

Gullet ES
Austin Independent School District
Austin, Texas

Project Manual



O'CONNELL ROBERTSON

Project Number: 1915.00
AI SD 200014-GULLT

01.03.20

SECTION 00 01 07

SEALS PAGE

ARCHITECT OF RECORD

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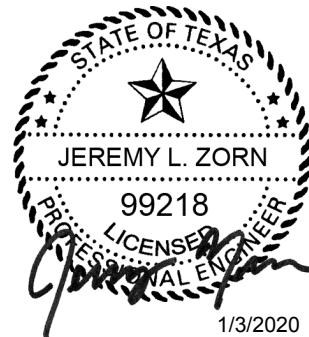


Architect of Record

Date

ELECTRICAL ENGINEER OF RECORD

O'Connell Robertson
811 Barton Springs Road, Suite 900
Austin, Texas 78704
TBPE Registered Firm No. F-2708

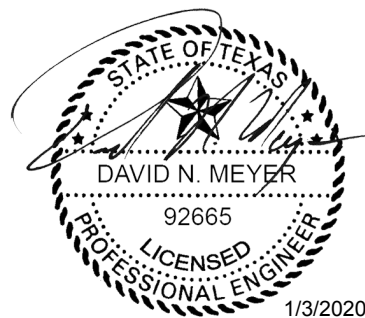


Electrical Engineer of Record

Date

PLUMBING ENGINEER OF RECORD

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Plumbing Engineer of Record

Date

END OF DOCUMENT

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END OF DRAWING INDEX

SECTION 01 10 00 – SUMMARY OF WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 CONTRACT DESCRIPTION

- A. The project consists of: Electronic switchgear replacement and providing positive site drainage at Gullet ES.

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

1.02 SCHEDULE OF VALUES

- A. Submit electronic schedule on AIA Form G703 – Continuation Sheet for G702.
- B. Submit Schedule of Values as electronic file 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 in each line item amount of allowances as specified in this Section.
 - 1. Include any allowances for additional structural steel and steel reinforcing as indicated in the general notes on the structural drawings.
- E. Include separately from each line item, direct proportional amount of Contractor's overhead and profit.
- F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.03 APPLICATIONS FOR PAYMENT

- A. Submit electronic 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: Submit at intervals stipulated in the Agreement.
- 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.
3. As stipulated in the Agreement, submit partial release of liens from major Subcontractors and vendors.

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 or AIA G701 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.

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. Preconstruction meeting.
- C. Site mobilization meeting.
- D. Progress meetings.
- E. Preinstallation meetings.
- F. Closeout meeting.
- G. Cutting and patching.
- H. 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 FIELD ENGINEERING

- A. Employ Land Surveyor registered in State of Texas and acceptable to Architect/Engineer.
- B. Locate and protect survey control and reference points. Promptly notify Architect/Engineer

of discrepancies discovered.

- C. Control datum for survey is that shown on Drawings.
- D. Verify set-backs and easements; confirm drawing dimensions and elevations.
- E. Provide field engineering services. Establish elevations, lines and levels, utilizing recognized engineering survey practices.
- F. Submit copy of site drawing and certificate signed by Land Surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.
- G. Maintain complete and accurate log of control and survey work as Work progresses.
- H. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- I. Promptly report to Architect/Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.
- J. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect/Engineer.

1.04 PRECONSTRUCTION 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. Scheduling activities of Geotechnical Engineer.
- 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.

1.05 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. Survey and building layout.
 - 4. Security and housekeeping procedures.
 - 5. Schedules.
 - 6. Application for payment procedures.
 - 7. Procedures for testing.
 - 8. Procedures for maintaining record documents.
 - 9. Requirements for start-up of equipment.
 - 10. 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.

1.06 PROGRESS MEETINGS

- A. Contractor shall schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- 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.

1.07 PREINSTALLATION 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.

1.08 CLOSEOUT MEETING

- A. Contractor to schedule Project closeout meeting with sufficient time to prepare for Substantial Completion. Contractor to preside over meeting and be responsible for meeting minutes.
- B. Attendance required: Contractor, Major Subcontractors, Architect/Engineer, Owner and others appropriate to agenda.
- C. Notify Architect/Engineer and Owner one week in advance of the meeting.
- D. Minimum Agenda:
 1. Start-up facilities and systems.

