identification upon installation shall be removed and replaced by the correctly labeled piping. Piping shall not be re-stenciled after it is installed, to meet this requirement.

1.14 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

- A. Coordinate location of piping, sleeves, inserts, hangers and equipment. Locate piping, sleeves, inserts, hangers and equipment clear of windows, doors, openings, light outlets, ductwork and other services and utilities. Prepare equipment layout drawings to coordinate proper location and personnel access of all facilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.
- B. Operating Personnel Access and Observation Provisions: Select and arrange all equipment and systems to provide clear view and easy access, without use of portable ladders, for maintenance and operation of all devices including, but not limited to: all equipment items and valves. All gages and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Do not reduce or change maintenance and operating space and access provisions that are shown on the drawings.
- C. Minor Piping: Generally, small diameter pipe runs from drips and drains and other services are not shown but must be provided.
- D. Install gages, valves and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position gages to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.

1.15 UNIONS

- A. No unions are to be placed in any pipe in a location which will be concealed or inaccessible after completion of the building unless furnished with an access panel either as shown on the Drawings or as specified herein. Unions must be installed on each side

of all pieces of equipment such as heating units, pumps, etc., so that such equipment may be readily disconnected.

1.16 TEMPORARY PIPING AND EQUIPMENT

- A. Continuity of operation of existing facilities may require temporary installation or relocation of equipment and piping. Temporary equipment or pipe installation or relocation shall be provided to maintain continuity of operation of existing facilities, when required by the phasing or called for specifically on the plans.
- B. The Contractor shall provide all required facilities in accordance with the requirements of phased construction and maintenance of service. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities.
- C. When construction is complete, temporary facilities and piping shall be completely removed back to the nearest active distribution branch or main pipe line and any openings in structures sealed. Dead legs in potable water systems will not be allowed. Provide necessary blind flanges and caps to seal open piping remaining in service.

1.17 DEMOLITION

- A. Rigging access, other than indicated on the drawings, shall be provided by the Contractor. Such access shall be provided without additional cost or time to the Owner. Where work is in an operating facility, provide approved protection from dust and debris at all times for the safety of personnel and maintenance of building operation and environment of the facility.
- B. In an operating facility, maintain the operation, cleanliness and safety. The Owner's personnel will be carrying on their normal duties of operating, cleaning and maintaining equipment and facility operation. Confine the work to the immediate area concerned; maintain cleanliness and wet down demolished materials to eliminate dust. Do not permit debris to accumulate in the area to the detriment of facility operation. Perform all flame cutting to maintain the fire safety integrity of this facility. Adequate fire extinguishing facilities shall be available at all times. Perform all work in accordance with recognized fire protection standards.
- C. Completely remove all piping, wiring, conduit, and other devices associated with the equipment not to be re-used in the new work. This includes all pipe, valves, fittings, insulation, and all hangers including the top connection and any fastenings to building structural systems. Seal all openings, after removal of equipment, pipes, and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the drawings and specifications of the other disciplines in the project for additional facilities to be demolished or handled.
- D. The Contractor shall remove all other material and equipment, devices and demolition debris under these plans and specifications. Such material shall be removed from the property expeditiously and shall not be allowed to accumulate.

1.18 FIRE ALARM INTERFACE

- A. Ensure that all required fire protection system alarm devices are installed and connected as required to the fire alarm system; including but not limited to: flow switches, tamper switches and alarm notifications.

1.19 UTILITIES

- A. The Contractor shall arrange and pay for any necessary revisions to existing utility services, including meter deposits and connection fees to all serving utility companies and shall install utilities, where applicable.

1.20 INDOOR AIR QUALITY CONTROL:

- A. All Adhesives, sealants, paints, coatings applied within the weatherproofed interior of the building shall comply with applicable VOC thresholds of SCAQMD 1113 and 1168.

PART 2 PRODUCTS

2.01 FACTORY-ASSEMBLED PRODUCTS

- A. Provide maximum standardization of components to reduce spare part requirements.
- B. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
 - 1. All components of an assembled unit need not be products of same manufacturer.
 - 2. Constituent parts that are alike shall be products of a single manufacturer.
 - 3. Components shall be compatible with each other and with the total assembly for intended service.
 - 4. Contractor shall guarantee performance of assemblies of components and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.
- C. Components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.
- D. Major items of equipment, which serve the same function, must be the same make and model. Exceptions will be permitted if performance requirements cannot be met.

2.02 COMPATIBILITY OF RELATED EQUIPMENT

- A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational system that conforms to contract requirements.

2.03 ESCUTCHEONS AND PLATES

- A. Where pipes pass through ceilings or walls in finished spaces, install sectional plates or escutcheons to cover the annular opening between pipe and sleeve. Solid plates with set screws shall be used where the sectional plates will not stay in place or are not available in the required size, or where other individual specification section(s) require one piece or greater quality escutcheons or plates.
- B. The annulus between pipe and walls or floors, shall be filled with Sonolastic NP unless fire wall or barrier then the approved UL listed fire assembly shall be used.
- C. Inside diameter of escutcheons shall fit around insulation and around pipe when not insulated; outside diameter shall cover sleeve. Secure escutcheons or plates to pipe or sleeve but not to insulation. All escutcheons shall be triple nickel-chromium plated brass, or Type 316L stainless steel.

2.04 INSULATION

- A. All insulation materials used inside the building on this project, including finishes and adhesives on the exterior surfaces of ducts, pipes and equipment shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less as determined by an independent testing laboratory in accordance with NFPA 255 as required by NFPA 90A, unless noted otherwise acceptable.

2.05 ASBESTOS

- A. Materials containing asbestos are not permitted.
- B. If any asbestos-containing material is discovered or suspected, the contractor shall immediately cease any and all work in that area. Cover the exposed material in plastic containment without disturbing the exposed material and notify the Architect and the Owner's representative.

PART 3 EXECUTION

3.01 ACCESS PANELS

- A. All valves, drains, gauges, etc., must be accessible. The Contractor shall, wherever required to service his installation, coordinate size and location of access panels with General Contractor. Refer to Section 08 31 13 – Access Doors and Frames.

3.02 FIRESTOPPING

- A. Firestopping: Unused slots, sleeves and other penetrations in floors, walls or other general construction shall be closed and sealed with an approved firestopping material.
 - 1. Reference Section 07 84 00 – Firestopping for appropriate firestopping material required for each wall rating and penetration size and type.
 - 2. Floor slots and openings shall be closed with 16-gauge galvanized steel sheet supported on 1-inch by 1-inch by 1/8-inch structural angle drilled or supported with powder-driven studs into the building structure. Firestop with a layer of silicone elastomer not less than 1-inch thick which completely fills the opening. The top surface of the silicone elastomer shall be approximately 1 inch below the

finished floor slab.

3. Openings in walls shall be closed with 16-gauge galvanized steel sheet securely attached at the midpoint of the wall thickness and firestopped on both sides of the steel sheet with not less than 1/8-inch thick layer of non-sagging silicone elastomer to fully cover the opening.
 4. Single or multiple pipes passing through walls and floors shall have the annular space between pipes or between pipes and structure filled with silicone elastomer to provide a 3-hour rated firestop for floors and walls.
- B. The annulus between exposed pipe and walls or floors, in finished spaces shall be refilled, sealed and painted to match adjacent surfaces.

3.03 CUTTING AND PATCHING

- A. All cutting and patching of floors, walls and ceilings for installation of work covered in these sections will be done by the General Contractor.
- B. Where it becomes necessary to drill into or cut through any existing or completed floors, walls or ceilings to permit the installation of any work under this contract or to repair any defects that may appear up to the expiration of the guarantee, such cutting and patching shall be done by the General Contractor under the supervision of the Architect.
- C. No joists, beams, girders or columns shall be cut without first obtaining written permission from the Architect.
- D. All drilling for expansion bolts, hangers and other supports shall be done subject to be approval of the Architect. Labor and materials required to replace or rebuild parts or injured portions shall be furnished at the Contractor's expense, subject to the satisfaction of the Architect.
- E. Refer also to Divisions 1 and 2 for related requirements.
- F. Renovations/Additions: At any time work is occurring when the building is occupied, avoid using tools that create excessive noise that might disrupt the building operations (e.g. concrete breaking equipment, excavating equipment, hammer drills, screw guns, etc.). Use other types of tools or schedule work to occur outside of normally occupied hours. Carefully plan water control for all coring and sawing operations to prevent damage and disruption of occupants.

3.04 PAINTING

- A. Paint all exposed fire sprinkler pipe. Paint color shall be submitted and acceptable to the Architect and Engineer. Where the color is other than Red; then the pipe shall also be labeled.
- B. Surfaces to be painted and types of paint shall be as specified in the Architectural specifications. Refer to Section 09 90 00.
- C. All surfaces to be painted shall be thoroughly cleaned, all rust scraped off and all oil and grease removed before any paint is applied.

- D. Under no conditions shall paint be applied to sprinkler heads, escutcheons, or covers. If paint is so applied, replacement of the affected parts shall be required.
- E. Finishing paint coats shall not be applied until all the plastering or other structural building work is completed. Cloths shall be spread where necessary to prevent drops of paint, oil, etc. from defacing walls, floors, etc., and the Contractor shall be held responsible for all damage by neglect of such precautions. The finished conditions of the painting shall be subject to the approval of the Architect, who may require retouching or repainting of surfaces not properly finished.

3.05 CLOSE OUT DOCUMENTATION AND TESTING REPORTS

- A. Contractor shall provide Project Record Documents, Operation and Maintenance data and all product warranty data as specified in Section 01 70 00.
- B. Contractor shall provide copies of all fire protection system tests and certification reports for inclusion in project close out documents. Reports shall include, but shall not be limited to, the following:
 - 1. Acceptance testing for various fire protection systems, as required by appropriate NFPA standard.
 - 2. Contractor's Material and Test Certificates.
 - 3. Final approval documentation from local Fire Department.
 - 4. Backflow prevention assembly certifications.
- C. Contractor shall provide As-Built Fire Protection Drawings, as hard copies and/or electronic format as required by Owner.

END OF SECTION

SECTION 21 13 13 – WET-PIPE SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wet-pipe sprinkler system.
- B. System design, installation, and certification.
- C. Sprinkler heads.

1.02 RELATED SECTIONS

- A. Section 21 00 01 – Basic Fire Protection Requirements
- B. Section 21 12 00 - Fire Suppression Standpipes.
- C. Section 26 05 03 – Equipment Wiring Systems
- D. Section 28 31 00 – Fire Detection and Alarm.

1.03 REFERENCES

- A. National Fire Protection Association:
 - 1. NFPA 13 – Standard for the Installation of Sprinkler Systems.
 - 2. NFPA 25 – Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.
 - 3. NFPA 70 – National Electrical Code.
 - 4. NFPA 72 - National Fire Alarm and Signaling Code
- B. Underwriter's Laboratories (UL):
 - 1. UL – Fire Equipment Directory.
 - 2. UL 199 – Automatic Sprinklers.

1.04 SUBMITTALS FOR REVIEW

- A. Submit under provisions of Section 01 33 00 and Section 21 00 01.
- B. Submittals shall include all items listed in Section 21 05 00, including but not limited to: fire flow test data, product data, coordination drawings, shop drawings and local Fire Department approval.

1.05 SUBMITTALS AT PROJECT CLOSEOUT

- A. Submit under provisions of Section 01 70 00 – Execution and Closeout Requirements.

- B. Submittals shall include all items listed in Section 21 05 00, including but not limited to Project Record Documents, System Certification forms, Operation and Maintenance data and warranty forms.

1.06 QUALITY ASSURANCE

- A. Perform work to the local adopted building and fire codes (as listed on sheet FP1.1), NFPA 13, 25 as modified herein, the local authority having jurisdiction, FM Global standards (where applicable) and the Architect/Engineer. The greater quality and/or value specified herein for the system(s) and various components and installation procedures shall take precedence over the minimum requirements of NFPA, in all instances.
- B. All work shall be supervised by a minimum NICET II certified individual or higher as may be required by the local AHJ. Certification shall be for above grade fire suppression installation.
- C. Sprinkler Shop Drawings and hydraulic calculations are to be sealed by a Professional Engineer, knowledgeable in fire protection engineering or a Responsible Managing Employee (RME) licensed by the State of Texas Fire Marshal Office, before submitting for review.
- D. Welding Materials and Procedures: Perform to ASME Code.
- E. Valves: Bear UL/FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- F. Piping: All piping installed on this project shall bear the complete ASTM and manufacturer marking, labeling and identification requirements as required by ASTM. All installed piping 3'-0" or greater in length shall be readily identifiable per ASTM labeling criteria. Piping not bearing this identification upon installation shall be removed and replaced by the correctly labeled piping. Piping shall not be re-stenciled after it is installed to meet these criteria.
- G. The system shall also conform to applicable requirements of the Texas Administrative Code Title 28, Chapter 34.

1.07 QUALIFICATIONS

- A. The work shall be performed by a person or organization with a current certificate of registration from the State Fire Marshal as an independent fire protection sprinkler contractor (Registered Firm). This contractor shall be fully responsible for all design to meet project requirements, including items exceeding those specifically illustrated or mentioned in the contract documents.
- B. The work shall be performed under the supervision of a licensed Responsible Managing Employee (RME) as defined by Texas Insurance Code (TIC), Chapter, Fire Protection Sprinkler System Service and Installation and the Texas Administrative Code Title 28, Chapter 34, Subchapter G – Fire Sprinkler Rules.
- C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years of documented experience.
- D. Installer Qualifications: Company specializing in performing Work specified in this section with minimum three years of documented experience.

- E. Although Contractor is responsible for design of system; sizes, routing and equipment shown on drawings and specifications shall be considered as minimum requirements, even if they exceed NFPA, FM and AHJ requirements. Contractor is reminded that other sections of specifications also apply to this work (i.e., refer to "Related Sections" above) and contractor shall comply with these sections even if they exceed NFPA, FM, and AHJ requirements.
- F. The system design and installation shall in all respects conform to the latest adopted editions of applicable NFPA, Building Code and Fire Code requirements, and any local modifications and/or amendments thereto. Where latest adopted editions vary between code authorities having jurisdiction (AHJ's) over this project, system shall meet the most stringent requirements. These requirements include, but not necessarily be limited to:
 - 1. NFPA 13 - Standard for the Installation of Sprinkler Systems.
 - 2. NFPA 72 – National Fire Alarm and Signaling Code

1.08 DELIVERY, STORAGE AND PROTECTION

- A. Section 01 60 00 – Product Requirements: Transport, handle, store and protect products.
- B. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.
- C. Utilize manufacturer supplied sprinkler caps, covers and bulb protectors. Remove all caps prior to placing system(s) in service.

1.09 WARRANTY

- A. Section 01 70 00 – Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish one-year manufacturer warranty for system components.

1.10 EXTRA MATERIALS

- A. Section 01 70 00 – Execution and Closeout Requirements.
- B. Furnish, equip and install spare sprinkler cabinet(s) in accordance with provisions of NFPA 13. Locate near main system riser assembly or as indicated on Drawings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Grinnell
 - 2. Reliable Automatic Sprinkler Co.
 - 3. Tyco Fire Products

4. Viking

- B. Section 01 60 00 – Product Requirements: Product options and substitutions. Substitutions.

2.02 SPRINKLER HEADS

- A. Unless otherwise specified or indicated on the drawings, sprinkler heads shall be regular automatic closed type spray heads with temperature ratings as required by National Fire Protection Association Standard No. 13.
1. Where feasible, all sprinkler heads shall be quick-response type.
 2. The installing contractor is to verify the existing type of sprinkler head installed in area of renovation projects to ensure the response type is the same. Standard response and quick response heads are not to be mixed in a project.
 3. Finished Ceilings: Provide concealed ceiling sprinklers with factory finished (no field painting) cover plate, color to match ceiling finish. (Exception: Provide chrome plated or alternate color cover plates where directed by Architect).
 4. Unfinished Areas without Ceilings: Provide bronze upright. Protect sprinkler heads against mechanical injury with standard guards where required.
 5. Sidewall heads: Recessed horizontal sidewall type heads with white enamel finish and matching push on escutcheon plate may be utilized, where indicated on drawings.
- B. An approved protective guard in accordance with NFPA 13 Section 6.2.8 shall be installed on each sprinkler head located in rooms/areas where there is a potential to receive damage or where the head is less than 7 feet above the floor level. Sprinkler heads guards shall be listed for use with the sprinklers on which they are installed.
- C. The use of UL listed and FM approved flexible type head assemblies is permitted. Flex type head assembly shall consist of 304 stainless steel braided hose with zinc plated steel 1" NPT male threaded nipple, factory tested at 400 psi, complete with one piece head securing bracket assembly, tamper resistant screws. The drop shall include a UL approved braided hose with a bend radius to 2" to allow for proper installation in confined spaces.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with NFPA 13, and in accordance with local Fire Department requirements.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Place pipe runs to minimize obstruction to other work.
- D. Center sprinklers in ceiling tile in one direction and provide piping offsets as required with location in other direction variable, dependent upon spacing and coordination with ceiling elements.

- E. Apply cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- F. Install guards on sprinklers where indicated.
- G. Flush entire piping system of foreign matter.
- H. Hydrostatically test entire new piping system per NFPA 13, as noted below.
- I. Provide both a Hydraulic Design Information Sign and a General Information Sign near each systems control riser. Signs shall be of permanently marked weatherproof material and shall include all information outlined in NFPA 13.
- J. Paint all exposed sprinkler piping as specified in Section 21 05 00.
- K. Under no conditions shall paint be applied to sprinkler heads, escutcheons, or covers. If paint is so applied, replacement of the affected parts shall be required.

3.02 INTERFACE WITH OTHER PRODUCTS

- A. Ensure required devices are installed and connected as required to fire alarm system.

3.03 CLEANING

- A. Section 01 70 00 – Execution and Closeout Requirements: Final cleaning.
- B. Flush entire system of foreign matter.

3.04 TESTING

- A. The installing contractor shall do the following:
 - 1. Notify the Fire Marshal, any other authority having jurisdiction and the Owner's authorized representative of the time and date testing will be performed.
 - 2. Perform all acceptance tests required by Chapter 25 of NFPA 13; including hydrostatic tests, main drain test, system operational tests, backflow prevention assembly test and pressure reducing valve tests.
 - 3. Complete and sign the appropriate Contractor's Material and Test Certificate, and forward Certificate(s) to the authority having jurisdiction.
 - 4. The contractor shall coordinate with the Owner's insurance provider for a system inspection and approval and for the completion of the Contractor's Material Test Certificate (CMTC).

3.05 OCCUPANCY CLASSIFICATIONS

<u>Location</u>	<u>Occupancy Classification</u>
Hospitals	Light Hazard
Institutional	Light Hazard
Nursing Homes	Light Hazard
Theaters and Auditoriums (excluding stages)	Light Hazard
Educational	Light Hazard
Cafeteria Dining Room	Light Hazard
Offices	Light Hazard
Libraries (except large stack rooms)	Light Hazard
Residential	Light Hazard
Janitor Closets	Ordinary Hazard, Group 1
Mechanical Rooms	Ordinary Hazard, Group 1
Kitchen Service Areas	Ordinary Hazard, Group 1
Laundries	Ordinary Hazard, Group 1
Electrical Rooms, with Dry Type Transformers	Ordinary Hazard, Group 1
Electrical Rooms, with Liquid-Filled Transformers	Ordinary Hazard, Group 2
Exterior Loading Docks	Ordinary Hazard, Group 2
Mercantile	Ordinary Hazard, Group 2
Stages	Ordinary Hazard, Group 2
Libraries – Large Stack Rooms	Ordinary Hazard, Group 2
Machine Shops	Ordinary Hazard, Group 2
Post Offices	Ordinary Hazard, Group 2
Wood Machining	Ordinary Hazard, Group 2
Miscellaneous Storage Rooms (with storage height up to 12')	Utilize the design criteria and appropriate protection criteria and density curves of NFPA 13, Chapter 13.
High-Piled Storage Areas: (with storage height exceeding 12')	Utilize general design criteria of NFPA 13, Chapter 12 and the appropriate protection criteria and density curves of Chapters 14 through 19.

END OF SECTION

SECTION 22 00 01 – BASIC PLUMBING REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Basic Plumbing Requirements specifically applicable to each Division 22 Section, in addition to Division 1 - General Requirements.

1.02 REFERENCES

- A. All references in Division 22 to codes, standards or other publications shall be the latest edition/version, unless noted otherwise.

1.03 PLANS

- A. These specifications are accompanied by plans indicating typical layouts, pipe and equipment location, etc. The plans and these specifications are complimentary each to the other and what is called for by one shall be as binding as if called for by both. Should there be a conflict between drawings and specifications regarding a material shown of work described or detailed then the material of work having the greater value shall be provided.
- B. The plans as prepared are in general diagrammatic. The contractor shall carefully lay out his work at the site to conform to the architectural, mechanical, electrical and structural conditions to provide grading of piping, to avoid all obstructions and to conform to details of installation as shown on the plans and supplied by the manufacturers of the equipment to be installed, and thereby to provide an integrated satisfactorily operating installation. **The General Contractor must coordinate the work of all trades.** All necessary offsets in piping, fittings, ductwork, etc. required to avoid interferences between piping, equipment, structural and architectural work are not shown but shall be furnished and installed by the contractor without additional expense to the Owner.
- C. These specifications and plans accompanying same are intended to cover systems which will not interfere with the design of the building, which will fit into the available spaces, and which will insure complete and satisfactory systems. Each contractor shall, therefore, carefully examine the plans and the building and shall be responsible for the proper fitting of his material and apparatus into the building.
- D. Contractor's attention is directed that all equipment he proposes to furnish shall fit into the spaces allocated for same on the plans. It shall be the Contractor's responsibility to furnish data to evidence that sufficient space can be provided for the installation of proposed equipment and that adequate access will exist for servicing and maintenance of equipment. Should changes become necessary during construction, the contractor shall make such necessary changes at his (the Contractor's) own expense.
- E. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention no later than ten (10) days prior to the bid date. Otherwise, the Contractor shall be responsible for any and all changes and additions that may be necessary to accommodate his particular apparatus or equipment.

1.04 CHANGES

- A. Any changes from the plans necessary to make this work conform to the building as it is constructed, to make this work fit the work of other trades or to make this work conform to the rules of city and municipal bodies having jurisdiction shall be made by this contractor at no additional cost to the Owner. However, no changes shall be made from the work described on the plans and these specifications except on written order from the Architect.
- B. If any changes are required other than those mentioned above and the changes involve extra work on the part of the contractor, no charges for this extra work shall be allowed unless authorized in advance of the work by a written order from the Owner and/or Architect stating the charges to be made for the work.
- C. Proposed use of item or equipment other than that specified or indicated may require redesign of structure, partitions, foundations, piping, wiring, or other parts of mechanical, electrical, or architectural layout. Redesign, new drawings, and detailing required shall be prepared and submitted to Architect/Engineer for approval.
- D. Where approved deviation requires different quantity, size and arrangement of wiring, conduit, equipment, etc. from that specified or indicated; provide such items and all other additional equipment required by system at no additional cost to the Owner.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Protection:
 - 1. All work, equipment and materials shall be protected at all times to prevent damage or breakage either in transit, storage, installation or testing. All openings shall be closed with caps or plugs during installation.
 - 2. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the owner has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
 - 3. Damaged equipment or material shall be replaced with new as determined and directed by the Architect or Engineer. In particular, piping insulation which becomes saturated will be rejected and must be removed from the job site. Such repair or replacement shall be at no additional cost to the Owner.
 - 4. Protect interiors of new equipment and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.
 - 5. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.
- B. Cleanliness of Piping and Equipment Systems:
 - 1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.

2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
3. Clean interior of all tanks prior to delivery for beneficial use by the Owner.
4. Boilers shall be left clean following final internal inspection by the inspector.
5. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.06 EXISTING FACILITIES

- A. All piping, valves, fittings, switches, starters, conduit boxes and/or any other items of plumbing, mechanical or electrical equipment which are not in service at the completion of this contract shall be removed, unless otherwise noted.
- B. Where an existing service to existing building requires disconnection to facilitate installation of this work, this Contractor shall include in his bid the cost of such disconnecting, re-routing and re-connecting. Where any existing facilities, which are to remain occupied, are affected by disconnection, re-routing or re-connection, then such disconnecting, re-connecting and re-routing shall be done in such a manner so as not to interrupt any service to the building. Satisfactory arrangements shall be made with local authorities and/or the various utility companies involved. The method of disconnecting, re-routing and re-connecting shall be as shown on the Drawings, or if not shown on the drawings, subject to the approval of the Architect and Owner.
- C. Unless noted otherwise, all equipment and material indicated or specified to be removed shall become the property of the Contractor.
- D. This Contractor shall carefully coordinate work in and around existing services and equipment and adjoining rooms to remodel areas. Coordinate shut-down, removal, capping, and turn-on of existing services with the Owner's facilities' department and general contractor to provide continuous (uninterrupted) service throughout the construction period. This Contractor shall refer to the architectural plans and specifications and thoroughly familiarize himself with the construction phasing in remodel areas before beginning work.
- E. Building Working Environment: Maintain the architectural and structural integrity of the building and the working environment at all times. Limit the opening of doors, windows or other access openings to brief periods as necessary for rigging purposes. No storm water or ground water leakage permitted. Provide daily clean up of construction and demolition debris on all floor surfaces and on all equipment being operated by the Owner.

1.07 SUBSTITUTIONS

- A. The materials, products and equipment described and specified establish a standard of quality, function, dimension and appearance to be met by any proposed substitutions.
- B. Reference Section 01 60 00 – Product Requirements.
- C. Substitution requests are only required where specific manufacturers are listed or scheduled.

1.08 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. The Contractor shall furnish copies of the manufacturer's literature and drawings describing all proposed equipment and materials indicated in the specifications. The proposed use of the exact equipment and materials specified shall not change this requirement of including literature describing the proposed equipment. Manufactured items proposed for use, whether specified or proposed for substitution, shall be the current, catalogued product of the manufacturer, and replacement parts shall be available.
- C. Manufacturer's regular catalog sheets will not be acceptable under this requirement unless they indicate completely all of the specification requirements. Where drawings cover several sizes or types of construction they shall clearly indicate the size or type of construction to be used on the project. In cases where several sizes of the same type of equipment are required to be furnished, the submittal shall include a schedule identifying each piece of equipment, complete with all capacity information needed to compare every submitted item with its respective specified item. **Annotate all submittal data to indicate exact model, size, and type submitted.**
- D. Brochures shall contain a certification that the equipment or materials are suitable for conditions shown and specified; that the equipment or materials are believed to be in conformity with the plans and specifications, except as may be specifically described and that approval is recommended. The certification shall be signed by the Contractor. Brochures received not in conformity with these requirements will be returned for required actions. Any deviation from the requirements of the specifications shall be clearly noted and marked for the Engineer's consideration.
- E. Approval of the brochures, or any part of the contents therein, shall not eliminate responsibility for compliance with the plans and specifications, unless specific attention has been called in writing to proposed deviations at the time of transmittal of the brochures and such deviations have been approved, nor shall it eliminate the requirements or the responsibilities, if there are errors of any sort in the data submitted.

1.09 INTERFERENCES AND COOPERATION

- A. The plans are generally diagrammatic and the Contractor shall coordinate the work of the different trades so that interferences between piping, equipment, structural and architectural work will be avoided. Not all offsets in piping, ductwork, etc., are shown. The Contractor shall cooperate with the General Contractor and all other contractors to coordinate their work to avoid interferences and delays and arrange all parts of the work to harmonize in service and appearance with all other parts.
- B. The General Contractor shall coordinate the work of all trades. The various systems to be installed shall follow the normal, common sense priority of systems installation with the highest system to lowest system installation as follows:
 - 1. HVAC ductwork shall be installed up and against building (floor/roof) structural members.
 - 2. Sanitary waste and storm drainage piping system shall begin horizontal routing as high as possible between structural members, offsetting vertically only to avoid conflict with structure or to drop below HVAC ductwork where offset is unavoidable.

3. Electrical conduit shall be installed up, and against building structure, running parallel with HVAC ductwork and offsetting up into structural bay (void) or below HVAC ductwork to obtain a change in direction or branch take-off. Electrical conduit installation shall not control or dictate the routing or installation of the HVAC ductwork storm drain piping or sanitary waste and vent piping.
 4. Domestic water piping (hot water, cold water and hot water return), medical gas piping and HVAC piping shall be installed beside and below the HVAC ductwork and electrical conduit. Preferred installation shall be on trapeze, wall brackets, or racked on vertical channel on the wall above the ceiling line. The completed installation shall not conflict with the installation or removal of ceiling system components or tile. All main and branch take-off isolation valves, strainers, sensors and other plumbing equipment shall be readily identifiable and accessible from a standing position on a step ladder, no more than 18 inches above ceilings.
 5. Fire sprinkler piping system shall be installed below all other systems and components, unless noted otherwise or as coordinated with all other trades. The fire sprinkler piping shall not conflict with the installation or removal of ceiling system components or tile. The fire sprinkler system piping layout and installation shall be coordinated by the fire sprinkler contractor and the General Contractor with all other trades performing work in the affected area, to avoid conflict with the installation or removal of any other systems components, or to prevent ready access to valves, equipment of the other trades. Do not install sprinkler piping until ductwork mains are in place.
- C. Provide an overhead coordination submittal per Section 01 30 00. The submittal shall include all structural, plumbing, mechanical, electrical, and fire protection components.

1.10 MATERIALS AND WORKMANSHIP

- A. All materials shall be new, of the quality specified and free of any defects. Manufacturer's names are listed to establish a standard of quality and construction.
- B. The Contractor will be responsible for transportation of his materials to the job and for their storage and protection until the final acceptance of the job.
- C. Contractor shall furnish all necessary scaffolding, tackle, tools and appurtenances of all kinds and all labor required for the safe and expeditious execution of his contract.

1.11 PERMITS AND INSPECTIONS

- A. The Contractor will be responsible for all permits and inspections required by law for the completion of his work. Cost of all permits and inspections shall be paid for by the Contractor. The Contractor shall obtain and pay for all certificates of approval which must be delivered to the Architect before final acceptance of the job. All materials and labor furnished by the Contractor shall be in strict accordance with the rules and requirements of the National Board of Fire Underwriters, state and municipal regulations and other authorities who may have lawful jurisdiction over the work being done.
- B. Each contractor shall be responsible for coordinating their work with the General Contractor and scheduling AHJ required inspections through the General Contractor to allow inspections to be performed without impeding the progress of construction. Generally, the Contractor shall plan for inspections to occur two (2) weeks prior to the scheduled concealment of work in the area of inspection.

1.12 ENGINEERING DESIGN TEAM OBSERVATIONS

- A. Each contractor shall be responsible for coordinating their work with the General Contractor and scheduling progress observations through the General Contractor to allow for the following observations to be performed without impeding the progress of construction. Generally the Contractor shall plan for observations to occur two (2) weeks prior to the scheduled concealment of work in the area of observation.
- B. The minimum observations required for this project shall include but not be limited to:
 - 1. Interior Below Grade: Utilities, services and systems.
 - 2. Rough Wall: All utilities, services and systems in-place including wall studs, cross bracing, supports, etc. (No sheetrock or insulation).
 - 3. Corrected Rough Wall: (Before Sheetrock).
 - 4. Above Ceiling: All utilities, services and systems in place, labeling on exposed piping (No insulation on piping systems. Ceiling grid/channels may be installed but no sheetrock or ceiling tile).
 - 5. Above Ceiling Final: All utilities, services and systems complete including hangers, insulation, and labeling (ceiling grid and/or channel may be in place but no sheetrock or ceiling tile shall be installed).
 - 6. Substantial Completion: All surfaces complete, fixtures installed and trim-out complete.
 - 7. Final: Cleaned and ready for occupancy.

1.13 EXAMINATION OF SITE

- A. All Contractors submitting proposals for this work shall first examine the site and all conditions thereon and therein. All proposals shall take into consideration conditions as may affect the work under this contract. They shall satisfy themselves as to existing grades and the actual formation, and soil conditions.
- B. They shall verify all service locations, depths, sizes, etc. No information given on the plans shall relieve the Contractor of this responsibility.

1.14 QUALITY ASSURANCE

- A. Perform Work in accordance with all codes listed on the drawing sheets, the local authority having jurisdiction (AHJ), and the Architect/Engineer. As the minimum standard for the level of quality, in all cases the greater quantity or better quality shall be the first consideration for the basis of an acceptable product or process. The local authority having jurisdiction, the Architect and the Engineer shall have the final authority on the approval and/or use of any product or process specified or submitted for substitution. The greater quality and/or value specified herein for the system(s) and various components and installation procedures shall take precedence over the minimum requirements of the herein before mentioned codes.
- B. Equipment and Components: Bear UL, ASME, ANSI and/or NSF label or marking, as

specified in appropriate Section.

- C. Valves: Provide manufacturer's name and pressure rating marked on valve body.
- D. Piping: All piping installed on this project shall bear the complete ASTM and Manufacturer's marking. Labeling and identification requirements as required by ASTM. All installed piping 5'-0" or greater in length shall be readily identifiable per ASTM labeling criteria. Piping not bearing this identification upon installation shall be removed and replaced by the correctly labeled piping. Piping shall not be re-stenciled after it is installed, to meet this requirement.
- E. Lead free components: All wetted surfaces of piping, fittings, valves and other products in contact with the potable water system shall be certified as lead free, as per current requirements of NSF/ANSI 61 and/or NSF/ANSI 372.
- F. Welding Materials and Procedures: Perform to ASME Code.

1.15 CONTROLS

- A. Where "automatic controls" are called for in the plans and specifications, all the control instruments, such as motorized valves, etc., shall be provided by the Contractor. The Drawings may show some power connections to controls equipment; however, if more power is required, then the Contractor shall provide this power.

1.16 UNIONS

- A. No unions are to be placed in any pipe in a location which will be concealed or inaccessible after completion of the building unless furnished with an access panel either as shown on the drawings or as specified herein. Unions must be installed on each side of all pieces of equipment such as water heaters, water softeners, thermostatic mixing valves, flow regulators, pumps, etc., so that such equipment may be readily disconnected in location that equipment can be disconnected and removed.

1.17 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

- A. Coordinate location of piping, sleeves, inserts, hangers, ductwork and equipment. Locate piping, sleeves, inserts, hangers and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Prepare equipment layout drawings to coordinate proper location and personnel access of all facilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.
- B. Operating Personnel Access and Observation Provisions: Select and arrange all equipment and systems to provide clear view and easy access, without use of portable ladders, for maintenance and operation of all devices including, but not limited to: all equipment items, valves, filters, strainers, transmitters, sensors, control devices. All gages and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Do not reduce or change maintenance and operating space and access provisions that are shown on the drawings.
- C. Equipment and Piping Support: Coordinate structural systems necessary for pipe and equipment support with pipe and equipment locations to permit proper installation.
- D. Location of pipe sleeves, trenches and chases shall be accurately coordinated with equipment and piping locations.

- E. Minor Piping: Generally, small diameter pipe runs from drips and drains, water cooling, and other service are not shown but must be provided.
- F. Electrical and Pneumatic Interconnection of Controls and Instruments: This is generally not shown but must be provided. This includes interconnections of sensors, transmitters, transducers, control devices, control and instrumentation panels, instruments and computer workstations. Comply with NFPA-70.
- G. Install gages, thermometers, valves and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position thermometers and gages to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.
- H. Work in Existing Building: Cut required openings through existing masonry and reinforced concrete using diamond core drills. Use of pneumatic hammer type drills, impact type electric drills, and hand or manual hammer type drills, will be permitted only with approval of the Owner. Locate openings that will least effect structural slabs, columns, ribs or beams.

1.18 TEMPORARY PIPING AND EQUIPMENT

- A. Continuity of operation of existing facilities may require temporary installation or relocation of equipment and piping. Temporary equipment or pipe installation or relocation shall be provided to maintain continuity of operation of existing facilities, when required by the phasing or called for specifically on the plans.
- B. The Contractor shall provide all required facilities in accordance with the requirements of phased construction and maintenance of service. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities.
- C. When construction is complete, temporary facilities and piping shall be completely removed back to the nearest active distribution branch or main pipe line and any openings in structures sealed. Dead legs in potable water systems will not be allowed. Provide necessary blind flanges and caps to seal open piping remaining in service.

1.19 PLUMBING DEMOLITION

- A. Rigging access, other than indicated on the drawings, shall be provided by the Contractor. Such access shall be provided without additional cost or time to the Owner. Where work is in an operating facility, provide approved protection from dust and debris at all times for the safety of plant personnel and maintenance of plant operation and environment of the facility.
- B. In an operating facility, maintain the operation, cleanliness and safety. The Owner's personnel will be carrying on their normal duties of operating, cleaning and maintaining equipment and facility operation. Confine the work to the immediate area concerned; maintain cleanliness and wet down demolished materials to eliminate dust. Do not permit debris to accumulate in the area to the detriment of facility operation. Perform all flame cutting to maintain the fire safety integrity of this facility. Adequate fire extinguishing facilities shall be available at all times. Perform all work in accordance with recognized fire protection standards.
- C. Completely remove all piping, wiring, conduit, and other devices associated with the

equipment not to be re-used in the new work. This includes all pipe, valves, fittings, insulation, and all hangers including the top connection and any fastenings to building structural systems. Seal all openings, after removal of equipment, pipes, and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the drawings and specifications of the other disciplines in the project for additional facilities to be demolished or handled.

- D. The Contractor shall remove all other material and equipment, devices and demolition debris under these plans and specifications. Such material shall be removed from the property expeditiously and shall not be allowed to accumulate.

1.20 UTILITIES

- A. The Contractor shall arrange and pay for any necessary revisions to existing utility services, including meter deposits and connection fees to all serving utility companies and shall install utilities, where applicable.
- B. The Contractor shall be responsible for all costs associated with the extension of utilities to the Building, including but not limited to natural gas, domestic water, sanitary sewage and storm drain piping.

PART 2 PRODUCTS

2.01 FACTORY-ASSEMBLED PRODUCTS

- A. Provide maximum standardization of components to reduce spare part requirements.
- B. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
 - 1. All components of an assembled unit need not be products of same manufacturer.
 - 2. Constituent parts that are alike shall be products of a single manufacturer.
 - 3. Components shall be compatible with each other and with the total assembly for intended service.
 - 4. Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.
- C. Components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.
- D. Major items of equipment, which serve the same function, must be the same make and model. Exceptions will be permitted if performance requirements cannot be met.

2.02 COMPATIBILITY OF RELATED EQUIPMENT

- A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational system that conforms to contract requirements.

2.03 ESCUTCHEONS AND PLATES

- A. Where pipes pass through ceilings (any type: i.e. lay-in, gypsum, etc.) or walls in finished spaces, install sectional plates or escutcheons to cover the annular opening between pipe and sleeve. Solid plates with set screws shall be used where the sectional plates will not stay in place or are not available in the required size, or where other individual specification section(s) require one piece or greater quality escutcheons or plates.
- B. Inside diameter of escutcheons shall fit around insulation and around pipe when not insulated; outside diameter shall cover sleeve. Secure escutcheons or plates to pipe or sleeve but not to insulation. All escutcheons shall be triple nickel-chromium plated brass, or type 316L stainless steel.

2.04 INSULATION

- A. All insulation materials used inside the building on this project, including finishes and adhesives on the exterior surfaces of ducts, pipes and equipment shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less as determined by an independent testing laboratory in accordance with NFPA 255 as required by NFPA 90A, unless noted otherwise acceptable.

2.05 SOLENOID VALVES

- A. All solenoid valves used in piping systems shall be the slow acting type.

2.06 ASBESTOS

- A. Materials containing asbestos are not permitted.

PART 3 EXECUTION

3.01 ACCESS PANELS

- A. All valves, traps, drains, cleanouts, equipment, etc., must be accessible. The Contractor shall, wherever required to service his installation, coordinate size and location of access panels with General Contractor. Refer to Section 08 31 13 – Access Doors and Frames.

3.02 FIRESTOPPING

- A. Firestopping: Unused slots, sleeves and other penetrations in floors, walls or other general construction shall be closed and sealed with an approved firestopping material.
 - 1. Reference Section 07 84 00 – Firestopping for appropriate firestopping material and method of installation required for each wall rating and penetration size and type to comply with the appropriate UL listing.
 - 2. Floor slots and openings shall be closed with 16 gauge galvanized steel sheet supported on 1-inch by 1-inch by 1/8-inch structural angle drilled or supported

with powder-driven studs into the building structure. Firestop with a layer of silicone elastomer not less than 1-inch thick which completely fills the opening. The top surface of the silicone elastomer shall be approximately 1-inch below the finished floor slab.

3. Openings in walls shall be closed with 16 gauge galvanized steel sheet securely attached at the midpoint of the wall thickness and firestopped on both sides of the steel sheet with not less than 1/8-inch thick layer of non-sagging silicone elastomer to fully cover the opening.
 4. Single or multiple pipes passing through walls and floors shall have the annular space between pipes or between pipes and structure filled with silicone elastomer to provide a rated firestop (rated to match the assembly) for floors and walls.
- B. The annulus between exposed pipe and walls or floors in finished spaces shall be refilled, sealed and painted to match adjacent surfaces.

3.03 CUTTING AND PATCHING

- A. All cutting and patching of floors, walls and ceilings for installation of work covered in these sections will be done by the General Contractor.
- B. Invert and location of existing sanitary piping connections shall be verified prior to any saw cutting or trenching of existing slab.
- C. Where it becomes necessary to drill into or cut through any existing or completed floors, walls or ceilings to permit the installation of any work under this contract or to repair any defects that may appear up to the expiration of the guarantee, such cutting and patching shall be done by the General Contractor under the supervision of the Architect.
- D. No joists, beams, girders or columns shall be cut without first obtaining written permission from the Architect.
- E. All drilling methods for expansion bolts, hangers and other supports shall be done subject to be approval of the Architect. Labor and materials required to replace or rebuild parts or injured portions shall be furnished at the Contractor's expense, subject to the satisfaction of the Architect.

3.04 PAINTING

- A. Types of paint shall be as specified in the Architectural specifications. Surfaces to be painted are identified in Section 09 90 00 and on the drawings. All exposed gas piping shall be painted as noted in Section 22 11 23.
- B. All surfaces to be painted shall be thoroughly cleaned, all rust scraped off and all oil and grease removed before any paint is applied.
- C. Finishing paint coats shall not be applied until all the work is completed. Cloths shall be spread where necessary to prevent drops of paint, oil, etc. from defacing walls, floors, etc., and the Contractor shall be held responsible for all damage by neglect of such precautions. The finished conditions of the painting shall be subject to the approval of the Architect, who may require retouching or repainting of surfaces not properly finished.

3.05 EXCAVATING AND BACKFILLING

- A. The Contractor shall do all excavating and backfilling necessary for the installation of the work, including shoring, bailing and pumping to maintain his trenches and keep them in dry condition until the work in question has been tested and approved.
- B. Care shall be taken that piping is properly and uniformly graded and that trench beds are well rammed and that ground under pipelines is firm and secure before piping is laid. All trenches must be backfilled with clean sand, four inches under pipe, rammed down, soaked with water and made solid. All surplus material shall be removed and carted away.
- C. The Contractors will be responsible for resurfacing all areas after trenches have been backfilled.
- D. The Contractor is directed to comply with all OSHA Requirements and State Requirements regarding trench safety.
- E. Perform all work with the highest regard to safety and in accordance with U.S. 29 CFR 1926 "Safety and Health Regulations for Construction". Special attention shall be directed to Subpart P – Excavations. Refer also to 230010.1.12 – Safety.
 - 1. All shoring and bracing shall be designed so that it is effective to the bottom of the excavation. Sheet piling, sheet piling, bracing, shoring, trench boxes, and other methods of protection, including sloping, shall be based upon the condition and nature of the materials to be retained, and by loads (including surcharge) imparted to the sides of excavation by equipment and stored materials.
 - 2. Store excavated or other materials a minimum of two feet (2') from the edge of any excavation. Retain such materials to prevent their falling or sliding into the excavation, and to prevent excessive pressure on the sides of the excavation.
 - 3. Maintain sides and slopes of excavations in a safe condition by scaling, benching or barricading.
 - 4. Take other precautions via shoring and bracing to prevent slides or cave-ins. Take special precautions when trenches are located adjacent to backfilled excavations, or subjected to vibrations from railroads, highway traffic, operation of machines, etc.
- F. Verify locations of all existing utilities in the area prior to start of excavation (gas, electrical, water, sanitary, storm, telephone, cable TV, optical cable, etc.). Coordinate with utility companies as required.
 - 1. Excavation within four feet (4') of existing utilities shall be done by hand digging only.
- G. Where conditions require concrete or other materials to be placed against undisturbed earth surfaces, any loosened or disturbed materials shall be removed from such surfaces.
- H. Trenching
 - 1. Trenches shall be large enough to permit handling of pipe and accessories and making connections. For cast iron pipe installation, trench bottom width shall exceed bell or coupling diameters by at least twelve inches (12").

2. Trenches in rock, soil containing rocks larger than two (2) inches in any dimension, and other non-uniform materials, shall be four (4) inches minimum and twelve inches (12") maximum below the bottom of the pipe to provide for a bedding course.

I. Preparation of Trench Bottom

1. If the excavation is carried below the finished flow line grade of the pipe in order to remove unsuitable material or for any other reason, the trench shall be course bedded to within six inches (6") of the finished flow line grade of the pipe bottom with compacted load-bearing backfill. A bedding course as specified below shall then be placed over the load-bearing backfill.
2. Trenches shall be dry when the trench bottom is prepared. A continuous trough with compacted bedding course shall be prepared to receive the bottom quadrant of the pipe barrel. Remove loose or disturbed material and bring the trench bottom up to grade with bedding material as follows:
 - a. For active soils where metallic piping is used, washed pea gravel with material no larger than 1/2 inch in largest dimension shall be utilized. Provide a Bentonite plug in the trench at the building perimeter where site drainage or other conditions could permit water intrusion into the trench under the building. Bentonite plug to extend 2 ft. on either side of the perimeter grade beam. (Sand bedding material may be substituted beyond ten (10) feet from building line only.)
 - b. NOTE: Confirm soil conditions prior to trenching. In general, soils with a plasticity index (PI) over 10 at depths to be encountered are considered active. Refer to Geotechnical Report included in project Specifications for PI value and additional information.
3. In addition, for bell joint pipe, excavation for the bell or coupling shall be so that the pipe will bear on the trench bottom along the entire length of the barrel.
4. Prepare the trench bottom carefully so that when placed in its final position, the pipe will be true to line and grade and uniformly supported.

J. Laying Pipe

1. All pipe shall be clean at the time it is placed in the line. Open ends of pipe sections already in place shall be tightly plugged to prevent the entrance of trench water, mud, dirt, etc.
2. Keep trench bottom free of frost, frozen earth or standing water at the time of pipe laying and jointing.

K. Compaction

1. Where compaction is indicated by specifications, accomplish same with vibratory or rammer type compactor, minimum of two full width passes.
2. Compaction below slabs, roads, flatwork, or other construction elements shall be performed to the requirements of compaction for those elements. Coordinate with

general construction trades and other Division's specifications.

L. Backfilling

1. Clean trenches and backfill material of any organic material, roots, trash, lumber, other debris and frozen material prior to backfilling. Backfill material shall contain no organic material, roots, trash, lumber, other debris or frozen material. Backfill material under slabs inside building shall match adjacent materials and be of density acceptable to the A/E.
2. Backfilling by means of sluicing or flooding with water is not permitted. Backfill shall not be placed on frozen ground.
3. Partially backfill immediately after the pipe is laid (unless other methods for anchoring pipe are provided). Leave joints exposed for hydrostatic testing. Water shall not be permitted to rise in unbackfilled trenches after pipe has been placed.
4. Pipe layer backfill (bedding material under the bottom quadrant of the pipe, around sides, and up to a point one foot above the top of the pipe) shall be: sand or select material containing rocks no larger than 1/2 inch in greatest dimension (sand only shall be used with all plastic piping systems or plastic jacketed piping systems); except that pipe layer backfill below slabs in active soils shall be washed pea gravel of 1/2 inch minus dimensions. Backfill below slabs may utilize flowable fill.
5. Backfill material shall be placed and compacted in six inch (6") layers. Backfill shall be brought up evenly on both sides of the pipe simultaneously to avoid damage or displacement from unbalanced loading.
6. Joints shall not be covered with backfill until pressure and leak testing is completed.

- M. The Contractor shall also comply with requirements set forth in Division 31 Drawings and Specifications.

3.06 CLOSE OUT DOCUMENTATION AND TESTING REPORTS

- A. Contractor shall provide Project Record Documents, Operation and Maintenance data and all product warranty data as specified in Section 01 70 00.
- B. Contractor shall also provide copies of all plumbing system test and certification reports for inclusion in project close out documents. Reports shall include, but shall not be limited to, the following:
1. Piping system pressure test reports (per Sections 22 11 00, and 22 13 00),
 2. Domestic water disinfection tests (per Section 22 11 00),
 3. Domestic hot water systems tests (per Section 22 11 00),

END OF SECTION

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

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Pipe hangers and supports.
2. Hanger rods.
3. Sleeves.
4. Mechanical sleeve seals.
5. Formed steel channel.

B. Related Sections:

1. Section 03 10 00 – Concrete Forming and Accessories: Execution requirements for placement of [inserts] [sleeves] in concrete forms specified by this section.
2. Section 03 30 00 – Cast-In-Place Concrete: Execution requirements for placement of concrete housekeeping pads specified by this section.
3. Section 07 84 00 – Firestopping: Product requirements for firestopping for placement by this section.
4. Section 07 90 00 – Joint Protection: Product requirements for sealant materials for placement by this section.
5. Section 22 00 01 – General Plumbing Requirements.
6. Section 22 05 48 – Vibration Controls for Plumbing Piping and Equipment.
7. Section 22 11 00 – Facility Water Distribution: Execution requirements for placement of hangers and supports specified by this section.
8. Section 22 13 00 – Facility Sanitary Sewerage: Execution requirements for placement of hangers and supports specified by this section.
9. Section 22 14 00 – Facility Storm Drainage: Execution requirements for placement of hangers and supports specified by this section.

1.02 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME B31.9 – Building Services Piping.

B. ASTM International:

1. ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials.
 2. ASTM E119 – Method for Fire Tests of Building Construction and Materials.
 3. ASTM E814 – Test Method of Fire Tests of Through Penetration Firestops.
 4. ASTM F708 – Standard Practice for Design and Installation of Rigid Pipe Hangers.
 5. ASTM E1966 – Standard Test Method for Fire-Resistive Joint Systems.
- C. American Welding Society:
1. AWS D1.1 – Structural Welding Code – Steel.
- D. FM Global:
1. FM – Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.
- E. Manufacturers Standardization Society of the Valve and Fittings Industry:
1. MSS SP 58 – Pipe Hangers and Supports – Materials, Design and Manufacturer.
 2. MSS SP 69 – Pipe Hangers and Supports – Selection and Application.
 3. MSS SP 89 – Pipe Hangers and Supports – Fabrication and Installation Practices.
- F. Underwriters Laboratories Inc.:
1. UL 263 – Fire Tests of Building Construction and Materials.
 2. UL 723 – Tests for Surface Burning Characteristics of Building Materials.
 3. UL 1479 – Fire Tests of Through-Penetration Firestops.
 4. UL 2079 – Tests for Fire Resistance of Building Joint Systems.
 5. UL – Fire Resistance Directory.
- G. Intertek Testing Services (Warnock Hersey Listed):
1. WH – Certification Listings.

1.03 DEFINITIONS

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.04 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate system layout with location including critical dimensions, sizes, and pipe hanger and support locations and detail of trapeze hangers.
- C. Product Data:
 - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
- D. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers. Indicate calculations used to determine load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- E. Manufacturer's Installation Instructions:
 - 1. Hangers and Supports: Submit special procedures and assembly of components.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- G. UL/FM assembly sheets or WH assembly sheets for fire rated penetrations.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three (3) years of documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum 3 years of documented experience.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 – Product Requirements: Requirements for transporting, handling, storing and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 – Product Requirements: Environmental conditions affecting products on site.

1.08 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

- B. Contractor shall review all drawings, including structural drawings, for details regarding pipe supports, housekeeping pads, anchors, hangers, and guides.

1.09 WARRANTY

- A. Section 01 70 00 – Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

- A. Plumbing Piping – DWV:
 - 1. Conform to ASTM F708, MSS SP58, MSS SP69, MSS SP89.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
 - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 5. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
 - 6. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- B. Plumbing Piping – Water.
 - 1. Conform to ASTM F708, MSS SP58, MSS SP69, MSS SP89.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
 - 3. Hangers for Cold Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
 - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 5. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
 - 6. Copper Pipe Support: Copper-plated, Carbon-steel ring. Provide non-metallic coatings or inserts on attachments for electrolytic protection where attachments are in direct contact with copper piping.
 - 7. Each hanger shall be properly sized to fit the supported pipe or fit the outside of the insulation on lines, hangers shall not penetrate insulation. Hangers shall bear on the outside of the insulation, which shall be protected by support shields as

specified. Protect insulation from crushing by means of a section of rigid insulation to be installed at hanger points.

8. Perforated strap iron or wire will not, under any circumstances, be acceptable as hanger material.

2.02 ACCESSORIES

- A. Hanger Rods: Galvanized mild steel threaded both ends, threaded on one end, or continuous threaded.
- B. Saddles: Metallic supports: ANSI/MSS SP-69 & SP-58 Type 40 shields and Type 30 saddles, galvanized, with partial bottom rib to center clevis hanger.

2.03 ATTACHMENT TO STRUCTURE

- A. Attachment:
 1. The load and spacing on each hanger and/or insert shall not exceed the safe allowable load for any component of the support system, including the concrete which holds the inserts. Reinforcement at inserts shall be provided as required to develop the strength required.
 2. All supports shall be designed and installed to avoid interference with other piping, hangers, ducts, electrical conduit, supports, building structures, equipment, etc. All piping shall be installed with due regard to expansion and contraction and the type of hanger method of support, location of support, etc. shall be governed in part by this Specification.
 3. Hangers shall be attached to the structure as follows:
 - a. Poured-In-Place Concrete: Where pipes and equipment are supported under poured in place concrete construction, each hanger rod shall be fitted with a nut at its upper end, which nut shall be set into an Underwriters Laboratories, Inc. listed universal concrete insert placed in the form work before concrete is poured. Where inserts are placed in the bottom faces of concrete joists which are too narrow to provide adequate strength of concrete to hold the insert properly or where a larger insert would require displacement of the bottom joist steel, the hanger rod shall be suspended from the center of a horizontal angle iron, channel iron, I-beam, etc. spanning across two adjacent joists. The horizontal support shall be bolted to nonadjustable concrete inserts of the "spot" type, of physical size small enough to avoid the bottom joist steel.
 - b. Steel Bar Joists: Where pipes and loads are supported under bar joists, hanger rods may be run through the space between the bottom angles and secured with a washer and two nuts. Where larger lines are supported beneath bar joists, hanger rods shall be secured to angle irons of adequate size; each angle shall span across two or more joists as required to distribute the weight properly and shall be welded to the joists or otherwise permanently fixed thereto.
 - c. Steel Beams: Where pipes and loads are supported under steel beams, approved type beam clamps shall be used.
 - d. Wood Framing: Where pipes and loads are supported from wood

- framing, hanger rods shall be attached to framing with side beam brackets or angle clips.
- e. Pre-Cast Tee Structural Concrete: Hanger supports, anchors, etc. required for mechanical systems attached to the precast, double tee, structural concrete system are to be installed in accord with approved shop Drawings only. Holes required for hanger rods shall be core drilled in the "flange" of the double tee only; impact type tools are not allowed under any circumstances. Core drilling in the "stem" portions of the double tee is not allowed. Holes core drilled through the "flange" for hanger rods shall be no greater than 1/4" larger than the diameter of the hanger rod. Hanger rods shall be supported by means of bearing plates of size and shape acceptable to the Architect/Engineer, with welded double nuts on the hanger rod above the bearing plate. Cinch anchors, lead shields, expansion bolts, and studs driven by explosion charges are not allowed under any circumstances in the lower 15" of each stem and in the "shadow" of the stem on the top side of the "double tees."
 - f. If it is necessary to install a method of fastening a hanger after the structure has been installed, then only clamps or drilled anchors shall be used.
4. Power-actuated fasteners (shooting) will not be acceptable under any circumstances.

(Note: Under no circumstances will the use of plastic anchors or plastic expansion shields be permitted for any purpose whatsoever.)

2.04 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- C. Sealant: Refer to Section 07 90 00.
- D. Provide UL/FM or Warnock Hersey approved assembly for sleeves through fire rated floors or walls.

2.05 FORMED STEEL CHANNEL

- A. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.

3.02 PREPARATION

- A. Do not drill or cut structural members.
- B. Obtain permission from Architect/Engineer before drilling or cutting structural members.
- C. All auxiliary steel required for supports, anchors, guides, etc. shall be provided by the Contractor unless specifically indicated to be provided by others.
- D. All supports shall be of type and arrangement to prevent excessive deflection, to avoid excessive bending stresses between supports, and to eliminate transmission of vibration.
- E. Contractor shall be responsible for structural integrity of all supports, anchors, guides, etc. All structural hanging materials shall have a minimum safety factor of 5 built in.

3.03 INSTALLATION – PIPE HANGERS AND SUPPORTS

- A. Install in accordance with ASME 31.9, ASTM F708, MSS SP 69 and MSS SP 89.
- B. Support horizontal piping as scheduled.
- C. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.
- D. Place hangers within 12 inches of each horizontal elbow.
- E. Use hangers with 1-1/2 inch minimum vertical adjustment.
- F. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
- H. Provide non-metallic coatings or inserts on attachments for electrolytic protection where attachments are in direct contact with copper piping.
- I. Design hangers for pipe movement without disengagement of supported pipe.
- J. Prime coat exposed steel hangers and supports. Refer to Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- K. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 22 07 00.
- L. Supports, hangers, anchors, and guides shall be fastened to the structure only at such points where the structure is capable of restraining the forces in the piping system.
- M. Cast iron soil pipe 6 inches and smaller shall be supported at each joint, within 18 inches of joint. Cast iron soil pipe 8 inches and larger shall be supported on both sides of each joint when horizontal run exceeds five (5) feet.

- N. Where piping runs in multiple and at the same level, trapeze hangers (or roof curbs/rails) shall be installed.
- O. Insulated Piping: Insulated piping shall be supported with inserts of the same thickness as the insulation, or with other approved methods. Refer also to Section 22 07 00 – Piping Systems Insulation.

3.04 INSTALLATION – SLEEVES

- A. Exterior watertight entries: Seal with mechanical sleeve seals.
- B. Set sleeves in position in forms. Provide reinforcing around sleeves.
- C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- D. Extend sleeves through floors 2 inches above finished floor level. Caulk sleeves.
- E. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with stuffing insulation and caulk [airtight]. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- F. Install stainless steel escutcheons at finished surfaces.
- G. Where installed in fire rated wall, floors, etc., install in accordance with UL/FM or Warnock Hersey fire rated assembly instructions.

3.05 FIELD QUALITY CONTROL

- A. Section 01 40 00 – Quality Requirements, 01 70 00 – Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

3.06 CLEANING

- A. Section 01 70 00 – Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean adjacent surfaces of firestopping materials.

3.07 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 – Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect adjacent surfaces from damage by material installation.

3.08 SCHEDULES

PIPE HANGER SPACING		
PIPE MATERIAL	MAXIMUM HANGER SPACING Feet	HANGER ROD DIAMETER Inches
Cast Iron, up to 2 inches	5	3/8
Cast Iron, 3 inches	5	1/2
Cast Iron, 4 inches	5	5/8
Cast Iron, 6 - 8 inches	5	3/4
Cast Iron, 10 – 12 inches	5	7/8
CPVC, 1 inch and smaller	3	1/2
CPVC, 1-1/4 inches and larger	4	1/2
Copper Tube, 1-1/2 inches and smaller	6	3/8
Copper Tube, 2 inches thru 4 inches	8	1/2
Polypropylene	4	3/8
PVC (All Sizes)	4	3/8
PVDF	4	3/8
Steel, 3 inches and smaller	12	1/2
Steel, 4 inches and larger	12	5/8

END OF SECTION

SECTION 22 05 53 – IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Valve tags.
2. Valve schedules.
3. Pipe markers.

B. Related Sections:

1. Section 09 90 00 - Painting and Coating: Execution requirements for painting specified by this section.

1.02 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME A13.1 – Scheme for the Identification of Piping Systems.

B. American National Standards Institute:

1. ANSI Z535.1 – Safety Color Standard.
2. ANSI Z535.2 – Environmental and Facility Safety Signs.

C. National Fire Protection Association:

1. NFPA 99 – Health Care Facilities Code.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit manufacturer's catalog literature for each product required.

C. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification. Submit a valve chart and schedule, including valve tag number, location, function and valve manufacturer's name and model number.

D. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

1.05 QUALITY ASSURANCE

- A. Conform to ASME A13.1 and ANSI Z535.1 for color scheme for identification of piping systems and accessories.
- B. Conform to ASME A13.1 for length of field and letter height for pipe markers.
- C. Conform to ANSI Z535.1 and ANSI Z535.2 for emergency operating, information and warning signs.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years of experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years of experience.

PART 2 PRODUCTS

2.01 PIPE MARKERS

- A. General: Conform to ASME A13.1 for background and letter colors, length of color field and letter height.
- B. Self-Adhesive Pipe Markers: Flexible, indoor/outdoor grade vinyl with factory-applied pressure-sensitive adhesive. Provide with minimum 1-1/2 inch wide banding tape.
- C. Mechanically Applied Pipe Markers:
 - 1. For pipes with an overall diameter up to 6 inches, including insulation, provide semi-rigid plastic wrap around pipe marker that extends 360 degrees around the pipe at each marker location. The semi-rigid marker should include the legend and a directional flow arrow. The marker shall be supplied as a pre-tensioned device and be equipped with a 1/2 inch strip of adhesive on the inside to further secure the marker in a permanent position on vertical locations.
 - 2. For pipes with an overall diameter greater than 6 inches, including insulation, provide a semi-rigid plastic strap-on pipe marker with a height no less than 3 times the letter height. The marker shall include a legend and a directional flow arrow. Markers to be installed indoors shall be supplied with no less than two nylon straps to secure the marker in place. Markers to be installed outdoors shall be supplied with stainless steel or aluminum strapping.

2.02 DIRECTIONAL ARROWS

- A. Flow Direction: Provide flow directional arrows either as part of pipe markers, banding tape or separately, attached to pipes.
 - 1. Conform to requirements for markers.
 - 2. Size to conform to ANSI A13.1 (1 inch wide minimum).

2.03 CEILING TACKS

- A. Description: Steel with 3/4 inch diameter color coded head.
- B. Color code as follows:
 - 1. Green: Plumbing valves.

2.04 VALVE TAGS

- A. Materials: Provide indoor valve tags of solid brass with stamped or engraved lettering or numbers. Provide outdoor valve tags of aluminum with stamped or engraved lettering or numbers.
 - 1. Fill lettering and numbers with black paint.
 - 2. Lettering shall be not less than 1/4 inch in height.
 - 3. Numbers shall be not less than 1/2 inch in height.
- B. Attachment: For valve tags in mechanical rooms, provide with brass jack chain and "S" hook attachment. For all other indoor valve tags, provide with brass beaded chain attachment. For all outdoor valve tags, provide with stainless steel jack chain and "S" hook attachment.

2.05 ENGRAVED PLASTIC LAMINATE SIGNS

- A. General: Where indicated in other sections of the specifications, provide engraved instruction signs, warning signs, operational instructions or other signs designated.
- B. Emergency Operating Signs: For emergency operating instructions, provide engraved, laminate, melamine plastic, white on red, not less than 1/8 inch thick.
 - 1. Provide concise written instructions on the emergency operation of the device.
 - 2. Letters shall be not less than 5/16 inch in height, engraved 1/16 inch deep in block capital letters.
- C. Information and Warning Signs: Provide general information and warning signs of laminated, melamine plastic, not less than 1/8 inch thick, with white engraved lettering on black, with letters not less than 1/4 inch in height, block capitals.

- D. Attachment: Attach signs directly to the equipment with rivets, bolts or screws, if possible. Otherwise, attach signs with angle brackets, U-bolts, or metal plates held in place to piping with stainless steel draw-bands.
 - 1. Attachment with adhesives will not be permitted.
 - 2. Locate signs not less than 4 feet nor more than 6 feet above the operating floor, directly visible from an operating aisle.
 - 3. Locate signs to preclude damage during maintenance and repair or by operating traffic.

2.06 VALVE SCHEDULES AND FRAMES

- A. General: Provide valve schedules for all valves provided by Division 22.
- B. Schedules: Provide typed or machine printed schedules, one item per line, double spaced.
 - 1. Printing shall be black on 8-1/2-inch by 11-inch white paper. Paper shall be waterproof or laminated after printing.
 - 2. For each valve, list the valve number, location, size and use or operating function.
 - 3. Support schedules in full extruded aluminum frames with removable, non-yellowing, clear plastic faces.
 - 4. Screw or bolt schedules to equipment room walls where directed.
 - 5. Coordinate valve numbers with valve tags so that no two valves or scheduled devices have the same number.

PART 3 EXECUTION

3.01 GENERAL

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Install identifying devices after completion of coverings and painting.
- C. Install labels with sufficient adhesive for permanent adhesion. For unfinished canvas covering, apply paint primer before applying labels.

3.02 CONCEALED VALVES AND EQUIPMENT

- A. Equipment Above Ceilings: Provide valve tagging and identification to equipment located above ceilings, such as valves, trap primers and other items before the ceilings are installed.
- B. Finished Surfaces: Where identification is to be provided on surfaces which require

insulation, painting and finishing, install identification after covering and painting is complete.

- C. Provide ceiling tacks to locate valves or equipment above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

3.03 PIPING SYSTEM IDENTIFICATION

- A. Install pipe markers on all piping systems and include arrows to show the normal direction of flow. Where flow can be in both directions, arrows in both directions shall be displayed.
- B. Identify piping exposed to view and concealed by accessible ceilings, including hard ceilings provided with access panels. Identify piping outdoors, in crawlspaces, on roof, above grade and within parking structures. Only piping located within walls or inaccessible areas need not be identified.
- C. Identify the temperature of domestic hot water piping systems, i.e. "140°F HOT WATER."
- D. Locate pipe markers as follows:
 - 1. Every 15 feet on straight runs.
 - 2. At each valve and control device.
 - 3. At each branch or take-off. Provide flow arrows on the branch pipe as well as on the main on both sides of the branch.
 - 4. At any change in piping direction.
 - 5. Above and below every floor or roof penetration.
 - 6. On either side of every wall or partition. Ensure there is a minimum of one marker per pipe in every room.
 - 7. On either side of large obstructions, ductwork or equipment that piping passes above.
 - 8. At 5-foot intervals where piping is obscured by close proximity to walls or other pipes.
 - 9. Provide only one label per unit drain connection for condensate drain piping on roof.
- E. Install pipe markers so they are visible and legible from a normal standing position.
- F. Secure each end of self-adhesive pipe markers with a full wrap of banding tape of the same background color. Banding tape shall overlap itself a minimum of 3 inches.
- G. Provide mechanically applied pipe markers for all piping in mechanical rooms and outdoors.

- H. Install detectable underground warning tape 12 inches below finished grade, directly above buried pipe. If piping is buried more than 36 inches below finished grade, then provide an additional continuous length of tape buried 12 inches above the piping.

3.04 VALVE IDENTIFICATION

- A. General: Provide a valve tag on every valve, cock and control device in each piping system. Exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibs and shut-off valves at plumbing fixtures. List each tagged valve in valve schedule for each piping system. In existing buildings, coordinate valve tags and schedules such that no valve numbers are duplicated.
 - 1. Tagging Schedule: Comply with requirements of "Valve Tags" and "Valve Schedules and Frames" paragraph.
- B. Install valve schedule frames and schedules in machine rooms where indicated or where directed.

3.05 COLOR AND IDENTIFICATION SCHEDULE

A. Provide final coat of paint, label surface, or lettering of color listed below.

<u>FLUID SERVICE TYPE</u>	<u>PIPE MARKER LEGEND</u>	<u>PIPE MARKER BACKGROUND / LETTERING COLOR</u>	<u>VALVE TAG LETTERING</u>
Domestic Cold Water	COLD WATER	Green / White	CW
Domestic Hot Water - 110°F	110°F HOT WATER	Green / White	HW
Domestic Hot Water Recirculation - 110°F	110°F HOT WATER RETURN	Green / White	HWC
Domestic Hot Water - 115°F	115°F HOT WATER	Green / White	HW
Domestic Hot Water Recirculation - 115°F	115°F HOT WATER RETURN	Green / White	HWC
Domestic Hot Water - 140°F	140°F HOT WATER	Green / White	HW
Domestic Hot Water Recirculation - 140°F	140°F HOT WATER RETURN	Green / White	HWC
Sanitary Waste	SANITARY WASTE	Green / White	
Sanitary Vent	SANITARY VENT	Green / White	
Storm or Roof Drain	STORM DRAIN	Green / White	
Grease Waste	GREASE WASTE	Green / White	
Acid Waste	ACID WASTE	Orange / Black	
Acid Vent	ACID VENT	Orange / Black	
Softened Water	SOFT WATER	Green / White	SW
Deionized Water	DEIONIZED WATER	Green / White	DI
Natural Gas	NATURAL GAS	Yellow / Black	GAS
Propane Gas	PROPANE GAS	Yellow / Black	GAS
Compressed Air	COMPRESSED AIR	Blue / White	CA
Non-Potable Water	CAUTION: NON-POTABLE WATER, DO NOT DRINK	Purple / Yellow	NP
Reclaimed / Re-use Water	CAUTION: NON-POTABLE RECLAIMED WATER, DO NOT DRINK	Purple / Black	RC

END OF SECTION

SECTION 22 07 00 – PLUMBING INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Piping – Glass Fiber.
2. Piping – Jackets.
3. Cellular Foam.

B. Related Sections:

1. Section 07 84 00 – Firestopping: Product requirements for firestopping for placement by this section.
2. Section 09 90 00 – Painting and Coating: Execution requirements for painting insulation jackets and covering specified by this section.
3. Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment: Product and Execution requirements for inserts at hanger locations.
4. Section 22 05 53 – Identification for Plumbing Piping and Equipment.

1.02 REFERENCES

A. ASTM International:

1. ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
2. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
3. ASTM C177 – Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
4. ASTM C195 – Standard Specification for Mineral Fiber Thermal Insulating Cement.
5. ASTM C449/C449M – Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
6. ASTM C518 – Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
7. ASTM C533 – Standard Specification for Calcium Silicate Block and Pipe

Thermal Insulation.

8. ASTM C534 – Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
9. ASTM C547 – Standard Specification for Mineral Fiber Pipe Insulation.
10. ASTM C552 – Standard Specification for Cellular Glass Thermal Insulation.
11. ASTM C553 – Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
12. ASTM C591 – Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
13. ASTM C592 – Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type).
14. ASTM C610 – Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation.
15. ASTM C612 – Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
16. ASTM C795 – Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
17. ASTM C921 – Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
18. ASTM C1126 – Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
19. ASTM C1136 – Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
20. ASTM D1784 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
21. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
22. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
23. ASTM E162 – Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.
24. ASTM G21 – Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. Sheet Metal and Air Conditioning Contractors':

1. SMACNA – HVAC Duct Construction Standard – Metal and Flexible.

1.03 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Submittal procedures.
- B. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.
- C. Samples: Submit one sample of representative size illustrating each insulation type.
- D. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.

1.04 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 – Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 – Product Requirements: Environmental conditions affecting products on site.
- B. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
- C. Maintain temperature during and after installation for minimum period of 24 hours.

1.07 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01 PIPING – GLASS FIBER

- A. Insulation: ASTM C547; rigid molded, non-combustible.
 - 1. 'K' value: ASTM C335, 0.24 at 75 degrees F.

2. Minimum Service Temperature: -20 degrees F.
3. Maximum Service Temperature: 300 degrees F.
4. Maximum Moisture Absorption: 0.2 percent by volume.
5. Maximum Flame Spread: ASTM F84:25.
6. Maximum Smoke Developed: ASTM E84:50.

B. Vapor Barrier Jacket

1. ASTM C921, white kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Transmission: ASTM E96; 0.02 perm inches.
3. Secure with self sealing longitudinal laps and butt strips.
4. Secure with outward clinch expanding staples and vapor barrier mastic.

C. Tie Wire: 18 gage stainless steel with twisted ends on maximum 12 inch centers.

D. Vapor Barrier Lap Adhesive

1. Compatible with insulation.

E. Insulating Cement/Mastic

1. ASTM C195; hydraulic setting on mineral wool.

F. Fibrous Glass Fabric

1. Cloth: Untreated; 9 oz/sq. yd. weight.
2. Blanket: 1.0 lb./cu. ft. density.

G. Indoor Vapor Barrier Finish

1. Vinyl emulsion type acrylic, compatible with insulation, white color.

2.02 PIPING – JACKETS

A. PVC Plastic

1. Jacket: ASTM C921, One piece molded type fitting covers and sheet material, off white color.
 - a. Minimum Service Temperature: -40 degrees F.
 - b. Maximum Service Temperature: 150 degrees F.
 - c. Moisture Vapor Transmission: ASTM E96; 0.002 perm inches.
 - d. Maximum Flame Spread: ASTM E84; 25.
 - e. Maximum Smoke Developed: ASTM E84; 50.