2. Operations and maintenance manuals.
3. Testing, adjusting and balancing.
4. System demonstration and observation.
5. Operation and maintenance instructions for Owner's personnel.
6. Contractor's inspection of Work.
7. Contractor's preparation of an initial punch list.
8. Procedure to request Architect/Engineer inspection to determine date of Substantial Completion.
9. Planned progress during succeeding work period.
10. Coordination of project progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on Progress Schedule and construction.
13. Other business relating to Work.

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 Ferrosan 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. At penetrations of fire-rated walls, partitions, ceiling or floor construction, completely seal voids with firestop material in accordance with Section 07 84 00 and appropriate UL Design Number.
- I. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.
- J. Identify hazardous substances or conditions exposed during the Work to Architect/Engineer for decision or remedy.

3.02 ALTERATION PROCEDURES

- A. Where designated areas of existing facility are to be occupied by Owner during progress of construction, cooperate with Owner in scheduling operations to minimize conflict and to permit Owner's continuous usage.
- 1. Perform Work not to interfere with operations of occupied areas.
 - 2. Keep utility and service outages to a minimum and perform only after written approval of Owner.
 - 3. Clean Owner-occupied areas daily. Clean spillage, overspray and heavy collection of dust in Owner-occupied areas immediately.
- A. Materials: As specified in product sections; match existing with new 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, specified 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. Proposed products list.
- D. Product data.
- E. Shop Drawings.
- F. Samples.
- G. Design data.
- H. Test reports.
- I. Certificates.
- J. Manufacturer's instructions.
- K. Manufacturer's field reports.
- L. Erection Drawings.
- M. Construction photographs.
- N. Contractor review.
- O. Architect's action.

1.02 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Architect/Engineer accepted form.
- B. Assemble complete submittal package into a single file incorporating submittal requirements of a single Specification Section.
- C. 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).
- D. 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.

- E. Identify Project, Contractor, subcontractor and supplier; pertinent Drawing and detail number, and specification section number, appropriate to submittal on transmittal form.
- F. 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.
- G. Incomplete submittals will be returned without review with a request to resubmit when complete.
- H. Schedule submittals to expedite Project, and deliver to Architect/Engineer at business address. Coordinate submission of related items.
- I. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work.
- J. Allow space on submittals for Contractor and Architect/Engineer review stamps.
- K. When revised for resubmission, identify changes made since previous submission.
- L. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- M. Submittals not requested will not be recognized or processed.

1.03 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedules within 15 days after date established in Notice to Proceed. After review, resubmit required revised data within ten days.
- B. Submit revised Progress 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 major portion of Work or operation, identifying first work day of each week.
- 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 PROPOSED PRODUCTS LIST

- A. Within 15 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.05 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 electronic copies via Newforma.
- 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.

1.06 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

1.07 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.
 3. Include photo image of product sample.
- 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.

1.08 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.

1.09 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.

1.10 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.

1.11 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.

1.12 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.

1.13 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.

1.14 CONSTRUCTION PHOTOGRAPHS

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

1.15 CONTRACTOR REVIEW

- A. Contractor to review for compliance with contract Documents and approve submittals before transmitting to Architect/Engineer.
- B. Contractor Responsible for:
 - 1. Determination and verification of materials including manufacturer's catalog numbers.
 - 2. Determination and verification of field measurements and field construction criteria.
 - 3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
 - 4. Determination and accuracy and completeness of dimensions and quantities.
 - 5. Confirmation and coordination of dimensions and field conditions of Site.
 - 6. Construction means, techniques, sequences and procedures.
 - 7. Safety precautions.
 - 8. Coordination and performance of Work of all trades.

1.16 ARCHITECT'S ACTION

- E. 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 with such reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time in the Architect's professional judgment to permit adequate review and return promptly.
 - 1. Compliance with specified characteristics is the Contractor's responsibility.
- F. 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.
7. Provide Sustainable Information: The submittal lacked the required Sustainable Information. Submit the required Sustainable 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. Mock-up requirements.
- E. Testing and inspection services.
- F. Manufacturers' field services.
- G. Labeling.
- H. Examination.
- I. 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 MOCK-UP REQUIREMENTS

- A. Tests will be performed under provisions identified in this section and identified in respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be comparison standard for remaining Work.
- D. Where mock-up has been accepted by Architect/Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so by Architect/Engineer.