- f. Thickness: 20 mil.
 - g. Connections: Brush on welding adhesive.
 - 2. Covering Adhesive Mastic
 - a. Compatible with insulation.
- B. Aluminum Jacket: ASTM B209.
 - 1. Thickness: 0.016 inch.
 - 2. Finish: Smooth.
 - 3. Joining: Longitudinal slip joints and 2 inch laps.
 - 4. Fittings: 0.016 mm thick die shaped fitting covers with factory attached protective liner.
 - 5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

2.03 CELLULAR FOAM

- A. Insulation: ASTM C534; flexible, cellular elastomeric, molded or sheet.
 - 1. 'K' Value: ASTM C177 or C518; 0.27 at 75 degrees F.
 - 2. Minimum Service Temperature: -40 degrees F.
 - 3. Maximum Service Temperature: 220 degrees F.
 - 4. Maximum Moisture Absorption: ASTM D1056; 1.0 by volume.
 - 5. Moisture Vapor Transmission: ASTM E96; 0.20 perm inches.
 - 6. Maximum Flame Spread: ASTM E84; 25.
 - 7. Maximum Smoke Developed: ASTM E84; 50.
 - 8. Connection: Waterproof vapor barrier adhesive.
- B. Elastomeric Foam Adhesive
 - 1. Air dried, contact adhesive, compatible with insulation.

2.04 INSERT AND SHIELDS

- A. Shields:
 - 1. Galvanized steel, ASTM 653, service temp -150° F to +500° F.
 - 2. Round corner design and flared edges with partial bottom rib, 180° formed arc.

- 3. Shields to comply with MSS SP 58 Type 39 for vapor barrier application.
- B. Inserts:
 - 1. Compression Resistant Insulating Material; 7.5lb/cu ft density cellular glass or equal suitable for planned temperature range and service.
 - 2. Inserts shall be a minimum of 6" long, of thickness and contour matching adjoining insulation; factory fabricated is acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.
- B. Verify piping and equipment has been tested before applying insulation materials.
- C. Verify surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION – PIPING

- A. Install materials in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- D. Insulated pipes conveying fluids below ambient temperature:
 - 1. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.
- E. Insulated pipes conveying fluids above ambient temperature:
 - 1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- F. Inserts and Shields:

1. Application: Piping or Equipment 1 inch diameter or larger.
 2. Shields: Between pipe hangers, pipe supports or pipe hanger rolls and inserts.
 3. Insert location: Between support shield and piping and under finish jacket.
- G. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Section 07 84 00 for penetrations of assemblies with fire resistance rating greater than one hour.
- H. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers or aluminum jacket.
- I. Exterior Applications: Provide vapor retarder jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with aluminum jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal equipment.

3.03 PIPING – GLASS FIBER INSULATION SCHEDULE

PIPING SYSTEMS		PIPE SIZE Inch	THICKNESS Inch
A.	Domestic Water:		
	Hot Water	1-1/2" & smaller 2" & larger	1" 1-1/2"
	Hot Water Return/Circulating	1-1/2" & smaller 2" & larger	1" 1-1/2"
	Cold Water	ALL	1/2"

3.04 PIPING – CELLULAR FOAM INSULATION SCHEDULE

Above floor piping receiving condensate from AC equipment. Insulate drainbody, trap, trap arm, tailpiece, and 20 ft of pipe vertical and horizontal and/or when it ties into the main.	ALL	1"
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END OF SECTION

SECTION 22 11 00 – FACILITY WATER DISTRIBUTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Domestic water piping, above grade.
2. Unions and flanges.
3. Valves.
4. Pipe hangers and supports.
5. Flow control valves.
6. Strainers.
7. Water hammer arrestors.
8. Thermostatic mixing valves.
9. Di-electric connections.

B. Related Sections:

1. Section 03 30 00 – Cast-In-Place Concrete: Execution requirements for placement of concrete house keeping pads specified by this section.
2. Section 07 84 00 – Firestopping: Product requirements for firestopping for placement by this section.
3. Section 08 31 13 – Access Doors and Frames: Product requirements for access doors for placement by this section.
4. Section 22 00 01 – General Plumbing Requirements.
5. Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment: Product requirements for pipe hangers and supports for placement by this section.
6. Section 22 05 53 – Identification for Plumbing Piping and Equipment: Product requirements for pipe identification and valve tags for placement by this section.
7. Section 22 07 00 – Plumbing Insulation: Product and execution requirements for pipe insulation.
8. Section 26 05 03 – Equipment Wiring Connections: Execution requirements for electric connections to equipment specified by this section.

1.02 REFERENCES

A. American National Standards Institute:

1. ANSI Z21.22 – Relief Valves for Hot Water Supply Systems.
2. ANSI/NSF 61 – Drinking Water Components – Health Effects.
3. NSF/ANSI 14 – Plastic Piping System Components and Related Materials

B. American Society of Mechanical Engineers:

1. ASME B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings.
2. ASME B16.22 – Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
3. ASME B16.26 – Cast Copper Alloy Fittings for Flared Copper Tubes.
4. ASME B31.9 – Building Services Piping.
5. ASME B40.1 – Gauges - Pressure Indicating Dial Type - Elastic Element.
6. ASME Section VIII – Boiler and Pressure Vessel Code - Pressure Vessels.
7. ASME Section IX – Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

C. American Society of Sanitary Engineering:

1. ASSE 1010 – Performance Requirements for Water Hammer Arresters.
2. ASSE 1011 – Performance Requirements for Hose Connection Vacuum Breakers.
3. ASSE 1012 – Performance Requirements for Backflow Preventer with Intermediate Atmospheric Vent.
4. ASSE 1013 – Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers.
5. ASSE 1017 – Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems.
6. ASSE 1019 – Performance Requirements for Vacuum Breaker Wall Hydrants, Freeze Resistant, Automatic Draining Type.
7. ASSE 1070 – Performance Requests for Water Temperature Limiting Devices.

D. ASTM International:

1. ASTM A182 – Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
 2. ASTM A269 – Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 3. ASTM A276– Standard Specification for Stainless Steel Bars and Shapes.
 4. ASTM A312– Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
 5. ASTM B32 – Standard Specification for Solder Metal.
 6. ASTM B42 – Standard Specification for Seamless Copper Pipe, Standard Sizes.
 7. ASTM B88 – Standard Specification for Seamless Copper Water Tube.
 8. ASTM B584 – Standard Specification for Copper Alloy Sand Castings for General Applications.
 9. ASTM E1 – Standard Specification for ASTM Thermometers.
 10. ASTM E77 – Standard Test Method for Inspection and Verification of Thermometers.
 11. ASTM F708 – Standard Practice for Design and Installation of Rigid Pipe Hangers.
 12. ASTM F1476 – Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.
 13. ASTM D2765 – Standard Test Method for Determination of Gel Content and Swell Ratio of Crosslinked Ethylene Plastics
 14. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
 15. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials
- E. American Welding Society:
1. AWS A5.8 – Specification for Filler Metals for Brazing and Braze Welding.
- F. American Water Works Association:
1. AWWA C651 – Disinfecting Water Mains.
- G. Manufacturers Standardization Society of the Valve and Fittings Industry:
1. MSS SP 58 – Pipe Hangers and Supports – Materials, Design and Manufacturer.

2. MSS SP 67 – Butterfly Valves.
3. MSS SP 69 – Pipe Hangers and Supports – Selection and Application.
4. MSS SP 70 – Cast Iron Gate Valves, Flanged and Threaded Ends.
5. MSS SP 71 – Cast Iron Swing Check Valves, Flanged and Threaded Ends.
6. MSS SP 78 – Cast Iron Plug Valves, Flanged and Threaded Ends.
7. MSS SP 80 – Bronze Gate, Globe, Angle and Check Valves.
8. MSS SP 85 – Cast Iron Globe & Angle Valves, Flanged and Threaded.
9. MSS SP 89 – Pipe Hangers and Supports – Fabrication and Installation Practices.
10. MSS SP 110 – Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

H. National Electrical Manufacturers Association:

1. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).

I. Plumbing and Drainage Institute:

1. PDI WH201 – Water Hammer Arrester Standard.

J. Underwriters' Laboratories

1. ANSI/UL 263 – Standard Fire Tests of Building Construction and Materials

1.03 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures: Submittal procedures.

B. Product Data:

1. Piping: Submit data on pipe materials, fittings and accessories. Submit manufacturer's catalog information and pipe joining methods: Solder, primer and glue, brazing, etc..
2. Valves: Submit manufacturer's catalog information with valve data and ratings for each service.
3. Hangers and Supports: Submit manufacturer's catalog information including load capacity.
4. Domestic Water Specialties: Submit manufacturer's catalog information, component sizes, rough-in requirements, service sizes, and finishes.

C. Manufacturer's Installation Instructions: Submit installation instructions for pumps, valves

and accessories.

- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- E. Shop Drawings of water system.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 – Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of valves and equipment.
- C. Operation and Maintenance Data: Submit spare parts list, exploded assembly views and recommended maintenance intervals.
- D. Record actual locations of valves, etc. and prepare valve charts.
- E. Test reports and inspection certification for all systems listed herein.
- F. Provide a certificate of completion detailing the domestic water system chlorination procedure and all laboratory test results.
- G. Submit location of access panels which vary from quantities or locations indicated on Contract Drawings.
- H. Provide full written description of manufacturer's warranty.
- I. Backflow preventer test report.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years of documented experience..

1.06 QUALITY ASSURANCE

- A. All work shall be in accordance with Texas Commission on Environmental Quality (TCEQ) Chapter 290 – Public Drinking Water.
- B. All piping materials shall be manufactured and tested according to applicable ANSI, ASTM, ASME, AWWA and CISPI standards.
- C. Unless otherwise noted, all piping materials shall be domestically manufactured in the USA.
- D. Piping Systems Materials:
 - 1. Note: Piping systems shall use consistent materials throughout each system. Materials for each piping system shall not be "mixed". Exception: where required

due to above/below grade conditions; allowed due to inside building/outside building conditions; or where indicated by drawings or specifications.

2. Note: Lead containing solders shall not be used at any place in any system.
 3. All domestic water piping, fittings, valves and appurtenances shall be certified to ANSI/NSF 61.
- E. Manufacturer's name and pressure rating shall be permanently marked on valve body.
- F. The Contractor shall notify the manufacturer's representative prior to installing any copper press fittings. The Contractor shall obtain the representative's guidance in any unfamiliar installation procedures. The manufacturer's representative of copper press fittings shall conduct periodic inspections of the installation and shall report in writing to the Contractor and Owner of any observed deviations from manufacturer's recommended installation practices.
- G. Manufacturer Qualifications: Company shall have minimum three years documented experience specializing in manufacturing the products specified in this section.
- H. All grooved joint couplings, fittings, flanges, valves, and specialties of the same type shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
- I. Installer Qualifications:
1. Company shall have minimum three years documented experience specializing in performing the work of this section.
 2. Installation of plumbing systems shall be performed by individuals licensed by the Texas State Board of Plumbing Examiners as a Journeyman or Master Plumber. Installation may be performed by Apprentice Plumbers provided they are registered with the Texas State Board of Plumbing examiners and under direct supervision of a licensed plumber. All installation shall be supervised by a licensed Master Plumber.
 3. All installers of copper press fittings shall be trained by the fitting manufacturer's appointed representative. Written notification of training shall be submitted to Owner prior to any installation.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 – Product Requirements: Product storage and handling requirements.
- B. Accept valves and equipment on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.
- F. Store piping and equipment in a safe place, dry, enclosed, under cover in a well ventilated area.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 – Product Requirements.
- B. Do not install underground piping when bedding is wet or frozen.

1.09 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.10 WARRANTY

- A. Section 01 70 00 – Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish 1-year manufacturer warranty for domestic water piping.

1.11 EXTRA MATERIALS

- A. Section 01 70 00 – Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish 1 packing kit for each size valve, 1 loose key for outside hose bibs, service kits for 1 pump seal for each pump model.

PART 2 PRODUCTS

2.01 DOMESTIC WATER PIPING – ABOVE GRADE

- A. Copper Tubing: ASTM B88, Type L, hard drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F. or Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.
 - 3. Thread fitting: Pipe joint compound shall be lead free, non-toxic, low VOC and ANSI/NSF6/compliant. Temperature service range 10°F to 300°F.
 - 4. Press fittings: At contractor's option, copper piping 2 inch and smaller may be joined using copper or copper alloy press fittings with factory installed sealing elements of EPDM material.

2.02 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:

1. Ferrous Piping: Class 150, malleable iron, threaded.
2. Copper Piping: Class 150, bronze unions with [soldered] [brazed joints].
3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Flanges for Pipe 2-1/2 inches and Larger:

1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
2. Copper Piping: Class 150, slip-on bronze flanges.

2.03 GLOBE VALVES

- A. 2 inches and Smaller: MSS SP 80, Class 125, bronze body, bronze trim, threaded bonnet, hand wheel, Buna-N composition discs.

2.04 BALL VALVES

- A. 2 inches and Smaller: MSS SP 110, 400 psi WOG two-piece bronze body, chrome-plated brass ball, full port, Teflon seats, blow-out proof stem, locking lever handle with balancing stops.
- B. 2 inches and Smaller: MSS SP 110, Class 150, bronze, two-piece body, chrome-plated bronze ball, full port, Teflon seats, blow-out proof stem, locking lever handle with balancing stops.
- C. Neck Extensions: Provide valves with extended round stem/necks where valves are installed in piping to be insulated. Stem/necks must permit operation of valve without damage to the insulation vapor barrier system. Nibco Nibseal or equal.

2.05 CHECK VALVES

A. Horizontal Swing Check Valves:

1. 2 inches and Smaller: MSS SP 80, Class 150, bronze body and cap, bronze seat, Buna-N disc.
2. 2-1/2 inches and Larger: MSS SP 71, Class 125, cast iron body, bolted cap, bronze or cast iron disc, renewable disc seal and seat, flanged ends.

B. Spring Loaded Check Valves:

1. 2 inches and Smaller: MSS SP 80, Class 250, bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat.
2. 2-1/2 inches and Larger: MSS SP 71, Class 125, wafer style, cast iron body,

bronze seat, center guided bronze disc, stainless steel spring and screws, flanged ends.

2.06 FLOW CONTROL VALVES

- A. Construction: Class 150, Brass or bronze body, temperature and pressure test plug on inlet, combination blow-down or back-flush drain.
- B. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 5 psi.

2.07 RELIEF VALVES

- A. Pressure Relief:
 - 1. ANSI Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.
- B. Temperature and Pressure Relief:
 - 1. ANSI Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME certified and labeled.

2.08 STRAINERS

- A. 2 inch and Smaller: Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
- B. 2-1/2 inch to 4 inch: Class 125, flanged iron body, Y pattern with 1/16-inch stainless steel perforated screen.
- C. 5 inch and Larger: Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

2.09 WATER HAMMER ARRESTORS

- A. ASSE 1010: Copper construction, piston type sized in accordance with PDI WH-201.
- B. Pre-charged suitable for operation in temperature range -100 to 300 degrees F and maximum 150 psi working pressure.
 - 1. Bellows Type
 - 2. Piston Operated

2.10 THERMOSTATIC MIXING VALVES

- A. Point of use mixing valve. Thermostatic mixing valve shall have body of brass or bronze with paraffin based thermal actuation. Valve shall be complete with integral checks with screens, and an adjustment cap with locking feature. Valve shall be ASSE Standard 1070

listed and shall maintain control down to 0.5 gpm. Valve shall maintain a mixed water temperature from 80° to 120°F \pm 3°F. Set to deliver 110°F (unless indicated otherwise). Valve shall be capable of controlling mixed temperature while hot supply temperature ranges from 120°F to 180°F and withstand a maximum pressure of 150 psi. The minimum required differential between entering cold and hot water and mixed water shall be 15°F or lower.

2.11 DIELECTRIC CONNECTION

- A. Provide Dielectric isolation between dissimilar metal piping. NOTE: Brass/bronze valves shall not be acceptable for dielectric isolation under this specification.
- B. Two inch connections may be either dielectric union or isolating flange as required.
- C. Two and one-half inch and larger connections shall incorporate isolating flange kits. Flanges copper pipe shall consist of Class 150 cast copper alloy companion flange with flat face
- D. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- E. Dielectric waterway fittings shall have a copper-silicon casting or a zinc electroplated steel pipe body with high temperature stabilized polyolefin polymer liner; manufactured by Victaulic, Style 647 or PPP, Inc. Series 19000, or Owner approved equal by Anvil.
- F. Dielectric unions shall be rated at 250 psi, ground-joint type with inert, non-corrosive thermoplastic sleeve. End connection materials shall be compatible with respective piping materials; manufactured by EPCO Sales, Inc or Watts. Provide models to suit applicable transitions.
- G. Dielectric flanges shall be rated at 175 psi, have nylon bolt isolators and dielectric gasket. Materials shall be compatible with respective piping materials; manufactured by EPCO Sales, Inc or Watts. Provide models to suit applicable transitions.
- H. Flange insulation kit contain one "E: full face Trojan style insulation gasket manufactured from Nema grade G-10 glass reinforced epoxy retainer with a Nitrile seal, two insulation washers manufactured from Nema grade G-10, two steel (SEA zinc plated steel) back-up washers and one Nema Grade G-10 sleeve for each bolt.
- I. Dielectric Nipples:
 - 1. Manufacturer's: Subject to compliance with requirements.
 - 2. Grinnell Mechanical Products.
 - 3. Precision Plumbing Products, Inc.
 - 4. Victaulic Company.
 - a. Description :

- 1) Standard: IAPMO PS 66
- 2) Electroplated steel nipple, complying with ASTM F1545
- 3) : 300 psig at 250 deg.F
- 4) End connection: Male Thread or grooved.
- 5) Lining: Inert and non corrosive, propylene.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.
- B. Verify excavations are to required grade, dry and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.

3.03 INSTALLATION – THERMOMETERS AND GAUGES

- A. Install one pressure gauge for each pump, locate taps before strainers and on suction and discharge of pump; pipe to gauge.
- B. Install gauge taps in piping
- C. Install pressure gauges with pulsation dampers. Provide needle valve or ball valve to isolate each gauge.
- D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Allow clearance from insulation.
- E. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- F. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- G. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.04 INSTALLATION – HANGERS AND SUPPORTS

- A. Install hangers and supports in accordance with Section 22 05 29. Provide non-metallic coatings or inserts on attachments for electrolytic protection where attachments are in direct contact with copper piping.

3.05 INSTALLATION – ABOVE GROUND PIPING

- A. Install non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- C. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.
- D. Group piping whenever practical at common elevations.
- E. Slope piping and arrange systems to drain at low points.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 00.
- H. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors with Section 08 31 13.
- I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- J. Provide support for utility meters in accordance with requirements of utility companies.
- K. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 90 00.
- L. Install domestic water piping in accordance with ASME B31.9.
- M. Sleeve pipes passing through partitions, walls and floors. Refer to Section 22 05 29.
- N. Install unions downstream of valves and at equipment or apparatus connections.
- O. Install valves with stems upright or horizontal, not inverted.
- P. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- Q. Install gate, ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- R. Install ball valves for throttling, bypass, or manual flow control services.
- S. Provide lug end butterfly valves adjacent to equipment when functioning to isolate equipment.
- T. Provide spring loaded check valves on discharge of water pumps.
- U. Provide flow controls in water circulating systems.

- V. Install potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.
- W. Pipe relief from valves, back-flow preventers and drains to nearest floor drain.
- X. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to each fixture or group of fixtures.
- Y. Utilize slow closing valves only. Do not install or allow quick closing valves.

3.06 PIPE JOINTS

- A. Welded: Beveling, spacing and other details shall conform to ASME B31.9 and AWS B2.1.
- B. Threaded: Treads shall conform to ASME B1.20. Joint compound shall be applied to male threads only and joints shall be made up so no more than three threads show. Coat exposed threads on steel pipe with joint compound for corrosion protection.
- C. Soldered: Solder joints shall be made in accordance with ASTM B828. The temperature of the joint during soldering shall not be raised above the maximum temperature limitation of the flux.
- D. Press Fittings:
 - 1. The installer of copper press type fittings shall be a factory qualified installer, licensed within the jurisdiction and familiar with the installation of the specific copper press joint system being utilized.
 - 2. Copper press fittings shall be installed using the proper tool, actuator, jaws and ring as instructed by the press fitting manufacturer.
 - 3. Copper and copper alloy press connections shall be made in accordance with the manufacturer's installation instructions.
 - 4. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark to assure the tubing is fully engaged in the fitting. The joints shall be pressed using the tool(s) approved by the manufacturer.

3.07 WATER-HAMMER ARRESTORS

- A. Provide water hammer arrestors as shown on the plans and as necessary to prevent water hammer from occurring. As a minimum, provide as follows.
 - 1. A minimum of one arrestor shall be installed for each fixture header serving up to three fixtures. A minimum of two arrestors shall be installed for each fixture header serving four to seven fixtures. A minimum of three shall be installed for each fixture header serving eight or more fixtures.

2. Note: "Header" refers to horizontal pipe from which adjacent fixtures are directly connected without intervening horizontal or vertical runs or offsets.
3. Provide permanently sealed air chamber type water-hammer arrestor at all water closet locations.
4. Provide an arrestor for each single fixture with a quick closing valve (e.g. single lever handles; wrist blades, push/pull faucets, self-closing faucets, flush valves, solenoid valves, etc.).
5. NOTE: Washing machines and other solenoid operated equipment shall have arrestor (not air chamber) provided for each piece of equipment/fixture.
6. Air chambers are not acceptable under any circumstance.
7. Where indicated, provide water hammer arrestors integral to the fixture (lavatory, sink etc.) supplies equal to Precision Plumbing Products "Mini-Angle Stop". Provide all washing machine and icemaker connections with water hammer arrestors integral to the connection box.

3.08 FIELD QUALITY CONTROL

- A. Section 01 40 00 – Quality Requirements and 01 70 00 – Execution and Closeout Requirements: Field inspecting, testing, adjusting and balancing.

3.09 CLEANING AND DISINFECTION

- A. Domestic Water Piping: Domestic cold water and hot water piping shall be thoroughly flushed, cleaned and disinfected in accordance with the appropriate procedure described in the latest edition of ANSI/AWWA C651 or as described in this section. Cold and hot domestic water piping shall be thoroughly flushed with potable water to remove all foreign particles. The piping shall then be sterilized by filling the systems with a solution of chlorine containing 50 PPM of chlorine this solution shall stay in the piping for a minimum period of 24 hours; or the piping shall be filled with a solution of chlorine containing 200PPM of chlorine and this solution shall stay in the piping for a minimum of 3 hours. During which time all valves shall be opened and closed several times in order that all parts of the valve shall be in contact with the solution. After the sterilization period, the system shall be drained and flushed with clean potable water until the residual chlorine content is not greater than 0.2 PPM.
- B. Bacteriological test shall be performed by a third party testing lab hired by the contractor. SUBMIT testing lab qualification for review and approval by the Owner and A/E. The testing lab shall not have less than five (5) years experience with water testing.
- C. The above procedure shall be performed prior to final connections to utility or existing piping systems in the building to assure no chlorine or other contamination migrates into systems.
- D. Within one week (7 days) days after cleaning is completed, submit written report signed by supervising craftsman and contractor principal certifying cleaning and sterilization was conducted as specified.

- E. Take samples no sooner than 24 hours after flushing, from at minimum of 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.
- F. The cleaning and disinfection of water lines shall not be done sooner than 3 weeks prior to owner occupancy. If it has been more than 3 weeks then the contractor shall, at his own expense, clean and disinfect the pipe again not sooner than 3 weeks before owner occupancy.

3.10 TESTING

- A. Each system installed under this contract shall be cleaned and tested to appropriate plumbing code for each particular application.
- B. Testing shall also include any additional requirements from the authority having jurisdiction.
- C. Equipment, material, power, and labor necessary for the cleaning, flushing, sterilization, inspection and testing of systems covered within this Specification Section shall be furnished by the Plumbing Contractor. All testing and inspection procedures shall be in accordance with Division 01 and Special Condition requirements of this Contract.
- D. For any requested inspection, the Contractor shall complete prior inspections and tests to ensure that items are ready for inspection and acceptance by the Owner and/or Architect/Engineer. The Contractor shall be responsible for any and all costs incurred by Owner and/or Owner representatives, including consultants, resulting from a review or inspection that was scheduled prematurely.
- E. The Contractor shall conduct the tests and the Owner's Construction Inspector will witness and approve the results.
- F. Verify systems are complete, flushed and clean prior to testing. Isolate all equipment subject to damage from test pressure. Test and inspect for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. Piping being tested shall not leak nor show any loss in test pressure for duration specified.
- G. Leave piping uninsulated, uncovered and unconcealed until it has been tested and approved. Where any portion of piping system must be concealed before completion of entire system, the portion shall be tested separately as specified for the entire system prior to concealment. Contractor shall expose all untested covered or concealed piping.
- H. In cases of minor installation and repairs where specified water and/or air test procedures are deemed impractical, Contractor shall obtain written approval from Owner's Representative to perform alternate testing and inspection procedures. Alternate testing and inspection procedures for minor installation and repairs shall include visual evaluation of installed components by Owner's Representative during a simulation of use.
- I. The water utilized for tests shall be obtained from a potable source of supply.
- J. Prepare testing reports. If testing is performed in segments, submit separate report for each segment, complete with diagram or clear description of applicable portion of piping. After inspection has been approved or portions thereof, certify in writing the time, date, name and title of the persons reviewing the test. This shall also include the description of

what portion of the system has been approved. Obtain approval signature by Owner's Representative. A complete record shall be maintained of all testing that has been approved, and shall be made available at the job Site. Upon completion of the work, all records and certifications approving testing requirements shall be submitted to the Owner's Representative before final payment is made.

- K. Gauges used for testing shall have increments as follows:
 - 1. Tests requiring a pressure of 10 psi or less shall utilize a testing gauge having increments of 0.10 psi or less.
 - 2. Tests requiring a pressure of greater than 10 psi but less than or equal to 100 psi shall utilize a testing gauge having increments of 1 psi or less.
 - 3. Tests requiring a pressure of greater than 100 psi shall utilize a testing gauge having increments of 2 psi or less.
- L. Separately test above and below ground piping.
- M. Do not introduce test water into piping systems when exposure to freezing temperatures is possible.
- N. Do not introduce test water into sections of piping located above existing sensitive areas and/or equipment that may be damaged or contaminated by water leakage. Coordinate with Owner's Representative to determine areas and/or equipment considered as being sensitive.
- O. Defective work or material shall be reworked and replaced, and inspection and test repeated. Repairs shall be made with new materials. Pipe dope, caulking, tape, dresser couplings, etc., shall not be used to correct deficiencies.
- P. The Contractor shall be responsible for cleaning up any leakage during flushing, testing, repairing and disinfecting to the original condition any building parts subjected to spills or leakage.
- Q. Domestic hot water system:
 - 1. Test Remote fixtures to determine hot water is available within 30 seconds. Provide a report and a drawing indicated fixtures tested and the duration of time to provide 110 °F.
 - 2. Record temperature at each return pump.
- R. Pressure test all water piping in accordance with the applicable plumbing code and local AHJ.
- S. All testing of pumps shall be by owner representative and a report shall be provided.
- T. Equipment, material, power, and labor necessary for the cleaning, flushing, sterilization, inspection and testing of systems covered within this Specification Section shall be furnished by the Plumbing Contractor. All testing and inspection procedures shall be in

accordance with Division 01 and Special Condition requirements of this Contract.

- U. For any requested inspection, the Contractor shall complete prior inspections and tests to ensure that items are ready for inspection and acceptance by the Owner and/or Architect/Engineer. The Contractor shall be responsible for any and all costs incurred by Owner and/or Owner representatives, including consultants, resulting from a review or inspection that was scheduled prematurely.

END OF SECTION

SECTION 22 13 00 – FACILITY SANITARY SEWERAGE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Sanitary sewer and vent piping buried below grade.
2. Sanitary sewer and vent piping above grade.
3. Cleanouts.

B. Related Sections:

1. Section 03 30 00 – Cast-In-Place Concrete: Execution requirements for placement of concrete specified by this section.
2. Section 07 84 00 – Firestopping: Product requirements for firestopping for placement by this section.
3. Section 08 32 13 – Access Doors and Frames: Product requirements for access doors for placement by this section.
4. Section 09 90 00 – Painting and Coating: Product and execution requirements for painting specified by this section.
5. Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment: Product requirements for pipe hangers and supports and firestopping for placement by this section.
6. Section 22 05 53 – Identification for Plumbing Piping and Equipment: Product requirements for pipe identification for placement by this section.
7. Section 22 07 00 – Plumbing Insulation: Product and execution requirements for pipe insulation.
8. Section 26 05 03 – Equipment Wiring Connections: Execution requirements for electric connections to equipment specified by this section.
9. Division 31 sections for excavation, trench and backfill required by this section.
10. Section 33 41 00 – Storm Utility Drainage Piping: Catch basins and manholes.

1.02 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME B16.1 – Cast Iron Pipe Flanges and Flanged Fittings.

2. ASME B16.3 – Malleable Iron Threaded Fittings.
 3. ASME B16.4 – Gray Iron Threaded Fittings.
 4. ASME B31.9 – Building Services Piping.
- B. ASTM International:
1. ASTM A47/A47M – Standard Specification for Ferritic Malleable Iron Castings.
 2. ASTM A53/A53M – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 3. ASTM A74 – Standard Specification for Cast Iron Soil Pipe and Fittings.
 4. ASTM A234/A234M – Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
 5. ASTM A395/A395M – Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
 6. ASTM A536 – Standard Specification for Ductile Iron Castings.
 7. ASTM A746 – Standard Specification for Ductile Iron Gravity Sewer Pipe.
 8. ASTM C478 – Standard Specification for Precast Reinforced Concrete Manhole Sections.
 9. ASTM C478M – Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).
 10. ASTM C564 – Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
 11. ASTM D1784 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
 12. ASTM D1785 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 13. ASTM D2241 – Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
 14. ASTM D2464 – Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 15. ASTM D2466 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
 16. ASTM D2467 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 17. ASTM D2564 – Standard Specification for Solvent Cements for Poly (Vinyl

Chloride) (PVC) Plastic Piping Systems.

18. ASTM D2855 – Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
19. ASTM D3311 – Standard Specification for Drain, Waste and Vent (DWV) Plastic Fitting Patterns.
20. ASTM F493 – Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
21. ASTM F2618 – Standard for Chlorinated Poly Vinyl Chloride (CPVC) Chemical Waste Drainage Systems

C. Cast Iron Soil Pipe Institute:

1. CISPI 301 – Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.
2. CISPI 310 – Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

D. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP 58 – Pipe Hangers and Supports – Materials, Design and Manufacturer.
2. MSS SP 69 – Pipe Hangers and Supports - Selection and Application.
3. MSS SP 89 – Pipe Hangers and Supports – Fabrication and Installation Practices.

E. Plumbing and Drainage Institute:

1. PDI G101 – Standard – Testing and Rating Procedure for Grease Interceptors.

1.03 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes for sewage-ejectors, and manholes.

C. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
3. Hangers and Supports: Submit manufacturers catalog information including load

capacity.

- 4. Sanitary Drainage Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.
- D. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 – Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of equipment and clean-outs.
- C. Operation and Maintenance Data: Submit frequency of treatment required for interceptors. Include, spare parts lists, exploded assembly views for pumps and equipment.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 – Product Requirements: Product storage and handling requirements.
- B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 – Product Requirements.
- B. Do not install underground piping when bedding is wet or frozen.

1.08 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.09 WARRANTY

- A. Section 01 70 00 – Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish 1-year manufacturer warranty for material.

1.10 EXTRA MATERIALS

- A. Section 01 70 00 – Execution and Closeout Requirements: Spare parts and maintenance products.

PART 2 PRODUCTS

2.01 SANITARY SEWER AND VENT PIPING – BELOW GRADE

- A. All cast iron soil, waste and vent pipe and fittings shall conform to the requirements of CISPI Standard 301, ASTM A888 or ASTM A74. All cast iron pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and shall be listed by NSF International. Acceptable manufacturers of cast iron soil pipe and fittings are AB&I, Charlotte Pipe and Tyler Pipe.
- B. Cast Iron Soil Pipe: ASTM A74, service weight, bell and spigot ends.
 - 1. Fittings: Cast iron, ASTM A74.
 - 2. Joints: Hub-and-spigot with compression gaskets conforming to the requirements of ASTM C-564 and ASTM C-1563.
- C. Cast Iron Pipe: CISPI 301, hub-less, service weight.
 - 1. Fittings: Cast iron, CISPI 301.
 - 2. Joints: Hubless pipe and fittings shall be joined by No-Hub couplings conforming to CISPI Standard 310 and listed by NSF International.
 - 3. Below grade piping shall be joined by heavy-duty shielded stainless steel couplings with rubber sleeves and stainless steel bands and tightening devices, conforming to ASTM C564; equivalent to Clamp-All 125 or Husky SD 4000.
- D. PVC Pipe: ASTM D1785, Schedule 40, polyvinyl chloride (PVC) material, bell and spigot style solvent sealed joints.
 - 1. Fittings: PVC, ASTM D2665, Schedule 40.
 - 2. Joints: ASTM D2855; solvent weld with ASTM D2564 solvent cement.

2.02 SANITARY SEWER AND VENT PIPING – ABOVE GRADE

- A. All cast iron soil, waste and vent pipe and fittings shall conform to the requirements of CISPI Standard 301, ASTM A888 or ASTM A74. All cast iron pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and shall be listed by NSF International. Acceptable manufacturers of cast iron soil pipe and fittings are AB&I, Charlotte Pipe and Tyler Pipe.
- B. Cast Iron Pipe: ASTM A74, service weight.

1. Fittings: Cast iron, ASTM A74.
 2. Joints: Hub-and-spigot with compression gaskets conforming to the requirements of ASTM C-564 and ASTM C-1563.
- C. Cast Iron Pipe: CISPI 301, hub-less, service weight.
1. Fittings: Cast iron, CISPI 301.
 2. Joints: Hubless pipe and fittings shall be joined by No-Hub couplings conforming to CISPI Standard 310 and listed by NSF International.
 - a. Above grade waste piping shall be joined by mid-duty shielded stainless steel couplings with rubber sleeves and stainless steel bands and tightening devices, conforming to ASTM C564; equivalent to Tyler Wide Body, Mission Heavyweight or Husky HD 2000.
 - b. Above grade vent piping shall be joined by standard duty shielded stainless steel couplings with rubber sleeves and stainless steel bands and tightening devices, conforming to ASTM C564; as manufactured by Tyler Pipe, Mission Rubber Co. or ANACO.
- D. PVC Pipe: ASTM D1785, Schedule 40, polyvinyl chloride (PVC) material, bell and spigot style solvent sealed joints.
1. Fittings: PVC, ASTM D2665, Schedule 40.
 2. Joints: ASTM D2855; solvent weld with ASTM D2564 solvent cement.

2.03 CLEANOUTS

- A. Refer to Plumbing Equipment Schedule on Drawings.
- B. Exterior Surfaced Areas: Round cast nickel bronze access frame and non-skid cover.
- C. Exterior Unsurfaced Areas: Line type with lacquered cast iron body and round epoxy coated cover with gasket.
- D. Interior Finished Floor Areas: Galvanized cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round scored cover with gasket in service areas and round depressed cover with gasket to accept floor finish in finished floor areas.
- E. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated cover with gasket, and round stainless steel access cover secured with machine screw.
- F. Interior Unfinished Accessible Areas: Calked or threaded type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.
- B. Verify excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.03 INSTALLATION – HANGERS AND SUPPORTS

- A. Inserts:
 - 1. Provide inserts for placement in concrete forms.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.
- B. Pipe Hangers and Supports:
 - 1. Install in accordance with MSS SP 89.
 - 2. Support horizontal piping as scheduled.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 - 7. Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.

8. Prime coat exposed steel hangers and supports. Refer to Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts and suspended ceiling spaces are not considered exposed.

3.04 INSTALLATION – BURIED PIPING SYSTEMS

- A. Verify connection to site utility piping system; size, location, and invert are as indicated on Drawings.
- B. Establish elevations of buried piping with not less than 1.5 ft of cover.
- C. Establish minimum separation of other services piping in accordance with Plumbing Code.
- D. Remove scale and dirt on inside of piping before assembly.
- E. Excavate pipe trench in accordance with Division 31 specifications.
- F. Install pipe to elevation as indicated on Drawings.
- G. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 4 inches loose depth; compact to 95 percent maximum density.
- H. Install pipe on prepared bedding.
- I. Route pipe in straight line.
- J. Install plastic ribbon tape continuous over top of pipe, 9 inches above pipe line.
- K. Install trace wire continuous over top of plastic pipe buried 9 inches above pipe line.
- L. Pipe Cover and Backfilling:
 1. Install underground Thermoplastic piping soil and waste drainage piping according to ASTM D 2321.
 2. Backfill trench in accordance with Division 31 specifications.
 3. Maintain optimum moisture content of fill material to attain required compaction density.
 4. After hydrostatic test, evenly backfill entire trench width by hand placing backfill material and hand tamping in 6 inches compacted layers to 12 inches minimum cover over top of jacket. Compact to 95 percent maximum density.
 5. Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.
 6. Do not use wheeled or tracked vehicles for tamping.

3.05 INSTALLATION – ABOVE-GROUND PIPING

- A. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Provide clearances at cleanout for snaking drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- F. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- G. Install piping to maintain headroom. Do not spread piping, conserve space.
- H. Group piping whenever practical at common elevations.
- I. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.
- J. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 22 07 00.
- K. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors with Section 08 31 13.
- M. Install piping penetrating roofed areas to maintain integrity of roof assembly.
- N. Where pipe support members are welded to structural building framing, scrape, brush clean and apply one coat of zinc rich primer to welding.
- O. Prepare exposed, unfinished pipe, fittings, supports and accessories ready for finish painting. Refer to Section 09 90 00.
- P. Install bell and spigot pipe with bell end upstream.
- Q. Sleeve pipes passing through partitions, walls and floors.
- R. Support cast iron drainage piping at every joint.
- S. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Section 07 84 00.

3.06 FIELD QUALITY CONTROL

- A. Section 01 40 00 – Quality Requirements and Section 01 70 00 – Execution and Closeout Requirements: Field inspecting, testing, adjusting and balancing.
- B. Test sanitary waste and vent piping system in accordance with applicable code and local

authority having jurisdiction.

C. Testing:

1. After each section of the sanitary waste, acid waste and grease waste systems have been set within project area, all outlets shall be temporarily "plugged up", except as are required for testing as described herein. Each section of piping shall be tested to a level of at least 10 feet above the pipe being tested. The pipes being tested shall be filled with water to a verifiable and visible level as described above and be allowed to remain so for a minimum of 2 hours. If after 2 hours the level of the water has been lowered by leakage, the leaks must be found and stopped, and the water level shall again be raised to the level described, and the test repeated until, after a 2 hour retention period, there shall be no perceptible lowering of the water level in the system being tested.
2. Should the completion of these tests leave any reasonable question of a doubt relative to the integrity of the installation, additional tests or measures shall be performed to demonstrate the reliability of these systems to the complete satisfaction of the Owner's duly authorized representative. Such tests shall be conducted and completed before any joints in plumbing are concealed or made inaccessible.

- D. Protect piping and drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work of other trades.
- E. Place temporary caps or plugs in ends of uncompleted piping and when work stops at the end of each day.

END OF SECTION

SECTION 22 40 00 – PLUMBING FIXTURES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Sinks.

B. Related Sections:

1. Section 07 90 00 – Joint Protection: Product requirements for calking between fixtures and building components for placement by this section.
2. Section 22 00 01 – General Plumbing Requirements.
3. Section 22 11 00 – Facility Water Distribution: Supply connections to plumbing fixtures.
4. Section 22 13 00 – Facility Sanitary Sewerage: Waste connections to plumbing fixtures.
5. Section 26 05 03 – Equipment Wiring Connections: Execution requirements for electric connections to sensor valves and faucets specified by this section.

1.02 REFERENCES

A. American National Standards Institute:

1. ANSI A117.1 – Accessible and Usable Buildings and Facilities.

B. American Society of Mechanical Engineers:

1. ASME A112; Plumbing Fixture Standards

C. National Sanitation Foundation

1. NSF/ANSI 61: Drinking Water System Components- Health Effects for fixtures material that will be in contact with potable water.

D. Texas Department of Licensing and Regulation, Texas Accessibility Standards of the Architectural Barriers Act, Article 9102, Texas Civil Statutes

E. Americans with Disabilities Act, 28 CFR Part 35 Nondiscrimination on the Basis of Disability in State and Local Government Services, Final Rule, as published in the Federal Register

F. ICC/ANSI A117.1, "Accessible and Usable Buildings and Facilities" relative to plumbing fixtures for people with disabilities

- G. Texas Administrative Code, Title 30, Part 1, Chapter 290, Subchapter G - Water Saving Performance Standards.
- H. Refer also to plumbing drawing P1.1 for applicable codes.

1.03 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Submittal procedures.
 - 1. Submittal shall have all options and all intended included items clearly identified on submittal.
- B. Product Data: Submit catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim and finishes.
- C. Manufacturer's Installation Instructions: Submit installation methods and procedures.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- E. Record Documents:
 - 1. Provide full written description of manufacturer's warranty.
 - 2. Manufacturer's installation instructions.
- F. Operation and Maintenance Data:
 - 1. Include installation instructions, exploded assembly views, servicing requirements, inspection data, installation instructions, spare parts lists, replacement part numbers and availability, location and contact numbers of service depot, for all plumbing specialties installed.
- G. Section 01 60 00 – Product Requirements; Substitution Request.
 - 1. Prior to submitting a product or a manufacturer that is not the basis of design or listed as an approved equal; the contractor and/or the vendor shall submit a substitution request.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 – Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit fixture, trim, exploded view and replacement parts lists. Provide contact number and location of supplier.

1.05 QUALITY ASSURANCE

- A. Provide products requiring electrical connections listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and indicated.
- B. Fixtures, trim, accessories and carriers of any one type shall be by the same manufacturer throughout.

- C. All fixtures and trim shall be new, institutional/commercial quality and free from mars, chips, scratches, blemishes or any defects.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 – Product Requirements: Product storage and handling requirements.
- B. Accept fixtures on site in factory packaging. Inspect for damage
- C. Equipment, fixtures and appurtenances shall not be allowed to be exposed to exterior weather or elements. Equipment, fixtures and appurtenances stored outside shall be covered by a weather-proof covering at all times and shall be stored on pallets or rack systems above the ground. Equipment, fixtures and appurtenances stored inside shall be covered to protect same from construction debris and activities and shall be stored on pallets or rack systems above the floor. Equipment, fixtures and appurtenances shall not be allowed to be stored within the construction area in a disorderly fashion. Cleanliness of the work area and safety of the construction personnel shall be the first consideration.
- D. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.
- E. Do not allow use of installed fixtures or trim, other than testing during construction phase of the project.

1.08 WARRANTY

- A. Section 01 70 00 – Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish 1-year manufacturer warranty for plumbing fixtures. Warranty shall not begin until acceptance by Owner.

1.09 EXTRA MATERIALS

- A. Section 01 70 00 – Execution and Closeout Requirements: Spare parts and maintenance products.

PART 2 PRODUCTS

2.01 GENERAL

- A. The Contractor shall provide plumbing fixtures where indicated on the Drawings. These plumbing fixtures shall be standard products of manufacturers scheduled or listed on Drawings. Where one manufacturer is scheduled or listed on Drawings, the intent is not to limit competition or to write a closed specification, but rather to set a standard of

quality. Refer to Section 01 60 00 for product options and substitution procedures. The fixtures shall be free from mars or chips and shall be new, first quality and shall be furnished with sufficient supports in order to adequately hang each and every unit.

- B. The space between fixtures and masonry walls shall be grouted with White General Electric Silicone flexible grout. The space between fixtures and sheetrock or wood panel walls shall not be grouted but the fixture shall fit flat against the wall surface with no more than 1/16" gap.
- C. All faucets, fittings, supply stops and similar devices shall be of one manufacturer unless otherwise specified. All water faucets and valve bodies shall be cast brass with a minimum copper content of 85%. They shall contain standardized interchangeable operating units constructed of a removable and replaceable unit containing all parts subject to wear. All water faucets shall contain an adjustable internal volume control unit. All exposed parts shall be chromium plated.
- D. All accessible fixtures shall meet the requirements of ADA, ANSI A117.1, ANSI Z124.2 and the State of Texas Accessibility Standards (TAS). The Contractor shall confirm locations with the Architectural drawings.
- E. Provide ADA/TAS compliant molded insulation on exposed water and drain components (piping, stops, etc.) beneath ADA accessible lavatories and sinks. Insulation shall be designed to allow removal and re-installation for pipe servicing. Insulation to be molded vinyl with added cushion and thermal resistance.
- F. Coordinate special blocking, other wall supports, floor bracing or other structural bracing with General Contractor.
- G. Point of use thermostatic mixing valves located under sinks and lavatories shall be secured to the wall with a mounting bracket and located under the sink. Supply hoses shall be ordered to the correct length. Excess supply hose shall be removed; wrapping excess supply tubing around other trim is not allowed.
- H. All fixtures and equipment shall be lead free and shall be assembled and manufactured with lead free solders in accordance with NSF-61-G and NSF 372.

2.02 FITTINGS AND PIPES

- A. Fittings and piping shall be brass and, wherever exposed, shall be polished chrome-plated. Provide tight fitting wall or floor escutcheons of chrome-plated brass wherever pipes pass through floors, walls or ceilings.
- B. Furnish and install all required water, waste, soil and vent connections to all plumbing fixtures, together with all fittings, supports, fastening devices, cocks, valves, traps, etc., leaving all in complete working order.
- C. Supplies for all lavatories, sinks, tank type water closets and drinking fountains shall be loose key angle stops with female inlets and shall include wall flanges, and O.D. flexible risers with bullnose or flared end outlets. All components to be chrome plated. In all cases, all piping, tubing, fittings, and faucets shall be installed using a mechanical non-slip connection, such as bullnose, flared, flanged, ferrule or threaded fittings. Fittings requiring a friction fit using slip-on or gasketed connections are not acceptable.

- D. Provide water hammers arrestors as indicated on the drawings and/or at all locations with quick closing valves such as water closets, automatic fixtures, knee operated or foot operated fixtures, ice makers, washer boxes, water softeners, etc.

2.03 PLUMBING FIXTURES

- A. Refer to Plumbing Fixture Schedules on the Plumbing drawings for basis of design fixtures and acceptable manufacturers offering equivalent products.
- B. Lavatory and sink faucets in patient care areas shall have a minimum of 5-inches clearance from the spout of the faucet to the rim of the sink per DSHS Licensing standards.
- C. Fixtures shall have flow control devices to limit flow of water to a maximum rate in accordance with local code or in accordance with the schedules for projects that require a more stringent water use criteria.

2.04 SINKS

A. Bowl:

- 1. Manufacturer: As Scheduled.
- 2. Other acceptable manufacturers offering equivalent products.
 - a. JUST.
 - b. Bradley.
 - c. Kohler.
 - d. Acorn.
 - e. Gerber.
- 3. ASME A112.19.3; 18-gage thick, Type 302 stainless steel, self-rimming and undercoated, with 1-1/2 inch chromed brass drain 3-1/2 inch crumb cup and tailpiece, ledge back drilled for trim.

B. Trim:

- 1. Manufacturer: As scheduled.
- 2. Other acceptable manufacturers offering equivalent products.
 - a. American Standard.
 - b. Bradley.
 - c. Chicago.
 - d. T & S Brass.
 - e. Delta.
 - f. Symmons.
 - g. Substitutions: Permitted.
- 3. Accessories: Chrome-plated 17-gage brass P-trap and arm with escutcheon, screwdriver stop, flexible supplies.

2.05 LAVATORY INSULATION KIT

- A. Manufacturers: As scheduled
 - 1. Truebro.
 - 2. Substitutions: Permitted.
- B. Product Description: Where Lavatories are noted to be insulated for ADA compliance, furnish the following: Safety Covers conforming to ANSI A177.1 and consisting of insulation kit of molded closed cell vinyl construction, 3/16 inch thick, white color, for insulating tailpiece, P-trap, valves, and supply piping. Furnish with weep hole and angle valve access covers.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.
- B. Verify walls and floor finishes are prepared and ready for installation of fixtures.
- C. Verify electric power is available and of correct characteristics.
- D. Confirm millwork is constructed with adequate provision for installation of counter top lavatories and sinks.

3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall carriers and bolts.
- E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 09 90 00, color to match fixture.
- F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.
- G. For ADA accessible water closets, install flush valve with handle to wide side of stall.

3.04 INTERFACE WITH OTHER PRODUCTS

- A. Review millwork Shop Drawings. Confirm location and size of fixtures and openings before rough in and installation.

3.05 ADJUSTING

- A. Section 01 70 00 – Execution and Closeout Requirements: Testing, adjusting and balancing.
- B. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

- A. Section 01 70 00 – Execution and Closeout Requirements: Final cleaning.
- B. Clean plumbing fixtures and equipment.

3.07 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 – Execution and Closeout Requirements: Protecting installed construction.
- B. Do not permit use of fixtures before final acceptance.

3.08 SCHEDULES – REFER TO PLUMBING DRAWINGS

END OF SECTION

SECTION 23 00 01 – BASIC HVAC REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Basic HVAC Requirements specifically applicable to Division 23 sections, in addition to Division 1 - General Requirements.

1.02 REFERENCES

- A. All references in Division 23 to code standards or other publications shall be the latest edition/version, unless noted otherwise.

1.03 PLANS

- A. These specifications are accompanied by plans indicating typical layouts, pipe and equipment location, etc. The plans and these specifications are complimentary each to the other and what is called for by one shall be as binding as if called for by both. Should there be a conflict between Drawings and specifications regarding a material shown or work described or detailed then the material of work having the greater value shall be provided.
- B. The plans as prepared are in general diagrammatic. The contractor shall carefully lay out his work at the site to conform to the architectural, mechanical, electrical and structural conditions to provide grading of piping, to avoid all obstructions and to conform to details of installation as shown on the plans and supplied by the manufacturers of the equipment to be installed, and thereby to provide an integrated satisfactorily operating installation. **The General Contractor must coordinate the work of all trades.** All necessary offsets in piping, fittings, ductwork, etc. required to avoid interferences between piping, equipment, structural and architectural work are not shown but shall be furnished and installed by the Contractor without additional expense to the Owner.
- C. These specifications and plans accompanying same are intended to cover systems which will not interfere with the design of the building, which will fit into the available spaces, and which will insure complete and satisfactory systems. Each contractor shall, therefore, carefully examine the plans and the building and shall be responsible for the proper fitting of his material and apparatus into the building.
- D. The size of mechanical and electrical equipment indicated on the plans is based on the dimensions of a particular manufacturer. While other manufacturers may be acceptable, it is the responsibility of the Contractor to determine if the equipment he proposes to furnish will fit in the space with the manufacturer's recommended clearances allocated for same on the plans. It shall be the Contractor's responsibility to furnish data to evidence that sufficient space can be provided for the installation of proposed equipment and that adequate access will exist for servicing and maintenance of equipment. Should changes become necessary during construction, the contractor shall make such necessary changes at his (the Contractor's) own expense.
- E. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention no later than ten (10) days prior to the bid date, unless specified otherwise in Division 1. Otherwise, the Contractor shall be responsible for any and all changes and additions that may be necessary to accommodate his particular apparatus

or equipment.

1.04 CHANGES

- A. Any changes from the plans necessary to make this work conform to the building as it is constructed, to make this work fit the work of other trades or to make this work conform to the rules of city and municipal bodies having jurisdiction shall be made by this contractor at no additional cost to the Owner. However, no changes shall be made from the work described on the plans and these specifications except on written order from the Architect/Engineer.
- B. If any changes are required other than those mentioned above and the changes involve extra work on the part of the Contractor, no charges for this extra work shall be allowed unless authorized in advance of the work by a written order from the Owner and/or Architect/Engineer stating the charges to be made for the work.
- C. Proposed use of item or equipment other than that specified or indicated may require redesign of structure, partitions, foundations, piping, wiring, or other parts of mechanical, electrical, or architectural layout. Redesign, new drawings, and detailing required shall be prepared and submitted to Architect/Engineer for approval.
- D. Where approved deviation requires different quantity, size and arrangement of wiring, conduit, equipment, etc. from that specified or indicated, provide such items and all other additional equipment required by system at no additional cost to the Owner.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Protection:
 - 1. All work, equipment and materials shall be protected at all time to prevent damage or breakage either in transit, storage, installation or testing. All openings shall be closed with caps or plugs during installation.
 - 2. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the owner has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
 - 3. Place damaged equipment in first class, new operating condition; or, replace same as determined and directed by the Architect. In particular, ductwork insulation which becomes saturated will be rejected and must be removed from the job. Such repair or replacement shall be at no additional cost to the Owner.
 - 4. Protect interiors of new equipment, ductwork, and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.
 - 5. Existing equipment, ductwork, and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.
- B. Cleanliness of Piping, Ductwork, and Equipment Systems:

1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.
2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
3. Clean interior of all tanks prior to delivery for beneficial use by the Owner.
4. Boilers shall be left clean following final internal inspection by the inspector.
5. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.06 EXISTING FACILITIES

- A. All piping, valves, fittings, switches, starters, conduit boxes and/or any other items of mechanical or electrical equipment which are not in service at the completion of this contract shall be removed, unless otherwise noted.
- B. Where an existing service to existing building requires disconnection to facilitate installation of this work, this Contractor shall include in his bid the cost of such disconnecting, re-routing and re-connecting. Where any existing facilities which are to remain occupied are affected by disconnection, re-routing or re-connection, then such disconnecting, re-connecting and re-routing shall be done in such a manner so as not to interrupt any service to the building. Satisfactory arrangements shall be made with local authorities and/or the various utility companies involved. The method of disconnecting, re-routing and re-connecting shall be as shown on the Drawings, or if not shown on the drawings, subject to the approval of the Architect and Owner.
- C. Unless noted otherwise, all equipment and material indicated or specified to be removed shall become the property of the Contractor.
- D. This Contractor shall carefully coordinate work in and around existing services and equipment and adjoining rooms to remodel areas. Coordinate shut-down, removal, capping, and turn-on of existing services with the Owner's facilities' department and general contractor to provide continuous (uninterrupted) service throughout the construction period. This Contractor shall refer to the architectural plans and specifications and thoroughly familiarize himself with the construction phasing in remodel areas before beginning work.
- E. Building Working Environment: Maintain the architectural and structural integrity of the building and the working environment at all times. Maintain the interior of building at 50 degrees F minimum. Limit the opening of doors, windows or other access openings to brief periods as necessary for rigging purposes. No storm water or ground water leakage permitted. Provide daily clean-up of construction and demolition debris on all floor surfaces and on all equipment being operated by the Owner.

1.07 SUBSTITUTIONS

- A. The materials, products and equipment described and specified establish a standard of quality, function, dimension and appearance to be met by any proposed substitutions.
- B. Reference Section 01 60 00 – Product Requirements.

- C. Substitution requests are only required where specific manufacturers are listed or scheduled.

1.08 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. The Contractor shall furnish copies of the manufacturer's literature and drawings describing all proposed equipment and materials indicated in the specifications. The proposed use of the exact equipment and materials specified shall not change this requirement of including literature describing the proposed equipment. Manufactured items proposed for use, whether specified or proposed for substitution, shall be the current, catalogued product of the manufacturer, and replacement parts shall be available.
- C. Manufacturer's regular catalog sheets will not be acceptable under this requirement unless they indicate completely all of the specification requirements. Where drawings cover several sizes or types of construction they shall clearly indicate the size or type of construction to be used on the project. In cases where several sizes of the same type of equipment are required to be furnished, the submittal shall include a schedule identifying each piece of equipment, complete with all capacity information needed to compare every submitted item with its respective specified item. **Annotate to indicate exact model, size, and type submitted.**
- D. Brochures shall contain a certification that the equipment or materials are suitable for conditions shown and specified; that the equipment or materials are believed to be in conformity with the plans and specifications, except as may be specifically described and that approval is recommended. The certification shall be signed by the Contractor. Brochures received not in conformity with these requirements will be returned for required actions. Any deviation from the requirements of the specifications shall be clearly noted and marked for the Engineer's consideration.
- E. Approval of the brochures, or any part of the contents therein, shall not eliminate responsibility for compliance with the plans and specifications, unless specific attention has been called in writing to proposed deviations at the time of transmittal of the brochures and such deviations have been approved, nor shall it eliminate the requirements or the responsibilities, if there are errors of any sort in the data submitted.

1.09 INTERFERENCES AND COOPERATION

- A. The plans are generally diagrammatic and the Contractor shall coordinate the work of the different trades so that interferences between piping, equipment, structural and architectural work will be avoided. Not all offsets in piping, ductwork, etc., are shown. The Contractor shall cooperate with the General Contractor and all other contractors to coordinate their work to avoid interferences and delays and arrange all parts of the work to harmonize in service and appearance with all other parts.
- B. The General Contractor shall coordinate the work of all trades. The various systems to be installed shall follow the normal, common sense priority of systems installation with the highest system to lowest system installation as follows:
 - 1. HVAC ductwork shall be installed up and against building (floor/roof) structural members.

2. Sanitary waste and storm drainage piping system shall begin horizontal routing as high as possible between structural members, offsetting vertically only to avoid conflict with structure or to drop below HVAC ductwork where offset is unavoidable.
 3. Electrical conduit shall be installed up, and against building structure, running parallel with HVAC ductwork and offsetting up into structural bay (void) or below HVAC ductwork to obtain a change in direction or branch take-off. Electrical conduit installation shall not control or dictate the routing or installation of the HVAC ductwork.
 4. HVAC heating and chilled water supply and return piping, domestic hot and cold water supply and hot water circulating return piping, and medical gas piping shall be installed beside and below the HVAC ductwork and electrical conduit. Preferred installation shall be on trapeze, wall brackets, or racked on vertical channel on the wall above the ceiling line. The completed installation shall not conflict with the installation or removal of ceiling system components of tile. All main-run and branch take-off isolation valves shall be readily identifiable and accessible from a standing position on a step ladder.
 5. Fire sprinkler piping system shall be installed below all other systems and components. The fire sprinkler piping shall not conflict with the installation or removal of ceiling system components or tile. The fire sprinkler system piping layout and installation shall be coordinated by the fire sprinkler contractor and the General Contractor with all other trades performing work in the affected area, to avoid conflict with the installation or removal of any other systems components, or to prevent ready access to valves, equipment of the other trades. **Do not install sprinkler piping until ductwork mains are in place.**
- C. Provide an overhead coordination submittal per Section 01 30 00. The submittal shall include all structural, plumbing, mechanical, electrical and fire protection components.

1.10 MATERIALS AND WORKMANSHIP

- A. All materials shall be new, of the quality specified and free of any defects. Manufacturer's names are listed to establish a standard of quality and construction.
- B. The Contractor will be responsible for transportation of his materials to the job and for their storage and protection until the final acceptance of the job.
- C. Contractor shall furnish all necessary scaffolding, tackle, tools and appurtenances of all kinds and all labor required for the safe and expeditious execution of his contract.

1.11 PERMITS AND INSPECTIONS

- A. The Contractor will be responsible for all permits and inspections required by law for the completion of his work. Cost of all permits and inspections shall be paid for by the Contractor. The Contractor shall obtain and pay for all certificates of approval which must be delivered to the Architect before final acceptance of the job. All materials and labor furnished by the Contractor shall be in strict accordance with the rules and requirements of the National Board of Fire Underwriters, state and municipal regulations and other authorities who may have lawful jurisdiction over the work being done.
- B. Each contractor shall be responsible for coordinating their work with the General

Contractor and scheduling AHJ required inspections through the General Contractor to allow inspections to be performed without impeding the progress of construction. Generally, the Contractor shall plan for inspections to occur two (2) weeks prior to the scheduled concealment of work in the area of inspection.

1.12 ENGINEERING DESIGN TEAM OBSERVATIONS

- A. Each contractor shall be responsible for coordinating their work with the General Contractor and scheduling progress observations through the General Contractor to allow for the following observations to be performed without impeding the progress of construction. Generally the Contractor shall plan for observations to occur two (2) weeks prior to the scheduled concealment of work in the area of observation.
- B. The minimum observations required for this project shall include but not be limited to:
 - 1. Exterior Below Grade: Site utilities and services.
 - 2. Interior Below Grade: Utilities, services and systems.
 - 3. Rough Wall: All utilities, services and systems in-place including wall studs, cross bracing, supports, etc. (No sheetrock or insulation).
 - 4. Corrected Rough Wall: (Before Sheetrock).
 - 5. Above Ceiling: All utilities, services and systems in place, labeling on exposed piping (No insulation on piping systems. Ceiling grid/channels may be installed but no sheetrock or ceiling tile).
 - 6. Above Ceiling Final: All utilities, services and systems complete including hangers, insulation, and labeling (ceiling grid and/or channel may be in place but no sheetrock or ceiling tile shall be installed).
 - 7. Substantial Completion: All surfaces complete, fixtures installed and trim-out complete.
 - 8. Final: Cleaned and ready for occupancy.

1.13 EXAMINATION OF SITE

- A. All Contractors submitting proposals for this work shall first examine the site and all conditions thereon and therein. All proposals shall take into consideration conditions as may affect the work under this contract. They shall satisfy themselves as to existing grades and the actual formation, and soil conditions.
- B. They shall verify all service locations, depths, sizes, etc. No information given on the plans shall relieve the Contractor of this responsibility.

1.14 QUALITY ASSURANCE

- A. Perform Work in accordance with codes listed on the drawing sheets the local authority having jurisdiction (AHJ), and the Architect/Engineer. As the minimum standard for the level of quality, in all cases the greater quantity or better quality shall be the first consideration for the basis of an acceptable product or process. The local authority having

jurisdiction, the Architect and the Engineer shall have the final authority on the approval and/or use of any product or process specified or submitted for substitution. The greater quality and/or value specified herein for the system(s) and various components and installation procedures shall take precedence over the minimum requirements of the herein before mentioned codes.

- B. Equipment and Components: Bear UL and FM label or marking.
- C. Welding Materials and Procedures: Perform to ASME Code.
- D. Valves: Bear UL/FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- E. Piping: All piping installed on this project shall bear the complete ASTM and Manufacturer's marking. Labeling and identification requirements as required by ASTM. All installed piping 5'-0" or greater in length shall be readily identifiable per ASTM labeling criteria. Piping not bearing this identification upon installation shall be removed and replaced by the correctly labeled piping. Piping shall not be re-stenciled after it is installed, to meet this requirement.

1.15 CONTROLS

- A. Where "automatic controls" are called for in the plans and specifications, all the control instruments, such as motorized valves, etc., shall be provided by the Contractor. The Drawings may show some power connections to controls equipment. However, if more power is required, then the Contractor shall provide this power.

1.16 UNIONS

- A. No unions are to be placed in any pipe in a location which will be concealed or inaccessible after completion of the building unless furnished with an access panel either as shown on the drawings or as specified herein. Unions must be installed on each side of all pieces of equipment such as heating/cooling equipment, coils, pumps, etc., so that such equipment may be readily disconnected in location that equipment can be disconnected and removed.

1.17 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

- A. Coordinate location of piping, sleeves, inserts, hangers, ductwork and equipment. Locate piping, sleeves, inserts, hangers, ductwork and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Prepare equipment layout drawings to coordinate proper location and personnel access of all facilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.
- B. Operating Personnel Access and Observation Provisions: Select and arrange all equipment and systems to provide clear view and easy access, without use of portable ladders, for maintenance and operation of all devices including, but not limited to: all equipment items, valves, filters, strainers, transmitters, sensors, control devices. All gages and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Do not reduce or change maintenance and operating space and access provisions that are shown on the drawings.
- C. Equipment and Piping Support: Coordinate structural systems necessary for pipe and

equipment support with pipe and equipment locations to permit proper installation.

- D. Location of pipe sleeves, trenches and chases shall be accurately coordinated with equipment and piping locations.
- E. Interconnection of Instrumentation or Control Devices: Generally, electrical and pneumatic interconnections are not shown but must be provided.
- F. Minor Piping: Generally, small diameter pipe runs from drips and drains, water cooling, and other service are not shown but must be provided.
- G. Electrical and Pneumatic Interconnection of Controls and Instruments: This is generally not shown but must be provided. This includes interconnections of sensors, transmitters, transducers, control devices, control and instrumentation panels, instruments and computer workstations. Comply with NFPA-70.
- H. Install gages, thermometers, valves and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position thermometers and gages to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.
- I. Work in Existing Building: Cut required openings through existing masonry and reinforced concrete using diamond core drills. Use of pneumatic hammer type drills, impact type electric drills, and hand or manual hammer type drills, will be permitted only with approval of the Owner. Locate openings that will least effect structural slabs, columns, ribs or beams.

1.18 TEMPORARY PIPING AND EQUIPMENT

- A. Continuity of operation of existing facilities will generally require temporary installation or relocation of equipment and piping.
- B. The Contractor shall provide all required facilities in accordance with the requirements of phased construction and maintenance of service. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities.
- C. Temporary facilities and piping shall be completely removed and any openings in structures sealed. Provide necessary blind flanges and caps to seal open piping remaining in service.
- D. Temporary equipment shall be provided when required by the phasing or called for specifically on the plans. The contractor shall maintain and operate temporary equipment or new equipment operated during construction strategically to provide desired indoor air conditions or for "dust" control.
- E. Temporary filters shall be provided throughout the entire construction period if the systems are operational. The frequency of replacement shall be directly related to the amount of airborne debris during the particular phase of construction. Different areas in different phases of the construction may require different frequencies of temporary filter replacement.
- F. Contractor shall keep building sealed weather tight if HVAC is turned 'ON' prior to substantial completion.

1.19 MECHANICAL DEMOLITION

- A. Rigging access, other than indicated on the drawings, shall be provided by the Contractor. Such access shall be provided without additional cost or time to the Owner. Where work is in an operating facility, provide approved protection from dust and debris at all times for the safety of plant personnel and maintenance of plant operation and environment of the facility.
- B. In an operating facility, maintain the operation, cleanliness and safety. The Owner's personnel will be carrying on their normal duties of operating, cleaning and maintaining equipment and facility operation. Confine the work to the immediate area concerned; maintain cleanliness and wet down demolished materials to eliminate dust. Do not permit debris to accumulate in the area to the detriment of facility operation. Perform all flame cutting to maintain the fire safety integrity of this facility. Adequate fire extinguishing facilities shall be available at all times. Perform all work in accordance with recognized fire protection standards.
- C. Completely remove all piping, wiring, conduit, and other devices associated with the equipment not to be re-used in the new work. This includes all pipe, valves, fittings, insulation, and all hangers including the top connection and any fastenings to building structural systems. Seal all openings, after removal of equipment, pipes, ducts, and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the drawings and specifications of the other disciplines in the project for additional facilities to be demolished or handled.
- D. The Contractor shall remove all other material and equipment, devices and demolition debris under these plans and specifications. Such material shall be removed from the property expeditiously and shall not be allowed to accumulate.

PART 2 PRODUCTS

2.01 FACTORY-ASSEMBLED PRODUCTS

- A. Provide maximum standardization of components to reduce spare part requirements.
- B. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
 - 1. All components of an assembled unit need not be products of same manufacturer.
 - 2. Constituent parts that are alike shall be products of a single manufacturer.
 - 3. Components shall be compatible with each other and with the total assembly for intended service.
 - 4. Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.
- C. Components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a name plate securely affixed in a

conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.

- D. Major items of equipment, which serve the same function, must be the same make and model. Exceptions will be permitted if performance requirements cannot be met.

2.02 COMPATIBILITY OF RELATED EQUIPMENT

- A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational system that conforms to contract requirements.

2.03 ESCUTCHEONS AND PLATES

- A. Where pipes or ducts pass through ceilings or walls in finished spaces, install sectional plates or escutcheons to cover the annular opening between pipe and sleeve. Solid plates with set screws shall be used where the sectional plates will not stay in place or are not available in the required size, or where other individual specification section(s) require one piece or greater quality escutcheons or plates.
- B. Inside diameter of escutcheons shall fit around insulation and around pipe or duct when not insulated; outside diameter shall cover sleeve. Secure escutcheons or plates to pipe or duct or sleeve but not to insulation. All escutcheons shall be triple nickel-chromium plated brass, or type 316L stainless steel.

2.04 INSULATION

- A. All insulation materials used inside the building on this project, including finishes and adhesives on the exterior surfaces of ducts, pipes and equipment shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less as determined by an independent testing laboratory in accordance with NFPA 255 as required by NFPA 90A, unless noted otherwise acceptable.

2.05 SOLENOID VALVES

- A. All solenoid valves used in hydronic systems shall be the slow acting type.

2.06 ASBESTOS

- A. Materials containing asbestos are not permitted.

PART 3 EXECUTION

3.01 ACCESS PANELS

- A. All valves, traps, drains, cleanouts, equipment, etc., must be accessible. The Contractor shall, wherever required to service his installation, coordinate size and location of access panels with General Contractor. Refer to Section 08 31 13 – Access Doors and Frames.

3.02 FIRESTOPPING

- A. Firestopping: Unused slots, sleeves and other penetrations in floors, walls or other general construction shall be closed and sealed with an approved firestopping material.

1. Reference Section 07 84 00 – Firestopping for appropriate firestopping material required for each wall rating and penetration size and type.
 2. Floor slots and openings shall be closed with 16 gauge galvanized steel sheet supported on 1-inch by 1-inch by 1/8-inch structural angle drilled or supported with powder-driven studs into the building structure. Firestop with a layer of silicone elastomer not less than 1-inch thick which completely fills the opening. The top surface of the silicone elastomer shall be approximately 1-inch below the finished floor slab.
 3. Openings in walls shall be closed with 16 gauge galvanized steel sheet securely attached at the midpoint of the wall thickness and firestopped on both sides of the steel sheet with not less than 1/8-inch thick layer of non-sagging silicone elastomer to fully cover the opening.
 4. Single or multiple pipes passing through walls and floors shall have the annular space between pipes or between pipes and structure filled with silicone elastomer to provide a rated firestop (rated to match the assembly) for floors and walls.
- B. Pipe and Ducts: The annulus between exposed pipe and ductwork and walls or floors in finished spaces shall be refilled, sealed and painted to match adjacent surfaces.
- C. Future Slots: Cap ends of sleeve and mark as future.

3.03 CUTTING AND PATCHING

- A. All cutting and patching of floors, walls and ceilings for installation of work covered in these sections will be done by the General Contractor.
- B. Where it becomes necessary to drill into or cut through any existing or completed floors, walls or ceilings to permit the installation of any work under this contract or to repair any defects that may appear up to the expiration of the guarantee, such cutting and patching shall be done by the General Contractor under the supervision of the Architect.
- C. No joists, beams, girders or columns shall be cut without first obtaining written permission from the Architect.
- D. All drilling methods for expansion bolts, hangers and other supports shall be done subject to be approval of the Architect. Labor and materials required to replace or rebuild parts or injured portions shall be furnished at the Contractor's expense, subject to the satisfaction of the Architect.

3.04 PAINTING

- A. Types of paint shall be as specified in the Architectural specifications. Surfaces to be painted are identified in Section 09 90 00 and the drawings.
- B. All surfaces to be painted shall be thoroughly cleaned, all rust scraped off and all oil and grease removed before any paint is applied.
- C. Finishing paint coats shall not be applied until all the work is completed. Cloths shall be spread where necessary to prevent drops of paint, oil, etc. from defacing walls, floors, etc., and the Contractor shall be held responsible for all damage by neglect of such precautions. The finished conditions of the painting shall be subject to the approval of the

Architect, who may require retouching or repainting of surfaces not properly finished.

3.05 EXCAVATING AND BACKFILLING

- A. The Contractor shall do all excavating and backfilling necessary for the installation of the work, including shoring, bailing and pumping to maintain his trenches and keep them in dry condition until the work in question has been tested and approved.
- B. Care shall be taken that piping is properly and uniformly graded and that trench beds are well rammed and that ground under pipelines is firm and secure before piping is laid. All trenches must be backfilled with clean sand, four inches under pipe, rammed down, soaked with water and made solid. All surplus material shall be removed and carted away.
- C. The Contractors will be responsible for resurfacing all areas after trenches have been backfilled.
- D. The Contractor is directed to comply with all OSHA Requirements and State Requirements regarding trench safety.
- E. Perform all work with the highest regard to safety and in accordance with U.S. 29 CFR 1926 "Safety and Health Regulations for Construction". Special attention shall be directed to Subpart P – Excavations. Refer also to 230010.1.12 – Safety.

1. Safety Precautions and Programs

- a. In excavations that are four (4) feet or more in depth, means of egress shall be provided by stairway, ladder, ramp or other safe means so as to require no more than twenty-five (25) feet of lateral travel for employees.
 - b. In addition, on projects in which trench excavation will have a depth of five feet or more, the Contractor, and all of their subcontractors, shall comply with all requirements of 29 CFR 1926 Subpart P 652 "Safety and Health Regulations for Construction – Excavations" and all Appendices related thereto.
 - c. Before commencing any trench excavation that will be five (5) feet deep or deeper, provide Owner, through A/E, with detailed plans and specifications regarding the safety systems to be utilized. Said plans and specifications shall include a certification from a registered professional engineer indicating full compliance with the 29 CFR 1926 Subpart P -- Excavations.
 - d. Contractor shall ascertain, prior to proposal, whether or not such conditions prevail and services are needed, and shall include cost of same in proposal.
- 2. All shoring and bracing shall be designed so that it is effective to the bottom of the excavation. Sheet piling, sheet piling, bracing, shoring, trench boxes, and other methods of protection, including sloping, shall be based upon the condition and nature of the materials to be retained, and by loads (including surcharge) imparted to the sides of excavation by equipment and stored materials.
 - 3. Store excavated or other materials a minimum of two feet (2') from the edge of any excavation. Retain such materials to prevent their falling or sliding into the excavation, and to prevent excessive pressure on the sides of the excavation.