1.06 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. Test samples of mixes submitted by Contractor.
 - 2. Provide qualified personnel at site. Cooperate with Architect/Engineer and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 5. Promptly notify Architect/Engineer and Contractor of observed irregularities or non-conformance of Work or products.
 - 6. Perform additional tests required by Architect/Engineer.
 - 7. 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.

1.07 MANUFACTURERS' FIELD SERVICES

- A. Provide manufacturers field services where 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.

1.08 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 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. Telephone service.
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. Water control.
5. Dust control.
6. Erosion and sediment control.
7. Noise control.
8. Pest control.

9. Pollution control.

10. 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. Existing exterior outlets may be utilized during construction.

1.03 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Existing building lighting may be utilized during construction.

1.04 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.

1.05 TEMPORARY WATER SERVICE

A. Owner will pay cost of temporary water. Exercise measures to conserve water. Utilize Owner's existing water system, extend and supplement with temporary devices as needed to maintain specified conditions for construction operations.

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. Preparation: Fill and grade sites for temporary structures sloped for drainage away from buildings.
- I. 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.
- J. 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.
- K. 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. Provide means of removing mud from vehicle wheels before entering streets.
- E. 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. Do not allow heavy vehicles or construction equipment in parking areas.
- E. Do not allow vehicle parking on existing pavement.
- F. Maintenance:
 - 1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow and ice.
- G. Removal, Repair:
 - 1. Remove temporary materials and construction before Substantial Completion.
 - 2. Remove underground work and compacted materials to depth of 2 feet; fill and grade site as specified.
 - 3. Repair existing facilities damaged by use, to original condition.
- H. Mud from Site Vehicles: Provide means of removing mud from vehicle wheels before entering streets.

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. 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.
- 1. 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.

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 WATER CONTROL

- A. Grade site to drain. Maintain excavations free of water. Provide, operate and maintain pumping equipment.
- B. Protect site from puddling or running water. Provide water barriers as required to protect

site from soil erosion.

1.18 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.

1.19 EROSION AND SEDIMENT CONTROL

- A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- B. Minimize surface area of bare soil exposed at one time.
- C. Provide temporary measures including berms, dikes and drains, and other devices to prevent water flow.
- D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
- E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

1.20 NOISE CONTROL

- A. Provide methods, means and facilities to minimize noise produced by construction operations.

1.21 PEST CONTROL

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

1.22 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.

1.23 RODENT CONTROL

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

1.24 REMOVAL OF UTILITIES, FACILITIES AND CONTROLS

- A. Remove temporary utilities, equipment, facilities and materials prior to Substantial Completion inspection.

- B. Remove underground installations to minimum depth of 2 feet. Grade site as indicated on Drawings.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. 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: **Gullet ES**
Austin ISD

PROJECT NO.: **1915.00**

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: **Gullet ES**
Austin ISD

PROJECT NO.: **1915.00**

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

☐ Lockouts

☐ Bankruptcy

☐ Discontinuance of production

☐ Proven shortage

☐ 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. Protecting installed construction.
- D. Project record documents.
- E. Operation and maintenance data.
- F. Manual for equipment and systems.
- G. Product warranties.
- H. 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 exterior glass, surfaces of foreign substances.
- C. Clean site; sweep paved areas, rake clean landscaped surfaces.
- D. Remove waste and surplus materials, rubbish and construction facilities from site.

1.04 PROTECTING INSTALLED CONSTRUCTION

- A. Prohibit traffic from landscaped areas.

1.05 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:

1. Drawings.
 2. Addenda.
 3. Change Orders and other modifications to the Contract.
 4. Reviewed Shop Drawings, Product Data and Samples.
 5. 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.

1.06 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.

1.07 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.

1.08 PRODUCT WARRANTIES

- 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.

1.09 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 01 74 19 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Construction waste management plan.
 - 2. Construction waste recycling.
 - 3. Construction waste adaptive reuse.
- B. Related Sections:
 - 1. Section 01 91 00 – Commissioning: General commissioning requirements.

1.02 PLAN REQUIREMENTS

- A. Intent:
 - 1. Divert construction and demolition debris from landfill disposal.
 - 2. Redirect recyclable material back to manufacturing process.
 - 3. Generate cost savings or increase minimal additional cost to Project for waste disposal.