4. Maintain sides and slopes of excavations in a safe condition by scaling, benching or barricading.
 5. Take other precautions via shoring and bracing to prevent slides or cave-ins. Take special precautions when trenches are located adjacent to backfilled excavations, or subjected to vibrations from railroads, highway traffic, operation of machines, etc.
- F. Verify locations of all existing utilities in the area prior to start of excavation (gas, electrical, water, sanitary, storm, telephone, cable TV, optical cable, etc.) Coordinate with utility companies as required.
1. Excavation within four feet (4') of existing utilities shall be done by hand digging only.
- G. Where conditions require concrete or other materials to be placed against undisturbed earth surfaces, any loosened or disturbed materials shall be removed from such surfaces.
- H. Trenching
1. Trenches shall be large enough to permit handling of pipe and accessories and making connections. For cast iron pipe installation, trench bottom width shall exceed bell or coupling diameters by at least twelve inches (12").
 2. Trenches in rock, soil containing rocks larger than two (2) inches in any dimension, and other non-uniform materials, shall be four (4) inches minimum and twelve inches (12") maximum below the bottom of the pipe to provide for a bedding course.
- I. Preparation of Trench Bottom
1. If the excavation is carried below the finished flow line grade of the pipe in order to remove unsuitable material or for any other reason, the trench shall be course bedded to within six inches (6") of the finished flow line grade of the pipe bottom with compacted load-bearing backfill. A bedding course as specified below shall then be placed over the load-bearing backfill.
 2. Trenches shall be dry when the trench bottom is prepared. A continuous trough with compacted bedding course shall be prepared to receive the bottom quadrant of the pipe barrel. Remove loose or disturbed material and bring the trench bottom up to grade with bedding material as follows:
 - a. For active soils where either metallic piping is used, washed pea gravel with material no larger than 1/2 inch in largest dimension. Provide a Bentonite plug in the trench at the building perimeter where site drainage or other conditions could permit water intrusion into the trench under the building. Bentonite plug to extend 2 ft. on either side of the perimeter grade beam. (Sand bedding material may be substituted beyond ten (10) feet from building line only.)
 - b. NOTE: Confirm soil conditions prior to trenching. In general, soils with a plasticity index (PI) over 10 at depths to be encountered are considered active.

3. In addition, for bell joint pipe, excavation for the bell or coupling shall be so that the pipe will bear on the trench bottom along the entire length of the barrel.
4. Prepare the trench bottom carefully so that when placed in its final position, the pipe will be true to line and grade and uniformly supported.

J. Laying Pipe

1. All pipe shall be clean at the time it is placed in the line. Open ends of pipe sections already in place shall be tightly plugged to prevent the entrance of trench water, mud, dirt, etc.
2. Keep trench bottom free of frost, frozen earth or standing water at the time of pipe laying and jointing.

K. Compaction

1. Where compaction is indicated by specifications, accomplish same with vibratory or rammer type compactor, minimum of two full width passes.
2. Compaction below slabs, roads, flatwork, or other construction elements shall be performed to the requirements of compaction for those elements. Coordinate with general construction trades and other Division's specifications.

L. Backfilling

1. Clean trenches and backfill material of any organic material, roots, trash, lumber, other debris and frozen material prior to backfilling. Backfill material shall contain no organic material, roots, trash, lumber, other debris or frozen material. Backfill material under slabs inside building shall match adjacent materials and be of density acceptable to the A/E.
2. Backfilling by means of sluicing or flooding with water is not permitted. Backfill shall not be placed on frozen ground.
3. Partially backfill immediately after the pipe is laid (unless other methods for anchoring pipe are provided). Leave joints exposed for hydrostatic testing. Water shall not be permitted to rise in unbackfilled trenches after pipe has been placed.
4. Whenever timber or other sheeting is driven to a depth below the elevation of the top of the pipe, that portion of the sheeting below a point four feet above the elevation of the top of the pipe shall not be disturbed or removed.
5. Pipe layer backfill (bedding material under the bottom quadrant of the pipe, around sides, and up to a point one foot above the top of the pipe) shall be: sand or select material containing rocks no larger than 1/2 inch in greatest dimension (sand only shall be used with all plastic piping systems or plastic jacketed piping systems); except that pipe layer backfill below slabs in active soils shall be washed pea gravel of 1/2 inch minus dimensions. Backfill below slabs may utilize flowable fill.
6. Backfill material shall be placed and compacted in six inch (6") layers. Backfill shall be brought up evenly on both sides of the pipe simultaneously to avoid damage or displacement from unbalanced loading.

- 7. Joints shall not be covered with backfill until pressure and leak testing is completed.
- 8. Backfill to grade (above pipe layer).
 - a. Active Soils: Where active soils are encountered backfill to grade within ten (10) feet of building line shall be uncompacted washed pea gravel to match the pipe layer backfill specified above.
- M. The Contractor shall also comply with requirements set forth in Division 31 Drawings and Specifications.

3.06 RIGGING

- A. Design is based on application of available equipment. Openings in building structures are planned to accommodate design scheme.
- B. Alternative methods of equipment delivery may be offered by Contractor and will be considered by Government under specified restrictions of phasing and maintenance of service as well as structural integrity of the building.
- C. Close all openings in the building when not required for rigging operations to maintain proper environment in the facility for Owner operation and maintenance of service.
- D. Contractor shall provide all facilities required to deliver specified equipment and place on foundations. Attachments to structures for rigging purposes and support of equipment on structures shall be Contractor's full responsibility.
- E. Contractor shall check all clearances, weight limitations and shall offer a rigging plan designed by a Registered Professional Engineer. All modifications to structures, including reinforcement thereof, shall be at Contractor's cost, time and responsibility.
- F. Restore building to original condition upon completion of rigging work.

END OF SECTION

SECTION 23 05 29 – HANGERS AND SUPPORTS FOR HVAC

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Hangers and supports.
2. Hanger rods.

B. Related Sections:

1. Section 07 90 00 – Joint Protection: Product requirements for sealant materials for placement by this section.

1.02 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME B31.9 – Building Services Piping.

B. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP 58 – Pipe Hangers and Supports – Materials, Design and Manufacturer.
2. MSS SP 69 – Pipe Hangers and Supports – Selection and Application.
3. MSS SP 89 – Pipe Hangers and Supports – Fabrication and Installation Practices.

1.03 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures: Submittal procedures.

B. Product Data:

1. Hangers and Supports: Submit manufacturer's catalog data including load capacity.

C. Design Data: Indicate when requested, load carrying capacity of trapeze, multiple pipe, and riser support hangers. Indicate calculations used to determine load carrying capacity of trapeze, multiple pipe, and riser support hangers.

D. Manufacturer's Installation Instructions:

1. Hangers and Supports: Submit special procedures and assembly of components.

1.04 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years of documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum 3 years of documented experience.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 – Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical and damage, by storing in original packaging.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 – Product Requirements: Environmental conditions affecting products on site.

1.07 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.08 WARRANTY

- A. Section 01 70 00 – Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.01 HANGERS AND SUPPORTS

- A. General:
 - 1. Refer to individual system and equipment Specification Sections for additional support requirements. Comply with MSS SP-69 for support selections and applications that are not addressed within these Specifications.
 - 2. Utilize hangers and supports to support systems under all conditions of operation, allowing free expansion and contraction, and to prevent excessive stresses from being introduced into the structure, piping or connected equipment.
 - 3. All pipe supports shall be of the type and arrangement to prevent excessive deflection, to avoid excessive bending stresses between supports, and to eliminate transmission of vibration.
 - 4. Design hangers to impede disengagement by movement of supported pipe.

5. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping.
 6. Wire or perforated strap iron will not be acceptable as hanger material.
 7. Field fabricated supports shall be constructed from ASTM A36/A36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
 8. Finishes: All ferrous hangers, rods, inserts, clamps, stanchions, and brackets on piping within interior non-corrosive environments, shall be dipped in Zinc Chromate Primer before installation. Rods may be galvanized or cadmium plated after threading, in lieu of dipping zinc chromate. All hangers and supports exposed to the weather, including roofs and building crawl space areas, shall be galvanized or manufactured from materials that will not rust or corrode due to moisture. All hangers and supports located within corrosive environments shall be constructed from or coated with materials manufactured for installation within the particular environment.
- B. Hydronic Piping (if necessary for VAV box or associated piping relocation):
1. Conform to ASME B31.9, ASTM F708, MSS SP58, MSS SP69, MSS SP89.
 2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
 3. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 5. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Larger: Steel channels with welded spacers and hanger rods, cast iron roll.
 6. Copper Pipe Support: Copper-plated, carbon steel ring.
- C. Ductwork:
1. All ductwork shall be supported in accordance with SMACNA recommendations for the service involved. Horizontal ducts supported using galvanized steel bands shall extend up both sides and onto the construction above, where they shall turn over and be secured with bolts and nuts fitted in inserts set in the concrete, bolted to angles secured to the construction above, or secured in another approved manner.
- D. Terminal Units (if necessary for VAV box relocation):
1. Terminal units weighing up to 150 pounds shall be supported by four (4) 1 inch wide sheet metal straps with ends turned under bottom of unit at all corners.
 2. Each band shall be secured by not over 3/4 inch in length, 1/4 inch diameter sheet metal screws – two (2) on bottom of unit and one (1) on each side.

3. The other strap end shall be attached to the structure by 1/4 inch diameter threaded bolt into the concrete insert or into drilled-hole threaded concrete expansion anchor.
4. Where interference occurs, overhead of the box, not allowing direct vertical support by straps, provide trapeze channels suspended by 1/4 inch diameter galvanized threaded rods providing such channels do not block access panels of units.
5. Terminal units weighing more than 150 pounds shall be supported per the terminal unit manufacturer's installation instructions using threaded rod and hanger brackets located per manufacturer's drawing.

2.02 ACCESSORIES

- A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded with adjusting and lock nuts.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.

3.02 PREPARATION

- A. Do not drill or cut structural members.

3.03 INSTALLATION – GENERAL

- A. Application, sizing and installation of piping, supports, anchors and sleeves shall be in accordance with manufacturer's printed installation instructions.
- B. Install hanger so that rod is vertical under operating conditions.
- C. The load and spacing on each hanger and/or insert shall not exceed the safe allowable load for any component of the support system, including any concrete that holds the inserts. Reinforcement at inserts shall be provided as required to develop the strength required. Contractor shall be responsible for engaging a structural engineer as required for design and review at support systems.
- D. Do not hang pipe, duct or any mechanical/plumbing item directly from a metal deck or locate on the bottom chord of any truss or joist unless approved by the Structural Engineer of Record.
- E. All supports shall be designed and installed to avoid interference with other piping, hangers, ducts, electrical conduit, supports, building structures, equipment, etc.

- F. All piping and ductwork supports shall be designed and installed to allow the insulation to be continuous through the hangers.
- G. All hanger rods shall be trimmed neatly so that 1 inch of excess hanger rod protrudes beyond the hanger nut. In the event a rod is intentionally but temporarily left excessively long (for sloped or insulated lines for example), the Contractor shall take appropriate measures to protect the pipe or other materials from damage.
- H. Install hangers to provide minimum ½ inch space between finished covering and adjacent structures, materials, etc.

3.04 INSTALLATION – PIPE HANGERS AND SUPPORTS

- A. Install in accordance with ASME B31.1, ASME B31.5, ASME 31.9, ASTM F708, MSS SP 58, MSS SP 69 and MSS SP 89.
- B. Support horizontal piping as scheduled.
- C. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.
- D. Place hangers within 12 inches of each horizontal elbow.
- E. Use hangers with 1-1/2 inch minimum vertical adjustment.
- F. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
- G. Support riser piping independently of connected horizontal piping.
- H. Provide copper plated hangers and supports for copper piping.
- I. Design hangers for pipe movement without disengagement of supported pipe.
- J. Prime coat exposed steel hangers and supports. Refer to Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- K. Provide clearance in hangers and from structure and other equipment for installation of insulation.

3.05 INSTALLATION – HANGER RODS

- A. Trim any excess at all hanger rods to within 1 inch of the fastener nut.

3.06 INSTALLATION – EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment. Refer to Section 03 30 00.
- B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

- C. Construct supports of steel members or formed steel channel. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.07 FIELD QUALITY CONTROL

- A. Section 01 40 00 – Quality Requirements and 01 70 00 – Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.08 CLEANING

- A. Section 01 70 00 – Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean adjacent surfaces of firestopping materials.

3.09 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 – Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect adjacent surfaces from damage by material installation.

3.10 SCHEDULES

- A. Copper and Steel Pipe Hanger Spacing:

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	STEEL PIPE MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	5	7	3/8	3/8
3/4	5	7	3/8	3/8
1	6	7	3/8	3/8
1-1/4	7	7	3/8	3/8
1-1/2	8	9	3/8	3/8
2	8	10	3/8	3/8
2-1/2	9	11	1/2	1/2
3	10	12	1/2	1/2
4	12	14	1/2	5/8

END OF SECTION

SECTION 23 05 93 – TESTING, ADJUSTING AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Testing, adjusting and balancing of air systems.
 - 2. Measurement of final operating condition of HVAC systems.
 - 3. Sound measurement of equipment operating conditions.
 - 4. Vibration measurement of equipment operating conditions.
- B. Related Sections:
 - 1. Section 23 37 00 -Air Outlets and Inlets

1.02 REFERENCES

- A. Associated Air Balance Council:
 - 1. AABC MN-1 - National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - 1. ASHRAE 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems.
- C. Natural Environmental Balancing Bureau:
 - 1. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Prior to commencing Work, submit proof of latest calibration date of each instrument.
- C. Test Reports: Indicate data on AABC MN-1 National Standards for Total System Balance forms or forms prepared following ASHRAE 111 or NEBB Report forms.
- D. Field Reports: Indicate deficiencies preventing proper testing, adjusting and balancing of systems and equipment to achieve specified performance.
- E. Prior to commencing Work, submit report forms or outlines indicating adjusting, balancing and equipment data required. Include detailed procedures, agenda, sample report forms

and Copy of NEBB Certificate of Conformance Certification.

- F. Submit draft copies of report for review prior to final acceptance of Project.
- G. Furnish reports in soft cover, letter size, three-ring binder manuals, complete with table of contents page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified in color to correspond with data sheets, and indicating thermostat locations.
- H. Submit name of adjusting and balancing agency for approval within 60 days after award of contract.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of flow measuring stations, balancing valves and rough setting.
- C. Operation and Maintenance Data: Furnish final copy of testing, adjusting and balancing report inclusion in operating and maintenance manuals.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with AABC MN-1 National Standards for Field Measurement and Instrumentation, Total System Balance, ASHRAE 111, NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

1.06 QUALIFICATIONS

- A. Agency: Company specializing in testing, adjusting and balancing of systems specified in this section with minimum three years of documented experience certified by AABC or Certified by NEBB.
- B. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor or registered professional engineer experienced in performance of this Work and licensed in State of Texas.

1.07 SEQUENCING

- A. Section 01 10 00 – Summary of Work: Work sequence.
- B. Sequence balancing between completion of systems tested and Date of Substantial Completion.

1.08 SCHEDULING

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify systems are complete and operable before commencing work. Verify the following:
 - 1. Systems are started and operating in safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Duct systems are clean of debris.
 - 5. Air outlets are installed and connected.
 - 6. Duct system leakage is minimized.
- B. Report any defects or deficiencies noted during performance of services to Architect/Engineer.
- C. Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.
- D. If, for design reasons, system cannot be properly balanced, report as soon as observed.
- E. Beginning of work means acceptance of existing conditions.

3.02 PREPARATION

- A. Furnish instruments required for testing, adjusting and balancing operations.
- B. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

3.03 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.04 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting and balancing.

- B. Verify recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.
- E. Report defects and deficiencies noted during performance of services, preventing system balance.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner.
- H. Check and adjust systems approximately six months after final acceptance and submit report.

3.05 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to obtain required or design supply, return, and exhaust air quantities.
- B. Make air quantity measurements in main ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts.
- E. Use volume control devices to regulate air quantities only to extent adjustments do not create objectionable air motion or sound levels. Effect volume control by using volume dampers located in ducts.
- F. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes to vary fan speed. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

- K. At modulating damper locations, take measurements and balance at extreme conditions. Balance variable volume systems at maximum airflow rate, full cooling, and at minimum airflow rate, full heating.
- L. For variable air volume system powered units set volume controller to airflow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable-air-volume temperature control.

3.06 SCHEDULES

A. Equipment Requiring Testing, Adjusting and Balancing:

- 1. Air Terminal Units.
- 2. Air Inlets and Outlets.

B. Report Forms

- 1. Title Page:
 - a. Name of testing, adjusting and balancing agency
 - b. Address of testing, adjusting and balancing agency
 - c. Telephone and facsimile numbers of testing, adjusting and balancing agency
 - d. Project name
 - e. Project location
 - f. Project Architect
 - g. Project Engineer
 - h. Project Contractor
 - i. Project altitude
 - j. Report date
- 2. Summary Comments:
 - a. Design versus final performance
 - b. Notable characteristics of system
 - c. Description of systems operation sequence
 - d. Summary of outdoor and exhaust flows to indicate building pressurization
 - e. Nomenclature used throughout report
 - f. Test conditions
- 3. Instrument List:
 - a. Instrument
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Range
 - f. Calibration date

4. Duct Leak Test:
 - a. Description of ductwork under test
 - b. Duct design operating pressure
 - c. Duct design test static pressure
 - d. Duct capacity, air flow
 - e. Maximum allowable leakage duct capacity times leak factor
 - f. Test apparatus
 - 1) Blower
 - 2) Orifice, tube size
 - 3) Orifice size
 - 4) Calibrated
 - g. Test static pressure
 - h. Test orifice differential pressure
 - i. Leakage
5. Terminal Unit Data:
 - a. Manufacturer
 - b. Type, constant, variable, single, dual duct
 - c. Identification/number
 - d. Location
 - e. Model number
 - f. Size
 - g. Minimum static pressure
 - h. Minimum design air flow
 - i. Maximum design air flow
 - j. Maximum actual air flow
 - k. Inlet static pressure
6. Air Distribution Test Sheet:
 - a. Air terminal number
 - b. Room number/location
 - c. Terminal type
 - d. Terminal size
 - e. Area factor
 - f. Design velocity
 - g. Design air flow
 - h. Test (final) velocity
 - i. Test (final) air flow
 - j. Percent of design air flow

END OF SECTION

SECTION 23 07 00 – HVAC INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Piping – Glass Fiber.
2. Ductwork – Glass Fiber, Flexible.

B. Related Sections:

1. Section 23 05 29 – Hangers and Supports for HVAC: Product and Execution requirements for inserts at hanger locations.
2. Section 23 31 00 - HVAC Ducts and Casings.

1.02 REFERENCES

A. ASTM International:

1. ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
2. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
3. ASTM C177 – Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
4. ASTM C195 – Standard Specification for Mineral Fiber Thermal Insulating Cement.
5. ASTM C449/C449M – Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
6. ASTM C518 – Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
7. ASTM C533 – Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
8. ASTM C534 – Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
9. ASTM C547 – Standard Specification for Mineral Fiber Pipe Insulation.

10. ASTM C552 – Standard Specification for Cellular Glass Thermal Insulation.
11. ASTM C553 – Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
12. ASTM C591 – Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
13. ASTM C592 – Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type).
14. ASTM C610 – Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation.
15. ASTM C612 – Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
16. ASTM C795 – Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
17. ASTM C921 – Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
18. ASTM C1071 – Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material).
19. ASTM C1126 – Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
20. ASTM C1136 – Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
21. ASTM C1290 – Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
22. ASTM D1784 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
23. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
24. ASTM E90-09 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
25. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
26. ASTM E2336 – Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems Acceptance Criteria for Grease Duct Enclosures.
27. ASTM E162 – Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

28. ASTM E1222-90 - Standard Test Method for Laboratory Measurement of the Insertion Loss of Pipe Lagging Systems
 29. ASTM F1249 -- Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor
 30. ASTM G21 – Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
 31. ASTM D5590 -- Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay.
- B. Sheet Metal and Air Conditioning Contractors':
1. SMACNA – HVAC Duct Construction Standard – Metal and Flexible.
- C. Greenguard Environmental Institute:
1. GEI - Greenguard Certification Standards for Low-Emitting Products.
- D. South Coast Air Quality Management District:
1. SCAQMD Rule 1168 – Adhesive and Sealant Applications, amended January 7, 2005.
 - a. PVC welding: Maximum VOC content 510 g/L.
 - b. Adhesive primer for plastic: Maximum VOC content 550 g/L.
 - c. Contact adhesive: Maximum VOC content 80 g/L.
 - d. Fiberglass adhesive: Maximum VOC content 80 g/L.
 - e. Insulation joint sealant: Maximum VOC content 420 g/L.
 - f. Other: Maximum VOC content 420 g/L.
- E. Green Seal Standard GS-11
1. GS-11 – Paints and Coatings (flat insulation coatings); amended May 20, 1993
 - a. Vapor Barrier Coatings: Maximum VOC content 50 g/L.
 - b. Weather Barrier Mastics: Maximum VOC content 50 g/L.
 - c. Lagging Adhesive/Coating: Maximum VOC content 50 g/L.

1.03 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Submittal procedures.
- B. Product Data: Submit product description, thermal characteristics, performance characteristics and list of materials and thickness for each service, and location.
- C. Samples: Submit one sample of representative size illustrating each insulation type.
- D. Manufacturer's Installation Instructions: Submit manufacturer's published literature indicating proper installation procedures.

1.04 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years of experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years of experience.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 – Product Requirements: Requirements for transporting, handling, storing and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical and damage, by storing in original wrapping.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 – Product Requirements: Environmental conditions affecting products on site.
- B. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
- C. Maintain temperature during and after installation for minimum period of 24 hours.

1.07 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01 PIPING – GLASS FIBER (IF NECESSARY FOR VAV BOX PIPING MODIFICATIONS)

- A. Insulation: ASTM C547; rigid molded, non-combustible.
 - 1. 'K' value: ASTM C335, 0.24 at 75 degrees F.
'K' value: ASTM C335, 0.27 at 150 degrees F.
'K' value: ASTM C335, 0.28 at 200 degrees F.
 - 2. Minimum Service Temperature: -20 degrees F.
 - 3. Maximum Service Temperature: 850 degrees F.
 - 4. Maximum Moisture Absorption: <5% percent by weight.

5. GEI Greenguard indoor air quality certified for low chemical and particle emission.
- B. Vapor Barrier Jacket:
1. ASJ, ASTM C921, white kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
 2. Moisture Vapor Transmission: ASTM E96; 0.02 perm inches.
 3. Secure with self sealing longitudinal laps and butt strips.
 4. Secure with outward clinch monel expanding staples and vapor barrier coating.
- C. Tie Wire: 18 gauge stainless steel with twisted ends on maximum 12 inch centers.
- D. Vapor Barrier Lap Adhesive:
1. Foster 85-20/85-60.
 2. Childers CP-82.
- E. Insulating Cement:
1. ASTM C195; hydraulic setting on mineral wool.
- F. Fibrous Glass or Nylon Fabric:
1. Reinforcing Mesh; Glass or nylon mesh; 10 strands by 10 strands per square inch.
 - a. Foster Mast a Fab.
 - b. Childers Chil Glas #10.
 2. Glass cloth: Untreated; 9 oz/sq. yd. weight.
 3. Blanket: 1.0 lb/cu. ft. density.
- G. Indoor Vapor Barrier Coating:
1. Compatible with below ambient piping insulation with a white color finish. Permeability shall be a maximum of 0.08 perms or less at 37 mils dry tested at 100 degrees F (38 degrees C) and 90 percent RH per ASTM F1249. Coating shall meet ASTM D5590 with 0 growth rating.
 - a. Foster 30-80 AF.

2.02 DUCTWORK – GLASS FIBER, FLEXIBLE

- A. Insulation: ASTM C553; flexible, noncombustible, blanket.

1. "K" (KSI) value: ASTM C518, 0.27 at 75 degrees F.
 2. Maximum service temperature: 250 degrees F.
 3. Maximum moisture absorption: 0.20 percent by volume.
 4. Density: 1.0 lb/cu ft.
 5. GEI Greenguard indoor air quality certified for low chemical and particle emission.
- B. Vapor Barrier Jacket:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
 2. Moisture vapor transmission: ASTM E96; 0.04 1.3 perm.
 3. Secure with pressure sensitive tape and coat all seams with vapor barrier coating.
- C. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber-based adhesive
- D. Vapor Barrier Coating:
1. Mold resistant, water based vapor barrier coating that is compatible with the insulation materials, jackets and substrates. White color finish. Permeability shall be a maximum of 0.08 perms or less at 37 mils dry tested at 100 degrees F and 90 percent RH per ASTM F1249. Coating shall meet ASTM D5590 with 0 growth rating.
 - a. Foster 30-80 AF.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.
- B. Verify piping, equipment and ductwork has been tested before applying insulation materials.
- C. Verify surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION – PIPING (IF NECESSARY FOR VAV BOX PIPING MODIFICATIONS)

- A. Install materials in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.

- C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- D. Insulated pipes conveying fluids below ambient temperature:
 - 1. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch monel expanding staples and seal staple penetrations and all ASJ seams with vapor barrier coating.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier coating or PVC covers.
- E. For hot piping conveying fluids over 180 degrees F, insulate flanges and unions at equipment. If 180 degrees F or under, then bevel and seal ends of insulation with breather mastic.
- F. Insulated pipes conveying fluids above ambient temperature:
 - 1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch monel expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
 - 2. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and weather barrier breather mastic or PVC covers.
- G. Inserts and Shields:
 - 1. Application: All Piping or Equipment, 1 inch diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under finish jacket.
 - 4. Insert configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
 - 5. Insert material: Compression resistant insulating material suitable for planned temperature range and service.
- H. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions and interruptions. Refer to Section 07 84 00 for penetrations of assemblies with fire resistance rating greater than one hour.

3.03 INSTALLATION – DUCTWORK

- A. Install in accordance with manufacturer's instructions.
- B. Insulated ductwork conveying air below ambient temperature:
 - 1. Provide insulation with vapor retarder jackets.
 - 2. Finish with tape and vapor retarder jacket.
 - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
 - 5. Insulate hi-efficiency filter frames and VAV box reheat coils.
 - 6. Finish all joints and seams with two coats of vapor barrier coating.
 - 7. Provide two coats of vapor barrier coating at the duct connection to air device insulation.
- C. Insulated ductwork conveying air above ambient temperature:
 - 1. Provide with or without standard vapor retarder jacket.
 - 2. Insulate fittings and joints. Where service access is required, then bevel and seal ends of the insulation.

3.04 PIPING – GLASS FIBER INSULATION SCHEDULE

PIPING SYSTEMS		PIPE SIZE-INCH	MIN. INSTALLED THICKNESS-INCH
A.	Heating Systems Indoors: Heating	1" & smaller	1-1/2"
	Water Supply and Return	1-1/2" & larger	2"

3.05 INDOOR DUCTWORK – GLASS FIBER FLEXIBLE INSULATION SCHEDULE

SYSTEM		MIN THICKNESS	MIN INSTALLED R-VALUE
A.	Supply, Outside Air, Return	2"	6
B.	Exhaust (connected to energy recovery equipment)	2"	6

END OF SECTION

SECTION 23 31 00 – HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Duct materials.
2. Insulated flexible ducts.
3. Single wall spiral round ducts.
4. Ductwork fabrication.
5. Duct cleaning.

B. Related Sections:

1. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for hangers, supports and sleeves for placement by this section.
2. Section 23 33 00 - Air Duct Accessories: Product requirements for duct accessories for placement by this section.

1.02 REFERENCES

A. ASTM International:

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A90/A90M - Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
3. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
4. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
5. ASTM A568/A568M - Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
6. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
7. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with

Improved Formability.

8. A1011/A1011M-07 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
9. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
10. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
11. ASTM C534 – Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation – Type II, Grade 1, Sheet Materials.
12. ASTM C1534 – Specification for Flexible Polymeric Foam Sheet Insulation Used as Thermal and Sound Absorbing Liner for Duct Systems.
13. ASTM G21/C1338 – Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
14. ASTM G22 – Standard Practice for Determining Resistance of Plastics to Bacteria.

B. Greenguard Environmental Institute:

1. GEI - Greenguard Certification Standards for Low-Emitting Products.

C. National Fire Protection Association:

1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
3. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

D. Sheet Metal and Air Conditioning Contractors:

1. SMACNA - Fibrous Glass Duct Construction Standards, most recent edition.
2. SMACNA - HVAC Air Duct Leakage Test Manual, most recent edition.
3. SMACNA - HVAC Duct Construction Standard - Metal and Flexible, most recent edition.

E. Underwriters Laboratories Inc.:

1. UL 94 – Standard for Safety of Flammability of Plastic Materials .

2. UL 181 - Factory-Made Air Ducts and Connectors.

F. South Coast Air Quality Management District:

1. SCAQMD Rule 1168 – Adhesive and Sealant Applications, amended January 7, 2005.
 - a. Metal to metal: Maximum VOC content 30 g/L.

G. U.S. Environmental Protection Agency (EPA)

1. EPA-registered antimicrobial agent for HVAC duct lining

1.03 PERFORMANCE REQUIREMENTS

- A. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.04 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Submit duct fabrication drawings, drawn to scale not smaller than 1/4 inch equals 1 foot, on drawing sheets same size as Contract Documents, indicating:
1. Fabrication, assembly and installation details, including plans, elevations, sections, details of components, and attachments to other work.
 2. Duct layout, indicating pressure classifications and sizes in plan view. For exhaust duct systems, indicate classification of materials handled as defined in this section.
 3. Fittings.
 4. Reinforcing details and spacing.
 5. Seam and joint construction details.
 6. Penetrations through fire rated and other walls.
 7. Terminal unit, coil and humidifier installations.
 8. Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.
- C. Product Data: Submit data for duct materials, duct liner and duct connectors.
- D. Duct Pressure Test Form.

1.05 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.
- C. Duct Pressure Test Report: Indicate pressure tests performed. Include date, section tested, duct design static pressure, test apparatus information (model, fan HP, orifice calibration certificate) test pressure, and leakage rate, following SMACNA HVAC Air Duct Leakage Test Manual, most recent edition.

1.06 SUSTAINABLE DESIGN SUBMITTALS

- A. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - b. Certify source for local and regional materials and distance from project site.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant, related primer and waterproof coating.

1.07 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.
- B. Construct ductwork to NFPA 90A standards and in accordance with applicable mechanical code.
- C. Construct kitchen grease exhaust ductwork to NFPA 96 standards.

1.08 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years of experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years of experience.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.
- C. Maintain temperatures during and after installation of duct sealant.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01 DUCT MATERIALS

- A. Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having G90 zinc coating of in conformance with ASTM A90/A90M.
- B. Steel Ducts: ASTM A1008/A1008M, ASTM A1011/A1011M or ASTM A568/A568M.
- C. Aluminum Ducts: ASTM B209; aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength.
- D. Stainless Steel Ducts: ASTM A240/A240M or ASTM A666, Type 316.
- E. Fasteners: Rivets, bolts or sheet metal screws.
- F. Hanger Rod: ASTM A36/A36M; carbon steel or galvanized; threaded both ends, threaded one end, or continuously threaded.
- G. Duct Sealants: Fire-resistive, water-based, indoor/outdoor, U.V.-resistant, non-fibrous sealant for use on low-, medium- and high-velocity duct seams. Foster 32-19; Childers CP-146; Duro Dyne SAS UL.
- H. Adhesive: Water based. Used to adhere duct liner and/or duct Wrap (up to 3#/cu. ft.) to metal. Foster 85-60, Childers CP-127, Duro Dyne SSG

2.02 ACOUSTIC INSULATED FLEXIBLE DUCTS

- A. Manufacturers & Product:
 - 1. Flexmaster – Type 1M
 - 2. Thermaflex – model M-KE
- B. Product Description: UL 181, Class 1, acoustically transparent core, polyethylene liner locked to a helical wound spring steel wire; fiberglass insulation; reinforced, aluminized vapor barrier film.
 - 1. Pressure Rating:
 - a. 10 inches w.g. positive and 1.0 inch w.g. negative through 12-inch diameter.
 - b. 6 inches w.g. positive and 0.5 inch w.g. negative for 14- through 16-inch diameter.
 - c. 4 inches w.g. positive and 0.5 inch w.g. negative for 18- and 20-inch diameter.

2. Maximum Velocity: 5000 fpm.
3. Temperature Range: -20 degrees F to 250 degrees F.
4. Thermal Resistance: 6 square feet-hour-degree F per BTU.

2.03 SINGLE WALL SPIRAL ROUND DUCTS

- A. Product Description: UL 181, Class 1, round or flat oval spiral lockseam duct with light reinforcing corrugations.
- B. Construct round or oval duct in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, most recent edition and as indicated on Drawings. Provide duct material, gauges, reinforcing and sealing for operating pressures indicated.
- C. Fabricate continuously welded round duct fittings two gauges heavier than duct gauges indicated in SMACNA Standard. Minimum 4-inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
- D. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.
- E. All elbows 45-degree and 90-degree shall be die-stamped for less than or equal to 10 inches diameter. Elbows greater than 10 inches diameter shall be of the gored type and according to the following: 30-degree shall be 2-gore, 45-degree shall be 3-gore and 90-degree shall be 5-gore.
- F. Seal joints between duct sections and duct seams with mastic adhesive regardless of duct pressure classification.
 1. Sealants, Mastics and Tapes: Conform to UL 181A. Provide products bearing appropriate UL 181A markings.
 2. Do not provide sealing products not bearing UL approval markings.
- G. Exposed ductwork to be painted shall have a matte, paint-grip finish.

2.04 RECTANGULAR DUCTWORK FABRICATION

- A. Fabricate and support rectangular ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and [as indicated on Drawings]. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.
- B. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation. Provide access door upstream of all turning vanes for inspection and cleaning.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

- D. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.
- E. Seal joints between duct sections and duct seams with gasket and/or mastic adhesives, regardless of duct pressure classification.
 - 1. Sealants, Mastics and Tapes: Conform to UL 181A. Provide products bearing appropriate UL 181A markings.
 - 2. Do not provide sealing products not bearing UL approval markings.
- F. Offsets shall be radius ogee type where possible. Where space does not allow radius ogee offsets, shop-fabricated mitered offsets with a maximum 30 degree offset angle shall be used.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify sizes of equipment connections before fabricating transitions.

3.02 INSTALLATION

- A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. During construction, install temporary closures of metal or taped polyethylene on all open ductwork, installed or in storage, to prevent construction dust from entering ductwork system.
- C. Duct inlet and outlet areas shall be clean and free of dirt, oil and other bond inhibiting contaminants.
- D. Install duct hangers and supports in accordance with SMACNA Duct Construction Standards.
- E. Use double nuts and lock washers on threaded rod supports.
- F. Connect flexible ducts to metal ducts with nylon draw bands on inner jacket and outer vapor barrier. Finish with mastic adhesive.
- G. Install in accordance with manufacturer's instructions.
- H. Duct sizes are inside clear dimensions.
- I. Located ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- J. For outdoor ductwork, protect ductwork, ductwork supports, linings and coverings from

weather.

- K. Connect terminal units to supply ducts with two inlet size diameters length of straight rigid duct. If run out to box exceeds three feet in length, increase duct size to box inlet as indicated on detail in Drawings.
- L. All ductwork that is exposed shall be joined with gasketed couplings. For metal to metal joining that cannot be gasketed shall be sealed from the inside. Sealant should not be visible to the end user.
- M. Set plenum doors 6 to 12 inches above floor. Arrange door swing so fan static pressure holds door in closed position.

3.03 INTERFACE WITH OTHER PRODUCTS

- A. Install openings in ductwork where required to accommodate thermometers and controllers. Install pitot tube openings for testing of systems. Install pitot tube complete with metal can with spring device or screw to prevent air leakage. Where openings are provided in insulated ductwork, install insulation material inside metal ring.
- B. Connect diffusers to low pressure ducts with 5 feet maximum length of flexible duct held in place with strap or clamp unless indicated otherwise.
- C. Connect air outlets and inlets to supply ducts with five foot maximum length of flexible duct. If flexible duct is used to change direction, the cross sectional profile of the flexible duct should be maintained.
- D. Where exposed ductwork penetrates a ceiling or wall in finished spaces, install sectional plates or escutcheons to cover the annular opening between pipe and sleeve. Solid plates with set screws shall be used where the sectional plates will not stay in place or are not available in the required size, or where other individual specification section(s) require one piece or greater quality escutcheons or plates. Refer to Section 23 00 01 for additional requirements.

3.04 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air flow, clean one half of system completely before proceeding to other half. Protect equipment with potential to be harmed by excessive dirt with temporary filters, or bypass during cleaning.
- C. Clean duct systems with high power vacuum machines. Protect equipment with potential to be harmed by excessive dirt with filters, or bypass during cleaning. Install access openings into ductwork for cleaning purposes.

3.05 TESTING

- A. For ductwork designed for 3 inches w.c. above ambient per pressure class schedule below, pressure test minimum 25 percent of ductwork after duct cleaning, but before duct insulation is applied or ductwork is concealed.

1. Test in accordance with SMACNA HVAC Air Duct Leakage Test Manual.
2. Maximum Allowable Leakage: In accordance with applicable, local code.

3.06 SCHEDULES

A. Ductwork Material Schedule:

AIR SYSTEM	MATERIAL
Indoor Supply	Galvanized Steel, Aluminum
Indoor Return and Exhaust	Galvanized Steel, Aluminum

B. Ductwork Pressure Class Schedule:

AIR SYSTEM	PRESSURE CLASS
Constant Volume Supply	2 inch w.g.
Variable Air Volume Supply (downstream of VAV boxes)	2 inch w.g.
Variable Air Volume Supply (upstream of VAV boxes)	4 inch w.g.
Return and Exhaust	2 inch w.g.

END OF SECTION

SECTION 23 33 00 – AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Branch duct take-off fittings.
2. Manual volume balancing dampers.

B. Related Sections:

1. Section 23 31 00 – HVAC Ducts and Casings: Requirements for duct construction and pressure classifications.

1.02 REFERENCES

A. Air Movement and Control Association International, Inc.:

1. AMCA 500 – Test Methods for Louvers, Dampers, and Shutters.

B. National Fire Protection Association:

1. NFPA 90A – Standard for the Installation of Air Conditioning and Ventilating Systems.

C. Sheet Metal and Air Conditioning Contractors:

1. SMACNA – HVAC Duct Construction Standard - Metal and Flexible.

1.03 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers, duct access doors and duct test holes.

C. Product Data: Submit data for shop fabricated assemblies and hardware used.

D. Product Data: Submit for the following. Include where applicable electrical characteristics and connection requirements.

1. Air device take-offs.
2. Volume control dampers.

1.04 CLOSEOUT SUBMITTALS

A. Section 01 70 00 – Execution and Closeout Requirements: Closeout procedures.

1.05 QUALITY ASSURANCE

- A. Dampers tested, rated and labeled in accordance with the latest UL requirements.
- B. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 – Product Requirements: Product storage and handling requirements.
- B. Protect dampers from damage to operating linkages and blades.
- C. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.
- D. Storage: Store materials in a dry area indoor, protected from damage. Products on site, but not yet installed shall be stored in boxes. The open airside ends of installed equipment shall be plastic wrapped during construction.
- E. Handling: Handle and lift dampers in accordance with manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.

1.08 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.09 COORDINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.
- B. Coordinate Work where appropriate with building control Work.

1.10 WARRANTY

- A. Section 01 70 00 – Execution and Closeout Requirements: Product warranties and product bonds.

1.11 EXTRA MATERIALS

- A. Section 01 70 00 – Execution and Closeout Requirements: Spare parts and maintenance products.

PART 2 PRODUCTS

2.01 BRANCH DUCT TAKE-OFF FITTINGS

- A. Provide all branch duct take-off fittings with construction that is suitable for the duct pressure class as scheduled in section 23 31 00, HVAC Ducts and Casings. Fittings shall be minimum 24-gauge galvanized sheet metal. If trunk ductwork is fabricated from aluminum or stainless steel, takeoffs shall be manufactured from same material.
- B. All branch duct take-off fittings serving air devices shall be provided with a manual volume damper equal to Flexmaster model BO3 with 3/8" aluminum square shaft secured to damper blade with U-bolts, nylon bushings, locking quadrant and 2-inch build out for insulation. (The 2-inch build out is not required on uninsulated ductwork.)
- C. All branch duct take-off fittings serving terminal units shall be provided without a volume damper.
- D. Branch duct take-offs from rectangular ductwork: Fittings shall be constructed for up to 4" w.g pressure rating, with all seams sealed. Connection to trunk duct shall be rectangular in shape with a 45° entry and shall have 1-inch flanges with double-sided adhesive gasket. Transition from rectangular to round branch shall be in an eccentric and tapered configuration. Take-off fittings shall be equal to Flexmaster model STO.
- E. Optional branch duct take-offs from rectangular ductwork: Fittings shall be constructed for up to 4" w.g pressure rating, with all seams sealed. Connection to trunk duct shall be round in shape with a conical entry and shall have 1-inch flanges with double-sided adhesive gasket. Take-off fittings shall be equal to Flexmaster model CB-SOG.
- F. Branch duct take-offs from round ductwork: Provide saddle tap take-off fitting for spiral duct sizes up to 24" diameter. Fitting shall have rectangular to round outlet and constructed for up to 4" w.g. pressure rating. Fitting shall transition from rectangular to round in an eccentric and tapered configuration. Fitting shall be equal to Flexmaster model STO-ST 90° or model STO-ST 45°.
- G. Branch duct take-offs from round ductwork with duct pressure class exceeding 4" w.g.: Fitting shall be designed to be low loss and have contoured saddle tap for connection to either a flat oval or round duct as indicated on the drawings. The fitting outlet shall transition to round duct. Fitting shall be a United McGill Model "SADDLE LO-LOSS TEE TAP" or equal.

2.02 MANUAL VOLUME BALANCING DAMPERS

- A. Fabricate in accordance with current SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.
- B. Rectangular Dampers:
 - 1. Single Blade Dampers: Duct sizes up to 36 inches in width. Blade dimension perpendicular to the axle rod shall be a maximum of 12 inches, for dimensions greater than 12 inches use a multi-blade damper. Furnish with 20 gauge galvanized steel blade, continuous axle rod and end bearings.
 - 2. Multi-Blade Damper: Fabricate of opposed blade pattern with a maximum blade size of 8 x 48 inches. Assemble center and edge crimped blades in prime coated or galvanized frame channel with suitable hardware. Blades shall be minimum 18 gauge galvanized steel and frame shall be minimum 16 gauge galvanized steel.

3. End Bearings: Furnish for single and multiple blade dampers. On multiple blade dampers, furnish synthetic or bronze bearings.
4. Quadrants:
 - a. Furnish locking, indicating quadrant regulators on dampers.
 - b. On insulated ducts mount quadrant regulators on standoff mounting brackets, bases, or adapters.
 - c. Where rod lengths exceed 30 inches furnish regulator at both ends.
- C. Round Dampers: Sleeve and blade shall be G90 galvanized steel construction, manufactured from 24 gauge or heavier material as required to meet SMACNA for commercial construction. Provide a continuous 3/8" square shaft secured to damper blade with u-bolt(s). Provide with nylon bearings, locking quadrant and 2-inch build out for insulation. Damper shall be Flexmaster Model SL with BO3 build out or equal.
- D. Concealed quadrant regulators:
 1. Manufacturers:
 - a. Young Regulator Co.
 - b. Metropolitan Air Technology.
 - c. Vent Fabrics.
 - d. Or equal.
 2. Locations: Provide on round and rectangular dampers in the following locations:
 - a. Where damper regulator is located above an inaccessible ceiling (i.e. gypsum board) and a ceiling access door is not provided.
 - b. Where the quadrant regulator is remote and is not accessible via a ceiling access door or by removal of a lay-in ceiling panel.
 - c. As indicated on the drawing.
 3. Flexible Cable Type Regulator:
 - a. Regulator shall consist of a remote cable control system with 1/4" rotary motion flexible steel shaft for control of round and rectangular dampers.
 - b. Provide with mounting controls, ceiling cup and hardware as required for installation of control mechanism in gypsum board ceiling, unless indicated on the drawings for the control mechanism(s) to terminate at a central control station.

PART 3 EXECUTION

1.01 EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.
- B. Verify ducts and equipment installation is ready for accessories.
- C. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

1.02 INSTALLATION

- A. Install in accordance with NFPA 90A and follow current SMACNA HVAC Duct Construction Standards – Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.
- B. Install back-draft dampers on exhaust ducts nearest to the outside and where indicated on Drawings.
 - 1. Adjust back-draft damper counterbalance weights to open damper with minimal differential pressure.
- C. Install temporary duct test holes where indicated on Drawings and required for testing and balancing purposes. Cut or drill in ducts. Seal with neat patches.
- D. Install all dampers at locations as indicated on Drawings.
 - 1. Install dampers square and free from racking with blades running horizontally.
 - 2. Do not compress or stretch damper frame into duct or opening.
 - 3. Handle damper using sleeve or frame. Do not lift damper using blades, actuator, or jack shaft.
 - 4. Install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed.
 - 5. Provide identification at each access door.
- E. Provide balancing dampers where indicated on the drawings and as required for air balancing where branch ducts are taken from larger ducts at points on: constant volume supply air systems; supply air system downstream of air terminal units; return air systems and exhaust air systems.
- F. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 23 37 00 – AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Indoor air devices.

B. Related Sections:

1. Section 09 90 00 – Painting and Coating: Execution and product requirements for Painting of ductwork visible behind outlets and inlets specified by this section.
2. Section 23 31 00 – HVAC Ducts and Casings: Requirements for duct construction and pressure classifications.
3. Section 23 33 00 – Air Duct Accessories: Volume dampers for inlets and outlets.

1.02 REFERENCES

A. Air Movement and Control Association International, Inc.:

1. AMCA 500 – Test Methods for Louvers, Dampers, and Shutters.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:

1. ASHRAE 70 – Method of Testing for Rating the Performance of Air Outlets and Inlets.

C. Sheet Metal and Air Conditioning Contractors:

1. SMACNA – HVAC Duct Construction Standard – Metal and Flexible.

1.03 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures: Submittal procedures.

B. Product Data: Submit sizes, finish, and type of mounting. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

C. Test Reports: Rating of air outlet and inlet performance.

D. Submit manufacturer's installation instructions under provisions of Section 01 33 00 – Submittal Procedures.

1.04 CLOSEOUT SUBMITTALS

A. Section 01 70 00 – Execution and Closeout Requirements: Closeout procedures.

- B. Project Record Documents: Record actual locations of air outlets and inlets.

1.05 QUALITY ASSURANCE

- A. Test and rate diffuser, register, and grille performance in accordance with ASHRAE 70.
- B. Test and rate louver performance in accordance with AMCA 500.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.07 WARRANTY

- A. Section 01 70 00 – Execution and Closeout Requirements: Product warranties and product bonds.

1.08 EXTRA MATERIALS

- A. Section 01 70 00 – Execution and Closeout Requirements: Spare parts and maintenance products.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Titus.
- B. E.H. Price Company.
- C. Substitutions: Section 01 60 00 – Product Requirements.

2.02 INDOOR AIR DEVICES – As Scheduled.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.
- B. Verify inlet and outlet locations.
- C. Verify ceiling and wall systems are ready for installation.

3.02 INSTALLATION

- A. Install diffusers to ductwork with airtight connection.
- B. Install balancing dampers on duct take-off to diffusers, grilles, and registers, whether or

not dampers are furnished as part of diffuser, grille, and register assembly. Refer to Section 23 33 00.

- C. Paint visible portion of ductwork behind air outlets and inlets matte black. Refer to Section 09 90 00.
- D. Install items in accordance with manufacturer's instructions.
- E. Insulate tops of all supply ceiling diffusers with min R-6 flexible duct insulation with vapor barrier.
- F. Install return and exhaust register with blades to minimize sight through outlets or inlets.
- G. Locations of air distribution devices on Drawings are approximate and shall be coordinated with other trades to make symmetrical pattern and shall be influenced by the established general pattern of the lighting fixtures or architectural reflected ceiling plan, but primarily located to maintain proper air distribution.
- H. Provide all specialties and frames for air distribution devices as required for proper installation in ceiling type as indicated on the architectural drawings. Provide all cutting and patching of T-bars, gypsum board, and other ceilings systems as required for installation of air devices.
- I. Install supply and return devices with a minimum of 24" separation.
- J. Integral OBDs shall be installed fully open and only adjusted if tap tampers are inaccessible or it is necessary for balancing.

3.03 INTERFACE WITH OTHER PRODUCTS

- A. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

3.04 SCHEDULES – See Drawings.

END OF SECTION

SECTION 26 00 01 – BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Basic Electrical Requirements specifically applicable to all Division 26 Sections, in addition to Division 1 - General Requirements.

1.02 OWNER-FURNISHED PRODUCTS

- A. Products furnished to the site and paid for by Owner:
 - 1. Where indicated on the Drawings or other sections of the specifications.

1.03 WORK SEQUENCE

- A. Install work in sequence to accommodate Owner's occupancy requirements during the construction period. Coordinate schedule and operations with Architect/Engineer and Owner.

1.04 BASIS OF BID

- A. The Bidders shall bid the work on the basis of the design presented on the Drawings and in the specifications. If in the opinion of the Bidder, the design will not be acceptable to the authorities having jurisdiction, he shall notify the Architect/Engineer, in writing, at least ten days prior to bid opening. After receipt of notice, and concurrence by the Architect/Engineer, changes to the design will be issued by addendum to all bidders of record.

1.05 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code, current edition with local amendments, if any.
- B. Applicable Building Code.
- C. All work installed under this contract shall comply with the requirements of the referenced standards.
- D. All materials and labor furnished by the Contractor shall be in strict accordance with the rules and requirements of the National Board of Fire Underwriters, NEC, State and Municipal regulations, telephone company, power company and other authorities who may have lawful jurisdiction over the work being done.

1.06 SUBMITTALS

- A. Submit under provisions of Section 01 33 00 – Submittal Procedures.
- B. Submit Shop Drawings and product data grouped to include complete submittals of related systems, products and accessories in a single submittal.

- C. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.

1.07 REGULATORY REQUIREMENTS

- A. Conform to referenced codes.
- B. Obtain permits, and obtain all required inspections from authority having jurisdiction.
- C. The Contractor will be responsible for all permits and inspections required by law for the completion of his work. Cost of all permits and inspections shall be paid by the Contractor. The Contractor shall obtain and pay for all certificates of approval which must be delivered to the Architect before final acceptance of the job.
- D. All Division 26 work shall be done under the supervision of a currently licensed State of Texas Master Electrician.

1.08 PROJECT/SITE CONDITIONS

- A. Contractor shall visit the site prior to bid and carefully familiarize himself with all existing conditions as may be determined by visual inspection without removing permanent finishes. If discrepancies are noted between the Drawings and existing conditions, the contractor shall notify the Architect/Engineer, in writing, no later than ten days prior to bid opening of the discrepancies. Upon receipt of notice of discrepancies, and verification, the Architect/Engineer will issue corrections by addendum to all bidders of record.
- B. Prepare Drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections.

1.09 QUALITY ASSURANCE

- A. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings or engineering parameters from those indicated on the contract documents, the contractor shall be responsible for all costs, including costs of all trades affected, involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed.
- B. All materials, except medium voltage equipment and components, shall be listed by and shall bear the label of an approved electrical testing laboratory. If none of the approved electrical testing laboratories has published standards for a particular item, then other national independent testing standards, if available, applicable and approved by Architect/Engineer, shall apply and such items shall bear those labels.

1.10 CONTINUITY OF EXISTING SERVICES AND SYSTEMS

- A. No outages shall be permitted on existing systems except at the time and during the interval specified by the Owner and by the Architect/Engineer Project Representative. The Owner may require written approval. Any outage must be scheduled when the interruption causes the least interference with normal schedules and business routines. No extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours.

- B. This Contractor shall restore any circuit interrupted as a result of this work to proper operation as soon as possible.

1.11 INTENT

- A. The Contractor shall furnish and install all the necessary materials, apparatus, and devices to complete the electrical equipment and systems installation herein specified, except such parts as are specifically exempted herein.
- B. If an item is either called for in the specifications or shown on the plans, it shall be considered sufficient for the inclusion of said item in this contract. If a conflict exists within the Specifications or exists within the Drawings, the Contractor shall furnish the item, system, or workmanship, which is the highest quality, largest, or most closely fits the Architect/Engineer's intent (as determined by the Architect/Engineer Project Manager).
- C. The details and Drawings are diagrammatic. The Contractor shall verify all dimensions at the site and be responsible for their accuracy.
- D. All sizes as given are minimum except as noted.
- E. Whenever a particular manufacturer's specific product is named, it is intended to establish a level of quality and performance requirements.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 SCOPE

The accompanying Plans and Specifications as outlined in the various sections of this Division cover the furnishing of all labor, materials, tools, transportation services, etc., necessary for complete and working installation of electrical facilities.

3.02 EXISTING WORK

- A. Remove exposed abandoned equipment wiring connections, raceway systems, and cables, including those located above accessible ceiling finishes.
- B. Disconnect abandoned utilization equipment and remove wiring connections. Remove abandoned components when connected raceway is abandoned and removed. Install blank cover for abandoned boxes and enclosures not required to be removed.
- C. Extend existing equipment connections where indicated on the Drawings. Where existing circuits to remain are interrupted, replace interrupted portions to maintain continuity. Use materials and methods compatible with existing electrical installations and as specified.

3.03 FIRESTOPPING

- A. Unless specifically indicated otherwise on the Drawings, all penetrations of fire-rated walls and floors shall be made in accordance with specification Section 07 84 00.

3.04 TESTING

- A. General: Provide all labor, materials and equipment necessary to make the required tests as required by code or per other Division 26 sections.

3.05 EXCAVATION AND BACKFILL

- A. Perform all excavation and backfill work to accomplish indicated electrical systems installation in accordance with provisions of Division 31. Blasting will not be allowed without written permission of the Architect/Engineer and Owner.

3.06 CONCRETE WORK

- A. All cast-in-place concrete unless noted otherwise elsewhere will be provided under Division 3. Provide all Layout Drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for the support of electrical equipment.

3.07 BUILDING ACCESS

- A. Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

3.08 EQUIPMENT ACCESS

- A. Install all piping, conduit, ductwork and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster or drywall walls or ceilings, provide the access doors.

3.09 COORDINATION

- A. Cooperate with other trades and Architect/Engineer's personnel in locating work. Should it be necessary to raise or lower or move longitudinally any part of the electrical work to better fit the general installation, such work shall be done at no extra cost to the Project. The Contractor shall check location of electrical outlets with respect to other installations before installing.
- B. The Contractor shall verify that all devices are compatible for the surfaces in or on which they will be used. This includes, but is not limited to light fixtures, panelboards, devices, etc. and recessed or semi-recessed heating units installed in/on architectural surfaces.
- C. Coordinate all work with other trades prior to installation. Any installed work that is not coordinated and that interferes with other trades' work shall be removed without additional cost.

3.10 SLEEVES

- A. Pipe sleeves for conduits 6" in diameter and smaller, in new poured concrete construction, shall be schedule 40 steel pipe, plastic removable sleeve or sheet metal sleeve, all cast in place.
- B. In wet area floor penetrations, provide Schedule 40 sleeves only. Top of sleeve to be 2 inches above the adjacent floor. In existing wet area floor penetrations, core drill sleeve openings large enough to insert Schedule 40 sleeve and grout the area around the sleeve. If a pipe clamp resting on the sleeve supports the pipe penetrating the sleeve, weld a collar or struts to the sleeve that will transfer weight to the existing floor structure. Wet areas for this paragraph are rooms or spaces containing air handling unit coils, converters, pumps, chillers, boilers and similar waterside equipment.
- C. Pipe penetrations in existing concrete floors that are not in wet areas may omit the use of a core drilled opening without the sleeve, provided that the firestopping requirements of Article 3.02 are met.

3.11 HOUSEKEEPING AND CLEANUP

- A. The Contractor shall clean up and remove from the premises, on a daily basis, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

END OF SECTION

SECTION 26 05 27 – WIRING DEVICES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Wall switches; wall dimmers; receptacles; multi-outlet assembly; lighting control devices; and device plates and decorative box covers.
 - 1. Wall Switches.
 - 2. Receptacles.
 - 3. Device Plates, Covers and Colors.
 - 4. Low Voltage Switches.
 - 5. Low Voltage Wall Mounted Motion Sensor.
 - 6. Wall-Mounted Line Voltage Occupancy Sensor Switch.
 - 7. Ceiling Mounted Low Voltage Occupancy Sensors.
- B. Related Sections:
 - 1. Section 26 05 33 - Raceway and Boxes for Electrical Systems: Outlet boxes for wiring devices.

1.02 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA WD 1 - General Requirements for Wiring Devices.
 - 2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.
 - 3. UL 498 - Receptacles
 - 4. UL 20 - Switches

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures.
- B. Product Data: Submit manufacturer's catalog information showing dimensions, colors and configurations.

1.04 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section.

1.05 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish two of each style, size and finish wall plate.

1.06 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish five-year manufacturer warranty for components.

PART 2 PRODUCTS

2.01 WALL SWITCHES

- A. Manufacturers:
 - 1. Cooper: CSB Series.
 - 2. Hubbell: CSB Series.
 - 3. Leviton: CSB Series.
 - 4. Pass and Seymour: CSB Series.
 - 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: NEMA WD 1, Commercial Spec Grade AC only general-use snap switch, side and back wired.
- C. Body and Handle: Plastic with toggle handle, unless otherwise noted on plans. Use red for devices connected to emergency systems.
- D. Indicator Light: Lighted handle type switch, where shown on plans.
- E. Ratings:
 - 1. Voltage: 120-277 volts, AC.
 - 2. Current: 20 amperes.

2.02 RECEPTACLES

- A. Duplex Receptacle
 - 1. Product Description: NEMA WD 1, WC-596 Federal spec grade receptacle, 20 amp.
 - 2. Configuration: NEMA WD 6, side and back wired.

3. Device Body: Plastic, unless otherwise noted on Drawings. Use red for devices connected to emergency systems.
 4. Manufacturers:
 - a. Cooper: 5362 Series
 - b. Hubbell: HBL5362 Series
 - c. Leviton: 5362 Series
 - d. Pass and Seymour: 5362-A Series
 - e. Substitutions: Section 01 60 00 - Product Requirements.
 5. Use Hospital Grade devices on all hospital projects.
- B. Simplex Receptacle
1. Product Description: NEMA WD 1, Commercial Spec Grade receptacle, 20 amp.
 2. Configuration: NEMA WD 6, side and back wired.
 3. Device Body: Plastic, unless otherwise noted on Drawings. Use red for devices connected to emergency systems.
 4. Manufacturers:
 - a. Cooper: 1877 Series
 - b. Hubbell, HBL 5261 Series
 - c. Leviton: 5891 Series
 - d. Pass and Seymour: 5361 Series
 - e. Substitutions: Section 01 60 00 - Product Requirements.
- C. GFCI Receptacle
1. Product Description: NEMA WD 1, Heavy-duty general use receptacle, 20 amp. Provide with weather-resistant rating when located outdoors.
 2. Configuration: NEMA WD 6, UL943, side and back wired, feed thru type.
 3. Device Body: Plastic, unless otherwise noted on Drawings. Use red for devices connected to emergency systems.
 4. Manufacturers:
 - a. Cooper: VGF20 Series
 - b. Hubbell: GF20L Series
 - c. Leviton: 8898 Series
 - d. Pass and Seymour: 2095 Series
 - e. Substitutions: Section 01 60 00 - Product Requirements.
- D. Twist Lock Receptacle
1. Product Description: NEMA Lx-xx, UL 94, Twist Lock receptacle.

2. Configuration: NEMA type as indicated on Drawings.
3. Device Body: Black plastic, unless otherwise noted on Drawings. Use red for devices connected to emergency systems.
4. Manufacturers:
 - a. Cooper
 - b. Hubbell
 - c. Leviton.
 - d. Pass and Seymour
 - e. Substitutions: Section 01 60 00 - Product Requirements.

E. Special Purpose Receptacle

1. Product Description: Heavy-duty Special Purpose Receptacle, Straight Blade or Pin and Sleeve Type.
2. Configuration:
 - a. Range receptacle: NEMA 14-50
 - b. Dryer receptacle: NEMA 14-30
 - c. Other types: As indicated on drawings.
3. Device Body: Black plastic, unless otherwise noted on Drawings. Use red for devices connected to emergency systems.
4. Manufacturers:
 - a. Cooper.
 - b. Hubbell.
 - c. Leviton.
 - d. Pass and Seymour.
 - e. Substitutions: Section 01 60 00 - Product Requirements.

2.03 DEVICE PLATES, COVERS AND COLORS

- A. Manufacturers: To match device manufacturer.
- B. Device Colors:
 1. Wall Devices: IVORY
 2. Ceiling Devices: WHITE
- C. Decorative Cover Plate: Smooth nylon.
- D. Jumbo Cover Plate: Smooth nylon. For use at masonry walls only.
- E. Weather Resistant Cover Plate: Gasketed cast metal plate with hinged and gasketed device cover. Provide weatherproof-while-in-use type covers where indicated on the Drawings.

- F. Devices and plates shall be red color when installed on emergency systems.

2.04 LOW-VOLTAGE SWITCHES

A. Manufacturers:

1. Hubbell Incorporated Model LV Series.
2. Leviton Manufacturing Co., Inc. Model LVS Series.
3. Wattstopper RS2 Series.
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Wall Switch: Specification Grade unlighted momentary push-button type for overriding relays.

1. Material: Plastic, provide with cover plate.
2. Color: Per Section 2.04

2.05 LOW VOLTAGE WALL-MOUNTED MOTION SENSOR

A. Manufacturers:

1. Hubbell Model LODIA.
2. Sensor Switch Model WV PDT 16.
3. Watt Stopper Model DT-200.
4. Substitutions: Section 01 60 00 - Product Requirements

B. Dual Technology ultrasonic and PIR sensor.

C. Separate sensitivity and time delay adjustments with LED indication of sensed movement. User adjustable time-delay: 8 to 32 minutes.

D. Provide with self adaptive technology to adapt to room size automatically.

E. Installation: Wall mount typically one foot below ceiling on corridor wall.

F. Coverage Sensitivity:

1. Capable of detecting motion over 1600 square foot area.
2. Capable of being wired in master-slave configuration to extend area of coverage.

2.06 WALL-MOUNTED LINE VOLTAGE OCCUPANCY SENSOR SWITCH

A. Manufacturers:

1. Hubbell Model LHIRS1.
 2. Sensor Switch Model LWS-P.
 3. Watt Stopper Model WS-250.
 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. 800 watt, 120/277 volt line voltage control. Passive infrared and ambient light sensing.
- C. Separate sensitivity and time delay adjustments. User adjustable time-delay: 30 seconds to 30 minutes. 0-200 foot candle adjustability for ambient light control.
- D. Furnish with manual override.
- E. Operation: Silent.
- F. Coverage Sensitivity: Capable of detecting motion over nominal 900 square foot area.

2.07 CEILING-MOUNTED LOW VOLTAGE OCCUPANCY SENSOR

- A. Manufacturers:
1. Hubbell Model OMNIUS2000.
 2. Sensor Switch Model CM PDT 10.
 3. Watt Stopper Model DT-300.
 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Dual Technology ultrasonic and PIR sensor.
- C. Separate sensitivity and time delay adjustments with LED indication of sensed movement. User adjustable time-delay: 8 to 32 minutes.
- D. Provide with self adaptive technology to identify and adjust to room size automatically.
- E. Installation: Ceiling mounted as shown on plans, maximum 15' heights.
- F. Coverage Sensitivity:
1. Capable of detecting motion over 2000 square foot area
 2. Capable of being wired in master-slave configuration to extend area of coverage.

2.08 AMBIENT LIGHT SENSOR CONTROL UNIT

- A. Manufacturers:
1. Hubbell Model LXPSCMLP Series

2. Leviton Mini-Z Series
 3. Watt Stopper Model LCO_203 Series.
 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Photodiode control unit with PHOTOCELL ENABLE and MASTER OVERRIDE inputs for remote control, 3 minute time delay, and with selectable ranges 100-1000 footcandle (1,076-10,760 lx).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify outlet boxes are installed at proper height.
- C. Verify wall openings are neatly cut and completely covered by wall plates.
- D. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.02 PREPARATION

- A. Clean debris from outlet boxes.

3.03 EXISTING WORK

- A. Disconnect and remove abandoned wiring devices.
- B. Modify installation to maintain access to existing wiring devices to remain active.
- C. Clean and repair existing wiring devices to remain or to be reinstalled.

3.04 INSTALLATION

- A. Install devices plumb and level.
- B. Install switches with OFF position down.
- C. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- D. Do not share neutral conductor on load side of dimmers.
- E. Install receptacles with grounding pole on top.
- F. Connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor.

- G. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
- H. Connect wiring devices by wrapping solid conductor around screw terminal. When stranded conductors are used in lieu of solid, use back wiring connections. Do not place bare stranded conductors directly under device screws.
- I. Use jumbo size plates for outlets installed in masonry walls.
- J. Install galvanized steel covers on outlet boxes and junction boxes in unfinished areas and above accessible ceilings.

3.05 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate locations of outlet boxes provided under Section 26 05 33 to obtain mounting heights as specified.

3.06 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements and Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting and balancing.
- B. Inspect each wiring device for defects.
- C. Operate each wall switch with circuit energized and verify proper operation.
- D. Verify each receptacle device is energized.
- E. Test each receptacle device for proper polarity and ground.
- F. Test each GFCI receptacle device for proper operation.

3.07 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting and balancing.
- B. Adjust devices and wall plates to be flush and level.
- C. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- D. Test each system component after installation to verify proper operation.
- E. Test relays, contactors and switches after installation to confirm proper operation. Provide sensitivity adjustments on motion sensors to avoid nuisance, undesired operation.
- F. Confirm correct loads are recorded on directory card in each panel.

3.08 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

- B. Clean exposed surfaces to remove splatters and restore finish.

3.09 DEMONSTRATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for demonstration and training.
- B. Demonstrate operation of the following system components:
 - 1. Operation of switches.
 - 2. Operation of occupancy sensors. Demonstrate for all zones.
- C. Furnish 1 hour to instruct Owner's personnel in operation and maintenance of system and differences from existing switching in the rest of the building. Schedule training with Owner, provide at least 7 days' notice to Architect/Engineer and Owner of training date.

END OF SECTION

SECTION 26 05 29 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Conduit supports.
 - 2. Formed steel channel.
 - 3. Spring steel clips.

1.02 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
 - 1. Hangers and Supports: Submit manufacturer's catalog data including load capacity.
- C. Design Data: Indicate load carrying capacity of hangers and supports.
- D. Manufacturer's Installation Instructions:
 - 1. Hangers and Supports: Submit special procedures and assembly of components.

1.03 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical and mechanical damage, by storing in original packaging.

PART 2 PRODUCTS

2.01 CONDUIT SUPPORTS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.

- B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads, 1/4" for single conduits 1" and smaller, 3/8" minimum for trapezes and single conduits 1 1/4" and larger.
- C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
- D. Conduit Clamps for Trapeze Hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.
- E. Conduit Clamps - General Purpose: One-hole plated steel for surface-mounted conduits. Provide with malleable iron clamp backs in damp and wet locations. Provide with pre-galvanized finish.
- F. Cable Ties: High-strength nylon temperature rated to 185 degrees F; self-locking.

2.02 FORMED STEEL CHANNEL

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Product Description: Galvanized 12 gauge thick steel, minimum 1 5/8" x 1 5/8" section when used for trapezes, with holes 1-1/2 inches on center.

2.03 SPRING STEEL CLIPS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Product Description: Mounting hole and screw closure.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.

3.02 INSTALLATION - HANGERS AND SUPPORTS

- A. Anchors and Fasteners:
 - 1. Concrete Structural Elements: Provide precast inserts, expansion anchors or preset inserts.
 - 2. Steel Structural Elements: Provide beam clamps or spring steel clips. Do not drill structural elements unless approved by Structural Engineer.
 - 3. Concrete Surfaces: Provide expansion anchors.

4. Hollow Masonry, Plaster and Gypsum Board Partitions: Provide toggle bolts.
 5. Solid Masonry Walls: Provide expansion anchors.
 6. Sheet Metal: Provide sheet metal screws.
 7. Wood Elements: Provide wood screws.
- B. Install conduit and raceway support and spacing in accordance with NEC.
- C. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit. Do not fasten to suspended ceiling grid system.
- D. Install multiple conduit runs on common hangers.
- E. Supports:
1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
 2. Install surface mounted cabinets and panelboards with minimum of four anchors.
 3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch off wall.
 4. Support vertical conduit at every floor.
 5. File and de-bur cut ends of support channel and spray paint with cold galvanized paint to prevent rusting.
- F. Install Work in accordance with referenced standards and authority having jurisdiction.

END OF SECTION

SECTION 26 05 33 – RACEWAY SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.
- B. Not included in this section: Electrical underground ductbank systems requiring concrete encasement or manholes.

1.02 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
 - 2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
 - 3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).
 - 4. ANSI C80.6 – Intermediate Rigid Conduit
 - 5. ANSI/UL 5 – Surface Metal Raceway
 - 6. ANSI/UL 5 – Surface Non-Metallic Raceway
- B. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
 - 3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 - 6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
 - 7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.03 SYSTEM DESCRIPTION

- A. Raceway and boxes located as indicated on Drawings, and at other locations required for

splices, taps, wire pulling, device mounting, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system. Except where other wiring methods are specifically allowed by other sections of the specifications, or specifically indicated on the Drawings, all wiring on this project shall consist of conductors installed in complete raceway systems as specified in this section of the specifications.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures.

B. Product Data: Submit for the following:

1. Flexible metal conduit.
2. Liquid-tight flexible metal conduit.
3. Non-metallic conduit.
4. Flexible non-metallic conduit.
5. Non-metallic tubing.
6. Raceway fittings.
7. Conduit bodies.
8. Surface raceway.
9. Wireway.
10. Pull and junction boxes.
11. Handholes.

1.05 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements.

B. Project Record Documents:

1. Record actual routing of conduits larger than 2 inch (DN50). Include locations of junction and pull boxes.

1.06 DELIVERY, STORAGE AND HANDLING

A. Section 01 60 00 - Product Requirements

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

C. Protect PVC conduit from sunlight.

1.07 COORDINATION

- A. Section 01 30 00 - Administrative Requirement: Coordinate installation of outlet boxes for equipment connected under Section 26 05 03.
- B. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes. Coordinate locations with architectural features, the work of other trades, obstructions and constraints. Where specific location information is shown on the Architectural Drawings, the information on those Drawings shall govern.

PART 2 PRODUCTS

2.01 SELECTION OF PRODUCTS

- A. Unless specifically indicated otherwise at particular locations on the Drawings, products shall be selected according to installation conditions as described in this article.
- B. Outdoor Below Grade Locations: Non-metallic conduit, schedule 40 or 80.
- C. Outdoor Above Grade Locations and other Wet Locations (as defined by the NEC): Rigid steel or intermediate metal conduit (IMC).
- D. Within or Under Concrete Construction Located On or Below Grade: Non-metallic conduit. Comply with Structural Specifications and Drawings regarding limitations on sizes and placement.
- E. Within Concrete Construction Located Above Grade: Non-metallic conduit, rigid steel conduit or intermediate metal conduit. Comply with Structural Specifications and Drawings regarding limitations on sizes and placement.
- F. Damp Locations as defined by the NEC including exposed work in any protected locations directly communicating with outside ambient air such as crawl spaces, breezeways, covered porches, under canopies, and similar locations: Rigid steel or intermediate metal conduits (IMC) conduits.
- G. Interior Dry Locations (as defined by the NEC): Rigid steel, intermediate metal conduits (IMC), or electric metallic tubing.
- H. Motor and Equipment Connections: Liquid-tight conduit not to exceed 24" in length.
- I. Lighting Fixtures: Flexible metal conduit.
- J. Special Conditions.
 - 1. Wiring between fire pump controllers and fire pumps: Rigid steel conduit, intermediate metal conduit (IMC), and liquid-tight flexible conduit.
 - 2. Classified (explosion proof) areas: Provide materials and fittings required to fully comply with all applicable NEC requirements.

2.02 METAL CONDUIT

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Rigid Aluminum Conduit: ANSI C80.5. Install only where specifically indicated on the Drawings.
- C. Intermediate Metal Conduit (IMC): ANSI C80.1.
- D. The term "metal conduit" does not include Electric Metallic Tubing (EMT).
- E. Fittings: NEMA FB 1; material to match conduit.
- F. Conduit Bodies: NEMA FB 1; shall be malleable iron with steel conduit. Aluminum conduit bodies are not acceptable except for use with aluminum conduit.

2.03 PVC-COATED METAL CONDUIT

- A. Product Description: NEMA RN 1; rigid steel conduit with external PVC coating, 40 mil (0.1 mm) thick.
- B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.04 NON-METALLIC CONDUIT

- A. Product Description: NEMA TC 2; Schedule 40 or 80 PVC.
- B. Fittings and Conduit Bodies: NEMA TC 3.

2.05 FLEXIBLE METAL CONDUIT

- A. Product Description: Interlocked steel or aluminum construction. Lightweight extra flexible type is not acceptable.
- B. Fittings: NEMA FB 1.

2.06 LIQUID-TIGHT FLEXIBLE METAL CONDUIT

- A. Product Description: Interlocked steel construction with PVC jacket, UL listed for grounding purposes.
- B. Fittings: NEMA FB 1.

2.07 ELECTRICAL METALLIC TUBING (EMT)

- A. Product Description: ANSI C80.3; galvanized tubing.
- B. Fittings and Conduit Bodies: NEMA FB 1.
 - 1. Indenter and die-cast set screw types are not acceptable.
 - 2. Wet or Damp Locations: Steel or die-cast compression type.

3. Concealed Dry Locations: Steel compression, die cast compression type, or steel set screw type.

2.08 SURFACE METAL RACEWAY

- A. Product Description: ANSI/UL 5 sheet metal channel with fitted cover, suitable for use as surface metal raceway.
- B. Size: As indicated on the Drawings.
- C. Finish: Gray enamel.
- D. Fittings, Boxes and Extension Rings: Furnish manufacturer's standard accessories; match finish on raceway. Furnish all fittings and accessories required to provide a complete and working system.

2.09 SURFACE NON-METAL RACEWAY

- A. Product Description: ANSI/UL 5A plastic channel with fitted cover, suitable for use as surface metal raceway.
- B. Size: As indicated on the Drawings.
- C. Finish: IVORY.
- D. Fittings, Boxes and Extension Rings: Furnish manufacturer's standard accessories; match finish on raceway. Furnish all fittings and accessories required to provide a complete and working system.

2.10 WIREWAY

- A. Product Description: General purpose or NEMA 3R type wireway suitable for installation conditions.
- B. Knockouts: None; provide in field as required.
- C. Size: As indicated on Drawings or as required to meet NEC fill requirements.
- D. Cover: Screw cover.
- E. Fittings: Lay-in type with captive screws.
- F. Finish: Galvanized in mechanical rooms and unfinished areas; gray powder coated in finished areas and outdoors.

2.11 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
 1. 4" square by 2 1/4" deep minimum size. Provide plaster rings of required depth at recessed locations. Provide compatible industrial device covers and blank covers at other locations.

2. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch (13 mm) male fixture studs where required.
 3. Ceiling Boxes imbedded in concrete: Concrete ring type with top cover
 4. Outlet boxes in masonry walls or embedded in concrete: Steel masonry type box.
- B. Cast Boxes: NEMA FB 1, material as specified in articles above. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.

2.12 PULL AND JUNCTION BOXES

- A. Above Ground: Sheet Metal Boxes: NEMA OS 1, galvanized steel, NEMA Type 1 or 3R as required by installation location.
- B. In Ground: Fiberglass polymer concrete handhole with concrete polymer composite weatherproof cover with nonskid finish

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.02 EXISTING WORK

- A. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces.
- B. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.
- C. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.
- D. Extend existing raceway and box installations using materials and methods as specified.
- E. Clean and repair existing raceway and boxes to remain or to be re-installed.

3.03 INSTALLATION

- A. Ground and bond raceway and boxes in accordance with Section 26 05 26.
- B. Fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.
- C. Identify raceway and boxes in accordance with Section 26 05 53.

- D. Arrange raceway and boxes to maintain headroom and present neat appearance.

3.04 INSTALLATION – RACEWAY

- A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.
- B. Arrange raceway supports to prevent misalignment during wiring installation.
- C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Group related raceways; support using conduit rack. Construct rack using steel channel specified in Section 26 05 29 and provide space on each for 25 percent additional raceways.
- E. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports.
- F. Do not attach raceway to ceiling support wires or other piping systems.
- G. Route exposed raceway parallel and perpendicular to walls.
- H. Route raceway installed above accessible ceilings parallel and perpendicular to walls.
- I. Route raceways in and under slab from point-to-point.
- J. Maintain clearance between raceway and piping for maintenance purposes.
- K. Maintain 12 inch (300 mm) clearance between raceway and surfaces with temperatures exceeding 104 degrees F (40 degrees C).
- L. Cut raceways square using saw or pipe cutter; de-burr cut ends.
- M. Bring raceways to shoulder of fittings; fasten securely.
- N. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe non-metallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.
- O. Install conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in wet locations.
- P. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate or provide factory elbows for bends in metal conduit larger than 1" size.
- Q. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
- R. Install fittings to accommodate expansion and deflection where raceway crosses expansion joints.

- S. Install suitable pull string or cord in each empty raceway except sleeves and nipples.
- T. Install suitable caps to protect installed conduit against entrance of dirt and moisture.
- U. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.
- V. Close ends and unused openings in wireway.
- W. Outdoor Below Grade Locations: Burial depth per NEC requirements.
 - 1. Where crossing under or through exterior grade beams utilize only Schedule 80 conduit within 5' of either side of beam.
 - 2. Provide rigid steel or intermediate metal conduit (IMC) elbows at all changes of direction exceeding 30 degrees, including transitions to outdoor above grade locations. Wrap metal conduit with one application, half-lapped, of Minnesota Mining and Manufacturing Company "Scotchwrap" No. 51, Plymouth Rubber Co. "Plywrap 20" or Westape, Inc. 20 mil. Extend tape wrap to a minimum of 6" above grade.
 - 3. Where penetrating exterior walls into basements or finished spaces transition to rigid steel or intermediate metal conduit (IMC) before penetrating wall. Provide an OZ Gedney series "FSK," Link Seal "LS-200" series, or approved equal seal at each penetration location.
- X. Within or Under Concrete Construction Located On or Below Grade:
 - 1. For trade sizes 1" and smaller, transitions to concealed areas above slab may be made with non-metallic elbows and riser nipples. Convert to metallic conduit or tubing within maximum of 18" above slab.
 - 2. For trade sizes 1 1/4" and larger, and all transitions to exposed locations, provide rigid steel or intermediate metal conduit (IMC) elbows.
- Y. Interior Dry Locations (as defined by the NEC): Do not use EMT for exposed work within 48" above finished floor. Do not use EMT for medium voltage cables.
- Z. Lighting Fixtures:
 - 1. Conduit size shall be 1/2" minimum and shall not exceed six feet (1.8 M) maximum length. Conduit shall be long enough to allow movement of lay-in type fixtures for maintenance purposes.
 - 2. Conduit shall run directly from a junction box to a single fixture. Direct connections between fixtures utilizing flexible metal conduit is not acceptable.
- AA. Flexible metal conduit:
 - 1. Use only in dry locations and only where flexibility is necessary for connections to equipment or fixtures.

2. Do not install aluminum type in locations less than 6' above finished floor or working surface.

BB. Liquid-tight flexible metal conduit: Use in wet or dry locations where flexibility is necessary for connections to equipment or for connections to lighting fixtures.

3.05 INSTALLATION – BOXES

- A. Install wall mounted boxes at elevations to accommodate mounting heights as indicated on Drawings.
- B. Adjust box location up to 10 feet (3 m) prior to rough-in to accommodate intended purpose.
- C. Orient boxes to accommodate wiring devices oriented as specified in Section 26 05 27.
- D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- E. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches (150 mm) horizontally from ceiling access panel or from removable recessed luminaire.
- F. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- G. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches (150 mm) separation. Install with minimum 24 inches (600 mm) separation in acoustic rated walls.
- H. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- I. Install stamped steel bridges to fasten flush mounting outlet box between studs.
- J. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- K. Install adjustable steel channel fasteners for hung ceiling outlet box.
- L. Do not fasten boxes to ceiling support wires or other piping systems.
- M. Support boxes independently of conduit.
- N. Install gang box where more than one device is mounted together. Do not use sectional box.
- O. Install gang box with plaster ring for single device outlets.
- P. Outdoor Above Grade Locations and other Wet Locations (as defined by the NEC): Provide malleable cast iron outlet boxes, "FS" or "FD" series where recessed mounting of outlets is not feasible and for junction boxes in trade sizes 1" and smaller. Utilize malleable iron conduit bodies (condulets) at changes of direction and pull points. Galvanized NEMA 3R steel boxes may be used only at locations where specifically called

for on the Drawings, or as approved by the Engineer.

- Q. Damp Locations: Provide malleable cast iron outlet boxes, "FS" or "FD" series where recessed mounting of outlets is not feasible and for junction boxes in trade sizes 1" and smaller. Utilize malleable iron conduit bodies (condulets) at changes of direction and pull points. Galvanized steel boxes may be used only at locations where specifically called for on the Drawings.

3.06 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with Section 07 84 00.
- B. Locate outlet boxes to allow luminaires to be positioned as indicated on the Drawings.
- C. Align adjacent wall mounted outlet boxes for switches, thermostats and similar devices.

3.07 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting and balancing.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused openings in boxes.

3.08 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Clean interior of boxes to remove dust, debris, and other material.
- C. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 26 05 35 – POWER POLES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes divided channel utility power poles for power and communications circuits.

1.02 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data for materials, finishes, receptacle and connector configuration, and attachment details.
- C. Samples: Submit two finish color chips.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit instructions for cleaning of finishes and adjusting.

PART 2 PRODUCTS

2.01 POWER POLES

- A. Manufacturers:
 - 1. Wiremold 30TP-4V Series
 - 2. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Power poles with outlet devices for power branch circuits, telephone and data communications.

2.02 MATERIALS

- A. Main Body: Steel.
- B. Cover Plates: Steel.

2.03 COMPONENTS

- A. Convenience Receptacle Configuration: NEMA WD 6; Type 5-20. Furnish 2 for each pole.
- B. Telephone Connector: Provide quantities as shown on plans, type per Division 27 specifications.
- C. Data Communications Connector: Provide quantities as shown on plans, type per Division 27 specifications.
- D. Foot: Suitable for floor finish as indicated on Drawings.
- E. Top Clamp: Concealed, designed to fasten pole to inverted "T" grid ceiling suspension member.

2.04 ACCESSORIES

- A. Trim plates for closing ceiling opening.
- B. Flexible cable assembly with connector for branch circuit connections.

2.05 FABRICATION

- A. Wire utility column with 12 AWG copper conductor to outlet box attached to top of pole. Allow 6 inch leads for connection to branch circuit. Furnish flexible cable assembly with connector for connection to branch circuit.
- B. Allow for installation of telephone cables per plans.
- C. Allow for installation of data communication cables per plans.
- D. Furnish knockout for connection of 1 inch conduit at top of pole.
- E. Finish: Manufacturer's standard ivory enamel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify installation of ceiling suspension system is complete.
- C. Verify floor covering installation is complete.
- D. Verify branch circuit wiring installation is completed, tested, in proper location, and ready for connection to power poles.
- E. Verify telephone raceway installation is completed, in proper location, and ready for connection to power poles.

- F. Verify data communication raceway installation is completed, in proper location, and ready for connection to power poles.

3.02 INSTALLATION

- A. Make wiring connections to branch circuit outlets using flexible conduit in accordance with Section 26 05 33.
- B. Bond equipment grounding conductor and body of pole to branch circuit equipment grounding conductor in accordance with Section 26 05 26.
- C. Neatly cut openings in ceiling panels. Install trim plate.

END OF SECTION

SECTION 26 05 53 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Nameplates.
2. Labels.
3. Wire markers.
4. Conduit markers.
5. Panelboard Directories.

B. Related Sections:

1. Section 09 90 00 - Painting and Coating: Execution requirements for painting specified by this section.
2. Section 26 05 19 – 600-Volt Building Wire and Cable
3. Division 27 – Communications.

1.02 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures.

B. Product Data:

1. Submit manufacturer's catalog literature for each product required.
2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location and function.

1.03 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

1.04 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section.

1.05 DELIVERY, STORAGE AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing and protecting products.

- B. Accept identification products on site in original containers. Inspect for damage.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 PRODUCTS

2.01 NAMEPLATES

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Product Description: Laminated three-layer plastic with engraved black letters on white contrasting background color. Use red lettering on nameplates for emergency system components.
- C. Letter Size:
 - 1. Panelboards, Switchboards and Motor Control Centers: 1 inch (25 mm); identify equipment designation. 1/2 inch (13 mm); identify voltage rating, source and room location of the source.
 - 2. Equipment Enclosures: 1 inch (25 mm); identify equipment designation.
 - 3. Circuit Breakers, Switches, and Motor Starters in Panelboards or Switchboards or Motor Control Centers: 1/2 inch (13 mm); identify circuit and load served, including location.
 - 4. Individual Circuit Breakers, Disconnect Switches, Enclosed Switches, and Motor Starters: 1/2 inch (13 mm); identify source and load served.
 - 5. Transformers: 1 inch (25 mm); identify equipment designation. 1/2 inch (13 mm); identify primary and secondary voltages, primary source, and secondary load and location.
- D. Minimum nameplate thickness: 1/8 inch.

2.02 LABELS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Labels: All labels shall be permanent, and machine generated. NO HANDWRITTEN OR NON-PERMANENT LABELS ARE ALLOWED. Exception: back side of device plates and junction boxes smaller than 8" X 8" may use handwritten, legible labeling on box covers, unless specifically prohibited by other specification sections.

- C. Embossed tape will not be permitted for any application.

2.03 WIRE MARKERS

- A. Furnish materials in accordance with referenced standards.
- B. Description: Cable label size shall be appropriate for the conductor or cable size(s), outlet faceplate layout and patch panel design. All labels shall be self-laminating, machine generated and be wrapped around the cable or sheath. Flag type labels are not acceptable. The labels shall be of adequate size to accommodate the circumference of the cable being labeled and properly self-laminate over the full extent of the printed area of the label.
- C. Legend:
 - 1. Control Circuits: Control wire number as indicated on schematic and interconnection diagrams.
- D. Tape (phase identification only): Scotch #35 tape in appropriate colors for system voltage and phase.

2.04 CONDUIT AND RACEWAY MARKERS

- A. Furnish materials in accordance with referenced standards.
- B. Description: Nameplate fastened with adhesive, labels fastened with adhesive and stencils.
- C. Color:
 - 1. Medium Voltage System: Black lettering on white background.
 - 2. 480 Volt System: Black lettering on white background.
 - 3. 208 Volt System: Black lettering on white background.
- D. Legend:
 - 1. Medium Voltage System: HIGH VOLTAGE.
 - 2. 480 Volt System: 480 VOLTS.
 - 3. 208 Volt System: 208 VOLTS.

2.05 PANELBOARD DIRECTORIES (FOR UPDATING EXISTING ONLY)

- A. Typed directories for panels must be covered with clear plastic, have a metal frame. Room number on directories shall be Owner's numbers, not Plan numbers unless Owner so specifies.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

3.02 EXISTING WORK

- A. Install identification on existing equipment to remain in accordance with this section.
- B. Install identification on unmarked existing equipment.
- C. Replace lost nameplates, labels and markers.
- D. Re-stencil existing equipment.

3.03 INSTALLATION

- A. Install identifying devices after completion of painting.
- B. Nameplate Installation:
 - 1. Install nameplate parallel to equipment lines.
 - 2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.
 - 3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
 - 4. Secure nameplate to equipment front using adhesive.
 - 5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.
 - 6. Install nameplates for the following:
 - a. Switchboards.
 - b. Panelboards.
 - c. Transformers.
 - d. Service Disconnects.
 - e. Motor Control Centers
 - 7. Nameplates shall include equipment designation, supply voltage, secondary voltage (for transformers) and feeder source designation.
- C. Label Installation:
 - 1. Install label parallel to equipment lines.

2. Install label for identification of individual control device stations.
3. Install labels for permanent adhesion and seal with clear lacquer.

D. Wire Marker Installation:

1. Install wire marker for each conductor at panelboard gutters, pull boxes, outlet and junction boxes.
2. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.
3. Install label for identification of health care facilities receptacles per NEC Article 517.
4. Install labels at data outlets identifying patch panel and port designation.

E. Underground Warning Tape Installation:

1. Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches below finished grade, directly above buried conduit, raceway, or cable.

END OF SECTION

SECTION 26 51 16 – INTERIOR LIGHTING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes interior luminaires, lamps, ballasts and accessories.

1.02 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C82.1 – American National Standard for Lamp Ballast-Line Frequency Fluorescent Lamp Ballast.
 - 2. ANSI C82.4 – American National Standard for Ballasts-for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).

1.03 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures.
- B. Shop Drawings: Indicate dimensions and components for each luminaire not standard product of manufacturer.
- C. Product Data: Submit dimensions, ratings, and performance data.
- D. Samples: Submit two color chips 3 by 3 inch in size illustrating luminaire finish color where indicated in luminaire schedule.

1.04 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years of experience.

PART 2 PRODUCTS

2.01 INTERIOR LUMINAIRES

- A. Product Description: Complete interior luminaire assemblies, with features, options and accessories as scheduled on Drawings.
- B. Refer to Section 01 60 00 – Product Requirements for product options.

2.02 LED LIGHTING

- A. Luminaires
 - 1. The luminaire manufacturer shall be registered as a DOE Quality Advocate.

2. Shall meet DOE's Energy Star or Design Light Consortium performance criteria.
3. The luminaire manufacturer shall provide the manufacturer's name of the LED being used in the luminaire.
4. Shall be UL or ETL listed and be furnished complete with LEDs and power supplies.
5. LED light source packages, arrays or modules used in the luminaire shall be tested in accordance with LM-80 lumen depreciation test. Provide test results of each unique package, array or module. The L70 rated life result shall be a minimum of 50,000 hours.
6. Shall be tested in accordance with LM-79-08 electrical and photometric measurements. Provide test results of each unique luminaire.
7. The CCT shall be 4000K unless otherwise approved. The CRI shall be ≥ 80 .
8. Each luminaire shall have a power factor ≥ 90 percent.
9. In instances where the LED sources are to be mounted directly into the architecture, such as installing a strip LED by using an adhesive tape, the LED manufacturer shall provide a recommended heat sink volume adequate to achieve rated life at L70.
10. Each luminaire shall carry a 3-year minimum product warranty covering failure of ALL electrical components.

B. Power Supplies

1. LED power supplies shall operate LEDs within the current limit specification of the manufacturer.
2. Shall operate from 60Hz input source and have input power factor > 90 percent and a minimum efficiency of 70 percent at full rated load of the driver.
3. Shall have short circuit and overload protection.
4. Shall have a minimum starting temperature of 0 degrees F and a maximum case temperature rating of at least 70 degrees C.
5. Power supply output shall be regulated to ± 5 percent across published load range.
6. Shall have a Class A sound rating.
7. Shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47CFR part 15, non-consumer (Class A) for EMI/RFI.
8. Shall contain no PCBs.
9. Shall carry a 3-year minimum warranty from date of manufacturer against defects

in material or workmanship, including a replacement, for operation at or below the maximum case temperature specification. (For LED lamps and internal power regulation components for defects resulting in a fixture lumen depreciation >30 percent.)

10. Dimmable power supplies shall allow the light output to be maintained at the lowest control setting (prior to off) without dropping out.

PART 3 EXECUTION

3.01 EXISTING WORK

- A. Disconnect and remove abandoned luminaires, lamps and accessories.
- B. Extend existing interior luminaire installations using materials and methods compatible with existing installations or as specified.
- C. Clean and repair existing interior luminaires to remain or to be reinstalled.

3.02 INSTALLATION

- A. Install suspended luminaires using pendants supported from swivel hangers. Install pendant length required to suspend luminaire at indicated height.
- B. Support luminaires 2 x 2 foot size and larger independent of ceiling framing.
- C. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
- D. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- E. Exposed Grid Ceilings: Support surface-mounted luminaires on grid ceiling directly from building structure.
- F. Install recessed luminaires to permit removal from below.
- G. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- H. Install clips to secure recessed grid-supported luminaires in place.
- I. Install wall-mounted luminaires at height as indicated on Drawings or as scheduled.
- J. Install accessories furnished with each luminaire.
- K. Connect luminaires to branch circuit outlets provided under Section 26 05 33 using 1/2" min. x 6'-0" max. flexible conduit, or type MC cable where allowed under other sections of this specification.
- L. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

- M. Install specified lamps in each luminaire.
- N. Interface with air handling accessories furnished and installed under Section 23 37 00.
- O. Ground and bond interior luminaires in accordance with Section 26 05 26.

3.03 FIELD QUALITY CONTROL

- A. Section 01 40 00 – Quality Requirements and Section 01 70 00 – Execution and Closeout Requirements: Field inspecting, testing, adjusting and balancing.
- B. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.04 ADJUSTING

- A. Section 01 70 00 – Execution and Closeout Requirements: Testing, adjusting and balancing.
- B. Aim and adjust luminaires [as indicated on Drawings].

3.05 CLEANING

- A. Section 01 70 00 – Execution and Closeout Requirements: Final cleaning.
- B. Remove dirt and debris from enclosures.
- C. Clean photometric control surfaces as recommended by manufacturer.
- D. Clean finishes and touch up damage.

3.06 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 – Execution and Closeout Requirements: Protecting finished work.
- B. Relamp luminaires [having failed lamps] at Substantial Completion.

END OF SECTION

SECTION 27 05 29 – HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Conduit supports.
 - 2. Formed steel channel.
 - 3. Spring steel clips.
- B. Related Sections:
 - 1. Section 26 05 29 - Hangers and Supports for Communications Systems.
 - 2. Section 28 05 29 - Hangers and Supports for Electronic Safety and Security.

1.02 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
 - 1. Hangers and Supports: Submit manufacturer's catalog data including load capacity.
- C. Design Data: Indicate load carrying capacity of [trapeze hangers] [and] [hangers and supports].
- D. Manufacturer's Installation Instructions:
 - 1. Hangers and Supports: Submit special procedures and assembly of components.

1.03 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

PART 2 PRODUCTS

2.01 CONDUIT SUPPORTS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.
- C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
- D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.
- E. Conduit clamps - general purpose: One hole plated steel for surface mounted conduits.
- F. Cable Ties: High strength nylon temperature rated to 185 degrees F. Self locking.

2.02 FORMED STEEL CHANNEL

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.03 SPRING STEEL CLIPS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Product Description: Mounting hole and screw closure.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.

3.02 INSTALLATION - HANGERS AND SUPPORTS

- A. Anchors and Fasteners:
 - 1. Concrete Structural Elements: Provide precast inserts, expansion anchors or preset inserts.

2. Steel Structural Elements: Provide beam clamps or spring steel clips.
 3. Concrete Surfaces: Provide expansion anchors.
 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts.
 5. Solid Masonry Walls: Provide expansion anchors.
 6. Sheet Metal: Provide sheet metal screws.
 7. Wood Elements: Provide wood screws.
- B. Install conduit and raceway support and spacing in accordance with NEC.
- C. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
- D. Install multiple conduit runs on common hangers.
- E. Supports:
1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
 2. Install surface mounted cabinets and panelboards with minimum of four anchors.
 3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch off wall.
 4. Support vertical conduit at every floor.
- G. Install Work in accordance with referenced standards and authority having jurisdiction.

3.04 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Seal with mechanical sleeve seals as specified in this section.
- B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.
- C. Set sleeves in position in forms. Provide reinforcing around sleeves.
- D. Size sleeves large enough to allow for movement due to expansion and contraction.
- E. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

END OF SECTION

SECTION 27 05 33 – CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.
- B. Related Sections:
 - 1. Section 26 05 33 - Raceway Systems.
 - 2. Section 26 05 27 - Wiring Devices.
 - 3. Section 27 05 29 - Hangers and Supports for Communications Systems.
 - 4. Section 27 05 53 - Identification for Communications Systems.
 - 5. Section 28 05 33 - Conduits and Backboxes for Electronic Safety and Security.

1.02 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
 - 2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
 - 3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).
- B. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
 - 3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 - 6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
 - 7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.03 SYSTEM DESCRIPTION

- A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Unless otherwise noted on Drawings, provide materials in various locations as allowed.
- B. Underground More than 5 feet Outside Found Wall: Provide Schedule 40 nonmetallic conduit. Provide rigid galvanized elbows or nonmetallic handhole.
- C. In or Under Slab on Grade: Provide Schedule 40 nonmetallic conduit.
- D. Outdoor Locations, Above Grade: Provide rigid steel conduit or intermediate metal conduit with galvanized rigid elbows, pull, and junction boxes.
- E. In Slab Above Grade: Electrical metallic tubing.
- F. Wet and Damp Locations: Provide rigid steel or intermediate metal conduit.
- G. Concealed Dry Locations: Provide electrical metallic tubing.
- H. Exposed Dry Locations: Provide rigid steel conduit or intermediate metal conduit. Provide to a minimum of 3 feet above floor level. Provide electrical metallic tubing at other exposed dry locations. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

1.04 DESIGN REQUIREMENTS

- A. Minimum Raceway Size: 3/4 inch unless otherwise specified.

1.05 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures.
- B. Product Data: Submit for the following as applicable for the process:
 - 1. Flexible metal conduit.
 - 2. Liquidtight flexible metal conduit.
 - 3. Nonmetallic conduit.
 - 4. Flexible nonmetallic conduit.
 - 5. Nonmetallic tubing.
 - 6. Raceway fittings.
 - 7. Conduit bodies.
 - 8. Surface raceway.
 - 9. Wireway.

10. Pull and junction boxes.

11. Handholes.

1.06 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents:

1. Record actual routing of conduits larger than 2 inch.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

C. Protect PVC conduit from sunlight.

1.08 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate installation of outlet boxes for equipment connected under Section 26 05 03.

C. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

PART 2 PRODUCTS

2.01 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Rigid Aluminum Conduit: ANSI C80.5.

C. Intermediate Metal Conduit (IMC): Rigid steel.

D. Fittings and Conduit Bodies: NEMA FB 1; [material to match conduit.] [furnish aluminum fittings with steel conduit.] [all steel fittings.]

2.02 PVC COATED METAL CONDUIT

A. Product Description: NEMA RN 1; rigid steel conduit with external PVC coating, 40 mil thick.

B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.03 FLEXIBLE METAL CONDUIT

- A. Product Description: Interlocked [steel] [aluminum] construction.
- B. Fittings: NEMA FB 1.

2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- A. Product Description: UL Listed, Interlocked steel construction with PVC jacket and integral copper bonding strip. Non-UL Listed products are not acceptable.
- B. Fittings: NEMA FB 1.

2.05 ELECTRICAL METALLIC TUBING (EMT)

- A. Product Description: ANSI C80.3; galvanized tubing.
- B. Fittings and Conduit Bodies: NEMA FB 1; steel compression, die cast compression, or steel set screw type. Die cast set screw or indenter types are not acceptable.

2.06 NONMETALLIC CONDUIT

- A. Product Description: NEMA TC 2; Schedule 40 or 80 PVC.
- B. Fittings and Conduit Bodies: NEMA TC 3.

2.07 SURFACE RACEWAY

- A. Product Description: Channel with fitted cover, suitable for use as surface metal raceway, size and type as indicated on the Drawings.
- B. Finish: Gray
- C. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories; match finish on raceway.

2.08 WIREWAY

- A. Product Description: General purpose indoors or raintight outdoors.
- B. Knockouts: All knockouts are to be cold punched.
- C. Size: Length as indicated on Drawings.
- D. Cover: Hinged cover.
- E. Connector: Slip-in.
- F. Fittings: Lay-in type.
- G. Finish: Galvanized in mechanical rooms and unfinished areas; gray powder coated in finished areas and outdoors.

2.09 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.
 - 2. Concrete Ceiling and Wall Boxes: Concrete type.
- B. Cast Boxes: NEMA FB 1, Type FD, cast ferrous alloy. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.
- C. Wall Plates for Finished Areas: As specified in Section 26 27 26.
- D. Wall Plates for Unfinished Areas: Furnish electro-galvanized cover.

2.10 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Hinged Enclosures: As specified in Section 26 27 16.
- C. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting:
 - 1. Material: Galvanized cast iron.
 - 2. Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.
 - 3. Cover Legend: "ELECTRIC".
- D. Fiberglass Concrete Composite Handholes: Die-molded, concrete composite hand holes:
 - 1. Cable Entrance: Pre-cut 6 inch x 6 inch cable entrance at center bottom of each side.
 - 2. Cover: Glass-fiber concrete composite, weatherproof cover with nonskid finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.02 EXISTING WORK

- A. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces.

- B. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.
- C. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.
- D. Extend existing raceway and box installations using materials and methods compatible with existing electrical installations, and as specified.
- E. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.03 INSTALLATION

- A. Ground and bond raceway and boxes in accordance with Section 26 05 26.
- B. Fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.
- C. Identify raceway and boxes in accordance with Section 26 05 53.
- D. Arrange raceway and boxes to maintain headroom and present neat appearance.

3.04 INSTALLATION - RACEWAY

- A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.
- B. Arrange raceway supports to prevent misalignment during wiring installation.
- C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 26 05 29; provide space on each for 25 percent additional raceways.
- E. Do not support raceway with wire or perforated pipe straps. Do not reuse wire used for temporary supports
- F. Do not attach raceway to ceiling support wires or other piping systems.
- G. Construct wireway supports from steel channel specified in Section 26 05 29.
- H. Route exposed raceway parallel and perpendicular to walls.
- I. Route raceway installed above accessible ceilings parallel and perpendicular to walls.
- J. Route conduit in and under slab from point-to-point.
- K. Maximum Size Conduit in Slab Above Grade: 3/4 inch. Do not cross conduits in slab larger than 1/2 inch. Place conduits immediately below reinforcing steel and tie to steel to maintain this position during pour. In slab on grade pours, larger conduits may be placed in fill below bottom of pour.

- L. Maintain clearance between raceway and piping for maintenance purposes.
- M. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.
- N. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- O. Bring conduit to shoulder of fittings; fasten securely.
- P. Wipe non-metallic conduit dry and clean before joining. Join non-metallic conduit using both precleaner and cement as recommended by manufacturer. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.
- Q. Install conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations.
- R. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Utilize hydraulic one-shot bender to fabricate or factory elbows for bends in metal conduit larger than 2 inch size.
- S. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
- T. Install fittings to accommodate expansion and deflection where raceway crosses expansion joints.
- U. Install suitable pull string or cord in each empty raceway except sleeves and nipples.
- V. Install suitable caps to protect installed conduit against entrance of dirt and moisture.
- W. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.
- X. Close ends and unused openings in wireway.

3.05 INSTALLATION - BOXES

- A. Install wall mounted boxes at elevations to accommodate mounting heights as indicated on Drawings.
- B. Adjust box location up to 10 feet prior to rough-in to accommodate intended purpose.
- C. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.
- D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- E. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- F. Where lay-in type fixtures are installed in plaster frames.

- G. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- H. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches separation. Install with minimum 24 inches separation in acoustic rated walls.
- I. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- J. Install stamped steel bridges to fasten flush mounting outlet box between studs.
- K. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- L. Install adjustable steel channel fasteners for hung ceiling outlet box.
- M. Do not fasten boxes to ceiling support wires or other piping systems.
- N. Support boxes independently of conduit.
- O. Install gang box where more than one device is mounted together. Do not use sectional box.
- P. Install gang box with plaster ring for single device outlets.

3.06 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with Section 07 84 00.
- B. Locate outlet boxes to allow luminaires positioned as indicated on Drawings.
- C. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.07 ADJUSTING

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closures in unused openings in boxes.

3.08 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 27 05 53 – IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Nameplates.
2. Labels.
3. Wire markers.
4. Conduit markers.
5. Stencils.

B. Related Sections:

1. Section 09 90 00 - Painting and Coating: Execution requirements for painting specified by this section.
2. Section 26 05 53 - Identification for Electrical Systems.
3. Section 28 05 53 - Identification for Communications Systems.

1.02 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data:

1. Submit manufacturer's catalog literature for each product required.
2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.

1.03 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of tagged devices; include tag numbers.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with referenced standards and authority having jurisdiction.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept identification products on site in original containers. Inspect for damage.
- C. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- D. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Install labels and namplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 PRODUCTS

2.01 NAMEPLATES

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Product Description: Laminated three-layer plastic with engraved black letters on white contrasting background color.
- C. Letter Size:
 - 1. 1/8 inch high letters for identifying individual equipment and loads.
 - 2. 1/8 inch high letters for identifying grouped equipment and loads.
- D. Minimum nameplate thickness: 1/8 inch.

2.02 LABELS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background.

2.03 WIRE MARKERS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.

- B. Description: Split sleeve type wire markers.
- C. Legend:
 - 1. Power and Lighting Circuits: Branch circuit or feeder number.
 - 2. Control Circuits: Control wire number as indicated on schematic and interconnection diagrams.

2.04 CONDUIT AND RACEWAY MARKERS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Description: Nameplate fastened with adhesive.
- C. Color:
 - 1. Telephone System: Blue lettering on white background.
- D. Legend:
 - 1. Telephone System: TELEPHONE

2.05 STENCILS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Stencils: With clean cut symbols and letters of following size:
 - 1. Up to 2 inches Outside Diameter of Raceway: 1/2 inch high letters.
 - 2. 2-1/2 to 6 inches Outside Diameter of Raceway: 1 inch high letters.
- C. Stencil Paint: As specified in Section 09 90 00 semi-gloss enamel, colors conforming to the following:
 - 1. Black lettering on white background.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

3.02 EXISTING WORK

- A. Install identification on existing equipment to remain in accordance with this section.

- B. Install identification on unmarked existing equipment.
- C. Replace lost nameplates, labels and markers.
- D. Re-stencil existing equipment.

3.03 INSTALLATION

- A. Install identifying devices after completion of painting.
- B. Nameplate Installation:
 - 1. Install nameplate parallel to equipment lines.
 - 2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.
 - 3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
 - 4. Secure nameplate to equipment front using adhesive.
 - 5. Secure nameplate to inside surface of door on recessed panels in finished locations.
 - 6. Install nameplates for the following:
 - a. [_____].
- C. Label Installation:
 - 1. Install label parallel to equipment lines.
 - 2. Install label for identification of individual control device stations.
 - 3. Install labels for permanent adhesion and seal with clear lacquer.
- D. Wire Marker Installation:
 - 1. Install wire marker for each conductor at [pull boxes,] [outlet and junction boxes,] [_____,] [and] each [_____].
- E. [Conduit] [Raceway] Marker Installation:
 - 1. Install [conduit] [raceway] marker for each [conduit] [raceway] longer than [6] [_____] feet.
 - 2. [Conduit] [Raceway] Marker Spacing: [20] [_____] feet on center.
 - 3. Raceway Painting: Identify conduit using field painting in accordance with Section [09 90 00.] [_____.]
 - a. Paint [colored band on] each conduit longer than [6] [_____] feet.

- b. Paint bands [20] [] feet on center.
- c. Color:

1) Telephone System: [Green.] []

F. Stencil Installation:

- 1. Apply stencil painting in accordance with Section 09 90 00.

G. Underground Warning Tape Installation:

- 1. Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches below finished grade, directly above buried conduit, raceway, or cable.

END OF SECTION

SECTION 28 05 29 – HANGERS AND SUPPORTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Conduit supports.
 - 2. Formed steel channel.
 - 3. Spring steel clips.
- B. Related Sections:
 - 1. Section 26 05 29 - Hangers and Supports for Electrical Systems.
 - 2. Section 27 05 29 - Hangers and Supports for Communications Systems.

1.02 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
 - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
- C. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
- D. Design Data: Indicate load carrying capacity of hangers and supports.
- E. Manufacturer's Installation Instructions:
 - 1. Hangers and Supports: Submit special procedures and assembly of components.

1.03 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical

damage, by storing in original packaging.

PART 2 PRODUCTS

2.01 CONDUIT SUPPORTS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.
- C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
- D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.
- E. Conduit clamps - general purpose: One hole malleable iron for surface mounted conduits.
- F. Cable Ties: High strength nylon temperature rated to 185 degrees F. Self locking.

2.02 FORMED STEEL CHANNEL

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.03 SPRING STEEL CLIPS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Product Description: Mounting hole and screw closure.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.

3.02 INSTALLATION - HANGERS AND SUPPORTS

- A. Anchors and Fasteners:
 - 1. Concrete Structural Elements: Provide precast inserts, expansion anchors, or

preset inserts.

2. Steel Structural Elements: Provide beam clamps or spring steel clips.
 3. Concrete Surfaces: Provide expansion anchors.
 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts.
 5. Solid Masonry Walls: Provide expansion anchors.
 6. Sheet Metal: Provide sheet metal screws.
 7. Wood Elements: Provide wood screws.
- B. Install conduit and raceway support and spacing in accordance with NEC.
- C. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
- D. Install multiple conduit runs on common hangers.
- E. Supports:
1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
 2. Install surface mounted cabinets and panelboards with minimum of four anchors.
 3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch off wall.
- F. Install Work in accordance with referenced standards and authority having jurisdiction.

3.03 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment. Refer to Section 03 30 00.
- B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of steel members or formed steel channel. Brace and fasten with flanges bolted to structure.

3.04 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Seal with adjustable interlocking rubber links.
- B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.
- C. Set sleeves in position in forms. Provide reinforcing around sleeves.
- D. Size sleeves large enough to allow for movement due to expansion and contraction.

Provide for continuous insulation wrapping.

- E. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.
- F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with stuffing or fire stopping insulation as required and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- G. Install chrome plated steel escutcheons at finished surfaces.

END OF SECTION

SECTION 28 05 33 – CONDUITS AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.
- B. Related Sections:
 - 1. Section 26 05 33 - Raceway and Boxes for Electrical Systems.
 - 2. Section 26 05 27 - Wiring Devices.
 - 3. Section 27 05 33 - Conduits and Backboxes for Communications Systems.
 - 4. Section 28 05 29 - Hangers and Supports for Electronic Safety and Security.
 - 5. Section 28 05 53 - Identification for Electronic Safety and Security.

1.02 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
 - 2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
 - 3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).
- B. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
 - 3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 - 6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
 - 7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.03 SYSTEM DESCRIPTION

- A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Unless otherwise noted on Drawings, provide materials in various locations as allowed.
- B. Underground More than 5 feet Outside Found Wall: Provide Schedule 40 nonmetallic conduit. Provide rigid galvanized elbows or nonmetallic handhole.
- C. In or Under Slab on Grade: Provide Schedule 40 nonmetallic conduit.
- D. Outdoor Locations, Above Grade: Provide rigid steel conduit or intermediate metal conduit with galvanized rigid elbows, pull, and junction boxes.
- E. In Slab Above Grade: Electrical metallic tubing.
- F. Wet and Damp Locations: Provide rigid steel or intermediate metal conduit.
- G. Concealed Dry Locations: Provide electrical metallic tubing.
- H. Exposed Dry Locations: Provide rigid steel conduit or intermediate metal conduit. Provide to a minimum of 3 feet above floor level. Provide electrical metallic tubing at other exposed dry locations. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

1.04 DESIGN REQUIREMENTS

- A. Minimum Raceway Size: 3/4 inch unless otherwise specified.

1.05 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit for the following:
 - 1. Flexible metal conduit.
 - 2. Liquidtight flexible metal conduit.
 - 3. Nonmetallic conduit.
 - 4. Flexible nonmetallic conduit.
 - 5. Nonmetallic tubing.
 - 6. Raceway fittings.
 - 7. Conduit bodies.
 - 8. Surface raceway.

- 9. Wireway.
- 10. Pull and junction boxes.
- 11. Handholes.

1.06 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents:
 - 1. Record actual routing of conduits larger than 2 inch.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- C. Protect PVC conduit from sunlight.

1.08 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate installation of outlet boxes for equipment connected under Section 26 05 03.
- C. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

PART 2 PRODUCTS

2.01 METAL CONDUIT

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Rigid Aluminum Conduit: ANSI C80.5.
- C. Intermediate Metal Conduit (IMC): Rigid steel.
- D. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit

2.02 PVC COATED METAL CONDUIT

- A. Product Description: NEMA RN 1; rigid steel conduit with external PVC coating, 40 mil thick.
- B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to

match conduit.

2.03 FLEXIBLE METAL CONDUIT

- A. Product Description: Interlocked steel construction.
- B. Fittings: NEMA FB 1.

2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- A. Product Description: UL Listed, Interlocked steel construction with PVC jacket and integral copper bonding strip. Non-UL Listed products are not acceptable.
- B. Fittings: NEMA FB 1.

2.05 ELECTRICAL METALLIC TUBING (EMT)

- A. Product Description: ANSI C80.3; galvanized tubing.
- B. Fittings and Conduit Bodies: NEMA FB 1; steel compression, die cast compression, or steel set screw type. Die cast set screw or indenter types are not acceptable.

2.06 NONMETALLIC CONDUIT

- A. Product Description: NEMA TC 2; Schedule 40 or 80 PVC.
- B. Fittings and Conduit Bodies: NEMA TC 3.

2.07 WIREWAY

- A. Product Description: General purpose indoors or raintight outdoors.
- B. Knockouts: All knockouts are to be cold punched.
- C. Size: Length as indicated on Drawings.
- D. Cover: Hinged cover.
- E. Connector: Slip-in.
- F. Fittings: Lay-in type.
- G. Finish: Galvanized in mechanical rooms and unfinished areas; gray powder coated in finished areas and outdoors.

2.08 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.

2. Concrete Ceiling and Wall Boxes: Concrete type.
- B. Cast Boxes: NEMA FB 1, Type FD, cast ferrous alloy. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.
- C. Wall Plates for Finished Areas: As specified in Section 26 07 26.
- D. Wall Plates for Unfinished Areas: Furnish electro-galvanized cover.

2.09 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Hinged Enclosures: As specified in Section 26 07 16.
- C. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting:
 1. Material: Galvanized cast iron.
 2. Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.
 3. Cover Legend: "ELECTRIC".
- D. Fiberglass Concrete Composite Handholes: Die-molded, concrete composite hand holes:
 1. Cable Entrance: Pre-cut 6 inch x 6 inch cable entrance at center bottom of each side.
 2. Cover: Glass-fiber concrete composite, weatherproof cover with nonskid finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.02 EXISTING WORK

- A. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces.
- B. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.
- C. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.

- D. Extend existing raceway and box installations using materials and methods compatible with existing electrical installations, and as specified.
- E. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.03 INSTALLATION

- A. Ground and bond raceway and boxes in accordance with Section 26 05 26.
- B. Fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.
- C. Identify raceway and boxes in accordance with Section 26 05 53.
- D. Arrange raceway and boxes to maintain headroom and present neat appearance.

3.04 INSTALLATION - RACEWAY

- A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.
- B. Arrange raceway supports to prevent misalignment during wiring installation.
- C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 26 05 29; provide space on each for 25 percent additional raceways.
- E. Do not support raceway with wire or perforated pipe straps. Do not reuse wire used for temporary supports
- F. Do not attach raceway to ceiling support wires or other piping systems.
- G. Construct wireway supports from steel channel specified in Section 26 05 29.
- H. Route exposed raceway parallel and perpendicular to walls.
- I. Route raceway installed above accessible ceilings parallel and perpendicular to walls.
- J. Route conduit in and under slab from point-to-point.
- K. Maximum Size Conduit in Slab Above Grade: 3/4 inch. Do not cross conduits in slab larger than 1/2 inch. Place conduits immediately below reinforcing steel and tie to steel to maintain this position during pour. In slab on grade pours, larger conduits may be placed in fill below bottom of pour.
- L. Maintain clearance between raceway and piping for maintenance purposes.
- M. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.

- N. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- O. Bring conduit to shoulder of fittings; fasten securely.
- P. Join nonmetallic conduit using both precleaner and cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.
- Q. Install conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations.
- R. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Utilize hydraulic one-shot bender to fabricate or factory elbows for bends in metal conduit larger than 2 inch size.
- S. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
- T. Install fittings to accommodate expansion and deflection where raceway crosses expansion joints.
- U. Install suitable pull string or cord in each empty raceway except sleeves and nipples.
- V. Install suitable caps to protect installed conduit against entrance of dirt and moisture.
- W. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.
- X. Close ends and unused openings in wireway.

3.05 INSTALLATION - BOXES

- A. Install wall mounted boxes at elevations to accommodate mounting heights as indicated on Drawings.
- B. Adjust box location up to 10 feet prior to rough-in to accommodate intended purpose.
- C. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.
- D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- E. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- F. Where lay-in type fixtures are installed in plaster frames.
- G. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- H. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches separation. Install with minimum 24 inches separation in acoustic rated walls.

- I. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- J. Install stamped steel bridges to fasten flush mounting outlet box between studs.
- K. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- L. Install adjustable steel channel fasteners for hung ceiling outlet box.
- M. Do not fasten boxes to ceiling support wires or other piping systems.
- N. Support boxes independently of conduit.
- O. Install gang box where more than one device is mounted together. Do not use sectional box.
- P. Install gang box with plaster ring for single device outlets.

3.06 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with Section 07 84 00.
- B. Locate outlet boxes to allow luminaires positioned as indicated on Drawings.
- C. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.07 ADJUSTING

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closures in unused openings in boxes.

3.08 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 28 05 53 – IDENTIFICATION FOR ELECTRONIC SAFETY AND SECURITY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Nameplates.
2. Labels.
3. Wire markers.
4. Conduit markers.
5. Stencils.

B. Related Sections:

1. Section 09 90 00 - Painting and Coating: Execution requirements for painting specified by this section.
2. Section 26 05 53 - Identification for Electrical Systems.
3. Section 27 05 53 - Identification for Communications Systems.

1.02 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data:

1. Submit manufacturer's catalog literature for each product required.
2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.

1.03 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of tagged devices; include tag numbers.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with referenced standards and authority having jurisdiction.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept identification products on site in original containers. Inspect for damage.
- C. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- D. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Install labels and namplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 PRODUCTS

2.01 NAMEPLATES

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Product Description: Laminated three-layer plastic with engraved black letters on white contrasting background color.
- C. Letter Size:
 - 1. 1/8 inch high letters for identifying individual equipment and loads.
 - 2. 1/8 inch high letters for identifying grouped equipment and loads.
- D. Minimum nameplate thickness: 1/8 inch.

2.02 LABELS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background.

2.03 WIRE MARKERS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.

- B. Description: Split sleeve type wire markers.
- C. Legend:
 - 1. Power and Lighting Circuits: Branch circuit or feeder number.
 - 2. Control Circuits: Control wire number as indicated on schematic and interconnection diagrams.

2.04 CONDUIT AND RACEWAY MARKERS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Description: Nameplate fastened with adhesive.
- C. Color:
 - 1. Red lettering on white background.
- D. Legend:
 - 1. Fire Alarm System: FIRE ALARM.

2.05 STENCILS

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Stencils: With clean cut symbols and letters of following size:
 - 1. Up to 2 inches Outside Diameter of Raceway: 1/2 inch high letters.
 - 2. 2-1/2 to 6 inches Outside Diameter of Raceway: 1 inch high letters.
- C. Stencil Paint: As specified in Section 09 90 00 semi-gloss enamel, colors conforming to the following:
 - 1. Black lettering on white background.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

3.02 EXISTING WORK

- A. Install identification on existing equipment to remain in accordance with this section.

- B. Install identification on unmarked existing equipment.
- C. Replace lost nameplates, labels and markers.
- D. Re-stencil existing equipment.

3.03 INSTALLATION

- A. Install identifying devices after completion of painting.
- B. Nameplate Installation:
 - 1. Install nameplate parallel to equipment lines.
 - 2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.
 - 3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
 - 4. Secure nameplate to equipment front using adhesive.
 - 5. Secure nameplate to inside surface of door on recessed panels in finished locations.
 - 6. Install nameplates for the following:
 - a. Panels.
- C. Label Installation:
 - 1. Install label parallel to equipment lines.
 - 2. Install label for identification of individual control device stations.
 - 3. Install labels for permanent adhesion and seal with clear lacquer.
- D. Wire Marker Installation:
 - 1. Install wire marker for each conductor at panelboard gutters, pull boxes, outlet and junction boxes.
 - 2. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.
 - 3. Install labels at data outlets identifying patch panel and port designation.
- E. Stencil Installation:
 - 1. Apply stencil painting in accordance with Section 09 90 00.
- F. Underground Warning Tape Installation:

1. Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches below finished grade, directly above buried conduit, raceway, or cable.

END OF SECTION

SECTION 28 13 00 – ACCESS CONTROL

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes security access devices in renovated areas to directly interface with and match Owner's existing security/access control systems.
- B. Related Sections:
 - 1. Section 08 71 00 - Door Hardware.
 - 2. Section 28 05 53 - Identification for Electronic Safety and Security.

1.02 SYSTEM DESCRIPTION

- A. Security Access System: Control access to building and selected areas using encoded cards and coded key pads. All devices shall match Owner's existing installations.

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate system wiring diagram showing each device and wiring connection; indicate annunciator layout, sequence of operation.
- C. Product Data: Submit catalog data showing electrical characteristics and connection requirements.
- D. Test Reports: Indicate procedures and results for specified field testing and inspection.
- E. Manufacturer's Field Reports: Indicate activities on site, adverse findings, and recommendations.
- F. Any differences from Owner's existing installed devices that are required due to product discontinuation, et cetera shall be noted in the submittal.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of security access equipment.
- C. Operation and Maintenance Data: Submit manufacturer's standard operating and maintenance instructions.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section

with minimum three years experience, and with service facilities within 100 miles of project.

- B. Installer: Certified security system installer with service facilities within 100 miles of Project.

1.06 MAINTENANCE SERVICE

- A. Section 01 70 00 - Execution and Closeout Requirements: Maintenance service.
- B. Furnish service and maintenance of security access equipment for one year from Date of Substantial Completion.

1.07 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

PART 2 PRODUCTS

- 2.01 GENERAL REQUIREMENTS – all devices shall interface with and match Owner's existing security/access system.

PART 3 EXECUTION

3.01 EXISTING WORK

- A. Remove exposed abandoned security access wiring, including abandoned wiring above accessible ceiling finishes. Cut cable flush with walls and floors, and patch surfaces.
- B. Disconnect and remove abandoned security access equipment.
- C. Maintain access to existing security access equipment and other installations remaining active and requiring access. Modify installation or provide access panel.
- D. Extend existing security access installations using materials and methods compatible with existing installations, or as specified.
- E. Clean and repair existing security access equipment to remain or to be reinstalled.

3.02 INSTALLATION

- A. Install 16 AWG minimum size conductors for circuit conductors. Install wiring in conduit.
- B. Install conduit and wiring connections to door hardware devices.
- C. Install engraved plastic nameplates in accordance with Section 28 05 53.
- D. Ground and bond security access equipment and circuits in accordance with Section 26 05 26.

3.03 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements and/or 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Test in accordance with manufacturer's recommendations.

3.04 MANUFACTURER'S FIELD SERVICES

- A. Section 01 40 00 - Quality Requirements: Manufacturer's field services.
- B. Furnish services of technician to supervise installation, adjustments, final connections, system testing, and Owner training.

3.05 DEMONSTRATION AND TRAINING

- A. Furnish one hour of instruction, to be conducted at project site with manufacturer's representative.

END OF SECTION

SECTION 28 31 00 – FIRE ALARM AND SMOKE DETECTION SYSTEM

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Modifications to existing addressable fire alarm system to include the following:
1. Audible voice and visual notification in the remodel areas to include removal of certain existing devices and providing new devices.
 2. Addition of certain additional devices including but not limited to items such as additional supervised addressable relays.
 3. All programming modifications as required to provide a complete and working system.
 4. Temporary protection of existing system including measures such as temporary substitution of heat detectors for smoke detectors in dust prone areas.
 5. The contractor shall be responsible for providing the design of the system. The design shall be performed either by a Engineer Licensed in the State of Texas with appropriate expertise, or by a "Fire Alarm Planning Superintendent" licensed by the Texas State Fire Marshal's Office and as provided for by the Texas Board of Professional Engineers Policy Advisory dated April 22, 2004, titled "Planning of Fire Alarm Systems."

1.02 REFERENCES

- A. The documents or portions thereof listed in this section shall be considered part of the requirements of this document.
1. NFPA 1: Uniform Fire Code
 2. NFPA 13: Standard for the Installation of Sprinkler Systems
 3. NFPA 14: Standard for the Installation of Standpipe and Hose Systems
 4. NFPA 70: National Electrical Code
 5. NFPA 72: National Fire Alarm Code
 6. NFPA 90A: Standard for the Installation of Air-Conditioning and Ventilating Systems
 7. NFPA 101: Life Safety Code
 8. NFPA 5000: Building Construction and Safety Code
 9. IBC: International Building Code
 10. IFC: International Fire Code

11. UL Standard 268: Smoke Detectors for Fire Protective Signaling Systems
12. UL Standard 268A: Smoke Detectors for Duct Application
13. UL Standard 346: Waterflow Indicators for Fire Protective Signaling Systems
14. UL Standard 521: Heat Detectors for Fire Protective Signaling Systems
15. UL Standard 864: Control Units for Fire Protective Signaling Systems
16. UL Standard 1424: Cables for Power-Limited Fire Protective Signaling Systems
17. UL Standard 1480: Speakers for Fire Protective Signaling Systems
18. UL Standard 1481: Power Supplies for Fire Protective Signaling Systems
19. UL Standard 1711: Amplifiers for Fire Protective Signaling Systems
20. UL Standard 1971: Signaling Devices for the Hearing Impaired
21. ADA: Americans with Disabilities Act
22. TAS: Texas Accessibility Standards
23. American Society of Mechanical Engineers (ASME)/American National Standards Institute (ANSI):
 - a. ANSI A17.1: Elevator Code, latest edition.
 - b. ANSI A17.3: Elevator Code for Existing Elevators, latest edition.
 - c. ANSI A117.1: Accessibility Code, latest edition.

1.03 QUALITY ASSURANCE

A. Installer Qualifications:

1. Authorized and designated representative of fire alarm manufacturer to sell, install, and service proposed manufacturer's equipment. Verify equipment supplier has technical factory training specifically for the system proposed.
2. Licensed by State Fire Marshal to sell, install and service fire alarm systems.
3. Actively engaged in business of selling, installing and servicing fire alarm systems for at least five years with minimum of ten such installations completed and operating properly.
4. Equipment furnished shall be of current manufacture.

B. The equipment furnished shall be listed and approved by a testing laboratory that has been approved by the State of Texas Commission on Fire Safety. This listing shall be for all functions required by this specification.

- C. The Contractor shall provide a signed "Fire Alarm Certification and Description" for each system, consisting of completed copies of the appropriate pages from NFPA 72, at the final Acceptance Test.
- D. Provide staff installation superintendents who are licensed by the State Fire Marshal's office for such purpose and under whose supervision installation, final connections, and testing will be performed.
- E. All systems must comply with applicable paragraphs of the National Electric Code.

1.04 SUBMITTALS

Prior to installation, the following documents shall be provided to the Owner for reference and/or approval:

- A. Shop Drawings: Include manufacturer's name, model numbers, ratings, power requirements, equipment layout, conduit, device arrangement, and complete point to point wiring diagrams along with other required information including but not limited to:
 - 1. General Drawing Notes.
 - 2. Electrical back box requirements.
 - 3. Control Equipment Schedules.
 - 4. Panel Schematics showing all connections, between modules within panels, to all modules from field wiring with zones identified.
 - 5. Riser Diagrams indicating circuits, type of devices, number of devices, number of conductors, conduit size, junction boxes, and zones.
 - 6. Scaled floor plans with layout of all devices with point numbers for initiating and notification devices, wiring connections, zoning, wire sizes and routing.
 - a. Wattage setting for each speaker labeled adjacent to the speaker
 - b. Candela rating for each strobe labeled adjacent to the strobe
 - 7. Detailed Legend.
 - 8. Fire safety and related symbols shown on Drawings and diagrams shall comply with NFPA 170.
 - 9. Detailed input/output matrix.
- B. Product Data: Provide electrical characteristics, connection requirements and compatibility listing showing that components are compatible with each other including but not limited to:
 - 1. Full equipment list including model numbers and quantities.
 - 2. Complete system operation.
 - 3. Highlighted Data Sheets on Devices and Products.

- a. Fire Alarm Control Panel
 - b. Wiring
 - c. Batteries
 - d. Detectors
 - e. Manual Stations
 - f. Audible Signaling Devices
 - g. Visual Signaling Devices
 - h. Control Devices
4. Wiring diagrams of all equipment.
5. Installation instructions for all equipment.
6. Equipment testing procedures.
7. Equipment maintenance manuals.
8. Wire data sheets.
- C. System Calculations – Complete calculations shall be provided which show the electrical load on the following system components:
 1. Each system power supply, including stand alone booster supplies.
 2. Standby Battery Calculations plus a 20 percent derating factor.
 3. Voltage drop calculations for each type of circuit (identify all mathematical formulas, variables and constants).
 4. dB loss calculations for speaker circuits.
 5. Speaker circuit loading and amplifier loading.
 6. Strobe circuit loading.
 7. Each auxiliary control circuit that draws power from any system power supply.
- D. Software and Database Information:
 1. Proposed point numbers.
 2. Labels of all addressable devices.
 3. English action messages.
- E. The submittal package shall be signed by State of Texas Alarm Planning Superintendent (NICET III) or signed and sealed by a Professional Engineer (P.E.) registered in the State of Texas.

PART 2 PRODUCTS

2.01 REMOTE MONITOR

- A. All systems must be capable of interconnection to the existing facility monitoring service supervisory signaling system utilizing one set of Form C contacts (one normally open, one normally closed) for transmission of each of the following signals separately:
 - 1. ALARM.
 - 2. WATERFLOW.
 - 3. SUPERVISORY.
 - 4. TROUBLE.

2.02 DISTRIBUTED POWER SUPPLIES

- A. Distributed power supplies for powering Notification Appliance Circuits, beam smoke detectors, and control relays may be used.
- B. All distributed power supply inputs must be controlled by addressable interface devices located on the same floor levels as the power supply and controlled by the SLC serving the area to facilitate maintenance.
- C. The distributed power supplies must be sized to provide 5 minutes of operation in alarm after 24 hours of system operation in standby power. Where voice evacuation systems are utilized, 15 minutes of alarm must be provided after operation in standby power.

2.03 MANUAL PULL STATIONS

- A. All manual pull stations must be of the "double-action" type to reduce unintentional or vandal alarms. Pull stations required to break glass to activate are not acceptable. Provide pull stations that utilize the same key as FACP for resetting.
- B. Each manual pull station must have a unique digital address on the SLC.
- C. Where separate addressable monitor modules are used for monitoring conventional type manual pull stations, the modules are required to be installed within the manual pull station back box.

2.04 HEAT DETECTORS

- A. All heat detectors shall be fixed temperature, rate-of-rise, or combination fixed temperature and rate-of-rise, spot type.
- B. Each addressable heat detector must have a unique address on the SLC.
- C. Non resetting detectors must give visual indication of "ALARM" condition to facilitate rapid response.
- D. Where separate addressable monitor modules are used for monitoring conventional type heat detectors, the modules are required to be installed within the heat detector junction box.

2.05 SMOKE DETECTORS

- A. All spot type smoke detectors shall be photoelectric or combination photoelectric and ionization type.
- B. Each smoke detector, whether spot-type, or projected-beam type, must have a unique digital address on the SLC.
- C. All smoke detectors must be field measurable and adjustable for sensitivity.
- D. All smoke detectors, except projected beam type, must be powered from the SLC.
- E. The FACP must function as the smoke detector sensitivity test set and must be approved and listed for that service.
- F. All smoke detectors must meet or exceed the requirements of Underwriters Laboratory Standard 268, as amended, and must be listed and approved for use with the FACP provided.

2.06 PROJECTED-BEAM SMOKE DETECTORS

- A. All projected-beam detectors must operate on the infrared principle.
- B. All projected-beam detectors must have automatic gain control circuits to compensate for deterioration of signal strength due to environmental factors such as dirt and dust accumulation, component aging and temperature fluctuations.
- C. Transmitting and receiving units of projected-beam detectors must be protected from physical damage.
- D. All projected-beam smoke detectors must have circuits to prevent "false" alarms due to sudden and complete obscuration.

2.07 AIR SAMPLING SMOKE DETECTION

- A. Provide air sampling smoke detection system if required by the project.
- B. Locate air sampling ports in accordance with NFPA 72 and manufacturer's requirements.
- C. Maintain a maximum transport time of 120 seconds, or the transport time specified by the manufacturer, from the farthest sampling point, whichever is less.
- D. Utilize CPVC piping that is listed for use in air sampling systems. Label piping as required per NFPA 72.

2.09 WATERFLOW SWITCHES

- A. Fire detection/alarm systems must be interconnected to the fire sprinkler systems by waterflow switches must be set for a 60-second delay (retard) prior to the "ALARM."
- B. Each waterflow switch must be monitored for a unique digital address on the SLC.

- C. It is the responsibility of the Sprinkler Contractor to locate the waterflow switches to assure indication of water flow within the building and at each level of the building to reduce water damage.

2.10 SUPERVISORY (TAMPER) SWITCHES

- A. Connect tamper switches installed on all sprinkler or standpipe system valves to the fire alarm system to indicate closing or opening of the valves.

2.11 AUDIBLE APPLIANCES

- A. Fire alarm system audible notification appliances are required to be provided by speakers in all buildings. The fire alarm speakers will also be utilized by the mass notification system for audible notification. The fire alarm signal generated must be the distinctive three-pulse temporal pattern described by NFPA and ANSI codes.
- B. The Evacuation Signal produced by the speakers must be per existing system standards.

2.12 VISUAL APPLIANCES

- A. All visual notification appliances must be xenon strobe, compliant with current requirements of ADA and TAS.
- B. All visual notification devices within a room or adjacent space within the field of view must be synchronized as required per NFPA 72.

2.13 REMOTE ANNUNCIATOR

- A. When required by the project, an LCD remote annunciator shall be located in an open accessible area at or adjacent to the main ground level entrance to the building. The FACP may then be located in a remote location or room.
- B. Remote annunciator must display the same addressable and common signal information as the main FACP.

2.14 MONITORING DEVICES

- A. Addressable monitoring devices used to monitor contact-closure initiating devices such as waterflow switches, and tamper switches must derive power from the SLC to which they are connected.
- B. Each monitoring device must have a unique digital address on the SLC.
- C. Monitoring devices used to interface smoke detectors to the SLC shall be limited to existing spot type smoke detectors or duct-mounted smoke detectors.

2.15 CONTROL DEVICES

- A. Addressable control devices must not control more than one type of appliance/device.

2.16 Documentation storage shall be provided at or adjacent to (within five feet of) the FACP. This storage shall be capable of storing and securing all documents required for system maintenance and response. Storage shall be separated from all active electrical, electronic or

electromechanical parts and components. If adequate, storage may contain unconnected spare/repair parts.

PART 3 INTERCONNECTION AND OPERATION

3.01 SIGNALING LINE CIRCUITS (SLC)

- A. All FACP's must provide circuit integrity monitoring for all Signaling Line Circuits at a level of Class A, Style 6.
- B. All the following devices/appliances must be individually addressed on the SLC:
 - 1. Smoke detectors.
 - 2. Heat detectors.
 - 3. Manual stations.
 - 4. Monitor devices.
 - 5. Control devices.
 - 6. IDCs.
 - 7. Audio NACs.
 - 8. Visual NACs.

3.02 INITIATING DEVICE CIRCUITS (IDC)

- A. Initiating Device Circuits (IDCs) must be monitored at a level of Class B.

3.03 NOTIFICATION APPLIANCE CIRCUITS (NAC)

- A. All Notification Appliance Circuits (NACs) must be monitored at a level of Class B.
- B. Direct current notification appliance power provided from a distributed power supply must be controlled by a digital addressable control device on the SLC.
- C. Audible notification appliances and visual notification appliances must always be connected to separate NACs to facilitate maintenance.

3.04 AUXILIARY FUNCTIONS

- A. Locate control devices utilized for operating auxiliary functions mounted within 3 feet of the system being controlled as required per NFPA 72.

3.05 VOICE ALARM NOTIFICATION

- A. The audible portion of the Public Alarm for all systems shall be Voice Alarm. Provide speakers for annunciation of voice messages. Signals generated must be the Distinctive Evacuation Signal per Owner requirements.

- B. The FACP and remote control station shall provide a microphone and associated controls to allow voice paging to selected areas.

3.06 FAN SHUTDOWN

- A. Initiation by duct-mounted smoke detectors must cause shutdown of associated air handling units and supervisory signal at the fire alarm control panel. Motor control circuits must not be routed through the housing.
- B. The SLC must connect to a control device within three feet of the motor starter or other approved location to interrupt the motor control circuits.
- C. The control device must be assigned a unique digital address on the SLC.
- D. A "BYPASS" control must be provided at the FACP.

3.07 AUTOMATIC DOOR CONTROL

- A. Automatic Release-to-Close
 - 1. Smoke control doors normally held open electrically must be allowed to close upon any "ALARM" condition.
- B. Automatic Unlock
 - 1. Access control doors normally electrically locked for security must unlock on any "ALARM" condition.

3.08 WIRING

- A. Basic wiring materials and installation must comply with NFPA 70.
- B. Conductor sizes must be sized in accordance with NFPA 72 and NFPA 70 to provide the minimum required voltage drop.
- C. Install wiring in conduit or raceway where required per NFPA 70.
- D. All system wiring shall be color coded in accordance with the following:
 - 1. Power circuits: Black.
 - 2. Strobe circuits: Yellow or white.
 - 3. One way voice speakers: Blue.
 - 4. Signaling line circuits, initiating device circuits, network communications cable: Red.
 - 5. Grounding conductor: Green.
 - 6. Elevator interface wiring must meet NEC 620.

- a. Main Floor Recall: Red.
 - b. Alternate Floor Recall: Blue.
 - c. Fire Hat Signal: White.
 - d. Supply power: Black.
- E. Circuits extending beyond buildings:
 - 1. Where circuits are required to extend outside of the building, wiring must be provided with primary protectors in accordance with NFPA 70 Article 760 and Article 800.

PART 4 SPECIAL CONDITIONS

4.01 GENERAL

- A. It is the responsibility of the Contractor to assure that there is no disruption of the building's normal functions during construction such as studying, testing, class, research or administration.

4.02 CONNECTING TO EXISTING SYSTEMS

- A. Connections to, or operation of, existing systems must be performed by the Fire Safety Systems Shop staff.
- B. Existing systems must remain operational during modifications or additions to the existing system throughout the duration of the project.
- C. Where part or all of the existing fire alarm system is required to be demolished, remove the existing fire alarm components only after the new system installation is complete and accepted by the Owner.
- D. Existing equipment that is required to be salvaged by the Owner shall be stored in a secure area designated by the Owner.

4.03 MASS NOTIFICATION SYSTEM

- A. Include the additional equipment required to connect to the future building-wide mass notification system. Fire alarm speakers and speaker/strobes will be utilized for the audible portion of the mass notification system. Coordinate with Owner for additional requirements involving equipment and connection to mass notification system.

PART 5 TESTING

5.01 GENERAL

- A. Upon completion of the system, the Contractor must perform a complete and comprehensive test of the entire system in accordance with the provisions of NFPA 72.
- B. It is the responsibility of the Contractor to demonstrate to the Owner that the system is installed and functions in accordance with the project documents and applicable codes.

5.02 SPECIFIC TESTS

- A. An acceptance test will be conducted at the completion of each project. The test will be the responsibility of the contractor and must be performed in strict compliance with the provisions of NFPA 72.
- B. In addition to the provisions of NFPA 72 and/or the above paragraph, it is the responsibility of the Contractor to provide all of the following:
 - 1. Smoke detector sensitivity report.
 - 2. Pressure differential readings for duct detector sample air flow.
 - 3. Closed loop resistance and EOL resistance readings for all field wiring.
 - 4. Programming volatility test.
- C. Third-Party Testing
 - 1. Third-party testing shall be conducted by an independent third party reporting to and approved by the Owner. Third-Party testing shall include repeating all of the tests described in "Contractor's Test" above. A detailed listing of any deficiencies found during these tests shall be forwarded to the Contractor and shall serve as a punchlist for the system.
 - 2. The Owner may, at its sole option, witness and/or participate in any and all tests.
 - 3. If, at any point during their tests, the Third Party finds significant deficiencies they are to report those to the Owner who will then determine an appropriate course of action. If the Owner determines that, the number and/or severity of the deficiencies so justify, they may stop the Third-Party testing and instruct the Contractor to correct the deficiencies and recertify the system. Such retesting shall include Supervision testing of 100 percent of the Initiating Device Circuits, Notification Appliance Circuits, and Signaling Line Circuits.
 - 4. If retesting by the Third Party is required due to significant deficiencies in the work of the Contractor, the Contractor shall reimburse the Owner for the cost of the Third-Party tests conducted to that point.
- D. Fix Deficiencies:
 - 1. A copy of the formatted check list shall be transmitted to the Contractor to serve as a punch out list for the correction of the noted deficiencies, The Contractor shall notify the verifying party in writing that the deficiencies have been corrected along with a copy of the punch out list with the corrected deficiencies initialed by the Contractor to indicate the corrections.
 - 2. The Contractor shall provide updated certification forms as set forth in Section II Certification of this document.
- E. Third-Party Retest:

1. Each deficient item shall be retested. Retesting of the system shall be conducted in accordance with NFPA 72, Table 10.4.2.2, Test Methods. If any software changes are made to the system updated site-specific software print out with all changes highlighted will be submitted to the verifying party prior to the start of retesting.

F. Third-Party Certification:

1. The Third Party shall then retest each portion of the system affected by the corrections. If no additional deficiencies are found, the Third Party shall issue a "Third-Party Certification" stating that they have tested the system and certify that it complies with the appropriate sections of NFPA 72. Such certification shall not contain any disclaimers or similar comments.

G. Building Test and Acceptance:

1. Upon receipt of all documents from the final "Contractor's Certification" and the "Third-Party Certification," the Owner will conduct any tests it determines to be necessary, consistent with the specified survivability style and performance requirements for the system. If no additional deficiencies are found, they will accept the system. If additional deficiencies are found, the Contractor will be required to correct the deficiencies, retest and recertify the system. Such retesting shall include Supervision testing of 100 percent of the Initiating Device Circuits, Notification Appliance Circuits, and Signaling Line Circuits. The Third Party shall then retest each portion of the system affected by the corrections. If no additional deficiencies are found. The Third Party shall reissue a "Third-Party Certification" as set forth in Section VI Third-Party Certification of this document.

H. Fire Alarm Testing Overview:

Fire Alarm System Testing Overview				
	Contractor	General Contractor	Owner	3rd Party
I. Contractor's Test	X	X		
II. Contractor's Certification	X	X		
III. 3rd Party Test	X	X		X
IV. Fix Deficiencies	X	X		
V. Third-Party Retest	X	X		X
VI. Third-Party Certification				X
VIII. Owner Test and Acceptance	X*	X*	X	

*Note: The Owner may, at its sole option, require the assistance and/or participation of the contractor in this testing.

1. References:

- a. Texas Administrative Code, Title 28. Insurance, Part 1. Texas Department of Insurance, Chapter 34. State Fire Marshal, Subchapter F. Fire Alarm Rules.
- b. National Fire Alarm Code (NFPA 72), 2002 edition

PART 6 DOCUMENTATION

6.01 GENERAL

- A. A documentation package must be provided by the Contractor before final testing with the Owner and FPS AHJ that shall include all information needed to allow the Owner to perform additions, modifications, maintenance and repair of the system.
- B. This must include:
 - 1. Equipment schematic diagrams for all components and modules.
 - 2. Equipment technical data.
 - 3. Field device address register.
 - 4. Equipment repair parts lists.
 - 5. Programming disk with all system software required for a re-start after traumatic failure. Software must be of appropriate and compatible update version for the firmware installed including hardware key, if required.
- C. "As-built" wiring, conduit diagrams to include:
 - 1. Floor plan layout drawings showing all significant conduit routes and sizes, wire amounts, sizes and color code and marshaling box locations.
 - 2. Riser diagram showing all significant conduit routes and sizes, wire amounts, sizes and color code and marshaling box locations.
- D. Floor plan device layout drawing to include:
 - 1. All initiating device locations and digital addresses.
 - 2. All notification appliance locations and NAC digital addresses or device number.
 - 3. All control device locations and digital addresses.
 - 4. All monitor device locations for supervisory switch groups.
 - 5. All distributed power supply locations and digital addresses.
 - 6. Schematic representation of all SLCs, NACs, control circuits, audio circuits and power circuits.
- E. Riser diagram to include:
 - 1. All initiating devices with their electrical location and digital address on the SLC.
 - 2. All notification appliances with their electrical location and device number or digital address on the SLC.
 - 3. All control devices with their electrical location and digital address on the SLC.

4. All supervisory switch locations and their interconnection to the monitor device (IDCs).
 5. All monitor devices with their electrical location and digital address on the SLC.
 6. All distributed power supplies with their associated wiring and digital address(es) on the SLC.
 7. Schematic representation of all SLCs, NACs, audio circuits and power circuits.
- F. Interconnection diagram(s) for all internal components of the Fire Alarm Control Panel.
- G. State of Texas or NFPA certification form.
- H. Programming guide for the functional programming to provide for field changes to the zone schedule or other operational features.
- I. Backup copy of the operating system and/or all resident programming, software or firmware, which would be required to restore the system to full operation after a complete failure or equipment replacement.
- J. A system hardware component capable of storing and transporting the above listed programming and operating systems and reports.
- K. Provide factory logging software for periodic testing.

6.02 WARRANTY AND MAINTENANCE

- A. The contractor shall warranty all materials, installation and workmanship for one (1) years from date of acceptance by the Owner, unless otherwise specified. A copy of the manufacturer's warranty shall be provided with closeout documentation and included with the operation and installation manuals.
- B. Materials, installation or workmanship found to be defective during that period shall be replaced without cost to the Owner. This Contractor shall initiate repair of any warranty defects within 8 hours of notification of such defects and shall be repaired within 24 hours.
- C. The warranty or any part of the warranty shall not be made void by any required operation or inspection of the system after acceptance during the warranty period. The Owner will use its own personnel to provide required tests and inspections.
- D. If the Owner experiences more than two factitious or unexplained false alarms or troubles in any 24-hour period while the system is under warranty, the Contractor shall provide the necessary labor, materials, and technical expertise to promptly correct the problem(s) at no cost to the Owner.
- E. The fire alarm contractor shall maintain a service organization with adequate spare parts stock within 75 miles of the installation.
- F. Spare Parts - The Contractor shall supply the following spare parts:

1. Automatic detection devices: Two (2) percent of the installed quantity of each type.
2. Manual fire alarm stations: Two (2) percent of the installed quantity of each type.
3. Modules: Two (2) percent of the installed quantity of each type.
4. Audible and visible devices: One (1) percent of the installed quantity of each type and color, but no less than two (2) devices.
5. Keys: A minimum of three (3) sets of keys shall be provided and appropriately identified.

6.03 TRAINING

- A. Provide services of manufacturer's representative to instruct Owner's personnel in operation and maintenance of system for a minimum of two 4 hour sessions.

END OF SECTION