1.03 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Requirements for submittals.
- B. Construction Plan: Submit construction waste management plan describing methods and procedures for implementation and monitoring compliance including the following:
 - 1. Transportation company hauling construction waste to waste processing facilities.
 - 2. Recycling and adaptive reuse processing facilities and waste type each facility will accept.
 - 3. Construction waste materials anticipated for recycling and adaptive reuse.
 - 4. Onsite sorting and site storage methods.
- C. Submit documentation with each application for payment substantiating construction waste management plan was maintained and goals are being achieved.
 - 1. Trash: Quantity by weight deposited in landfills. Include associated fees, transportation costs, container rentals, and taxes for total cost of disposal.

2. Salvaged Material: Quantity by weight with destination for each type of material salvaged for resale, recycling or adaptive reuse. Include associated fees, transportation costs, container rentals, and taxes for total cost of disposal. Also include reimbursements due to salvage resale.
3. Total Cost: Indicate total cost or savings for implementation of construction waste management plan.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 – Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Submit completed documents indicating diverted waste quantity, total waste quantity and percentage of waste diverted from landfills.

1.05 CONSTRUCTION WASTE MANAGEMENT PLAN

- A. Construction Waste Landfill Diversion: Minimum [50] [75] percent by weight of construction waste materials for duration of Project through resale, recycling or adaptive reuse.
- B. Implement construction waste management plan at start of construction.
- C. Review construction waste management plan at pre-construction meeting and progress meetings specified in Section 01 30 00.
- D. Distribute approved construction waste management plan to subcontractors and others affected by Plan Requirements.
- E. Oversee plan implementation, instruct construction personnel for plan compliance, and document plan results.
- F. Purchase Products to prevent waste by:
 1. Ensuring correct quantity of each material is delivered to site.
 2. Choosing products with minimal or no packaging.
 3. Requiring suppliers to use returnable pallets or containers.
 4. Requiring suppliers to take or buy-back rejected or unused items.

1.06 CONSTRUCTION WASTE RECYCLING

- A. Use source separation method or co-mingling method suitable to sorting and processing method of selected recycling center. Dispose non-recyclable trash separately into landfill.
- B. Source Separation Method: Recyclable materials separated from trash and sorted into separate bins or containers, identified by waste type, prior to transportation to recycling center.
- C. Co-Mingling Method: Recyclable materials separated from trash and placed in unsorted

bins or container for sorting at recycling center.

D. Materials required to be recycled include:

1. Packing materials including paper, cardboard, foam plastic, and sheeting.
2. Recyclable plastics.
3. Organic plant debris.
4. Native stone and granular fill.
5. Asphalt and concrete paving.
6. Wood without embedded nails and staples.
7. Glass, clear and colored types.
8. Metals.
9. Gypsum products.
10. Acoustical ceiling tile.
11. Carpet.
12. Equipment oil.
13. Insulation.

1.07 CONSTRUCTION WASTE ADAPTIVE RE-USE

A. Arrange with processing facility for salvage of construction material and processing for reuse. Do not reuse construction materials on site except as accepted by Architect/Engineer.

B. Materials suggested for adaptive reuse include:

1. Concrete and crushed concrete.
2. Masonry units.
3. Lumber suitable for re-sawing or refinishing.
4. Casework and millwork.
5. Doors and door frames.
6. Windows.
7. Window glass and insulating glass units.
8. Hardware.

- 9. Acoustical ceiling tile.
- 10. Equipment and appliances.
- 11. Fluorescent light fixtures and lamps.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 CONSTRUCTION WASTE COLLECTION

- A. Collect construction waste materials in marked bins or containers and arrange for transportation to recycling centers or adaptive salvage and reuse processing facilities.
- B. Maintain recycling and adaptive reuse storage and collection area in orderly arrangement with materials separated to eliminate co-mingling of materials required to be delivered separately to waste processing facility.
- C. Store construction waste materials to prevent environmental pollution, fire hazards, hazards to persons and property, and contamination of stored materials.
- D. Cover construction waste materials subject to disintegration, evaporation, settling or runoff to prevent polluting air, water and soil.

3.02 CONSTRUCTION WASTE DISPOSAL

- A. Deliver construction waste to waste processing facilities. Obtain receipt for deliveries.
- B. Dispose construction waste not capable of being recycled or adaptively reused by delivery to landfill, incinerator or other legal disposal facility. Obtain receipt for deliveries.

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 of 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. 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 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 coordinate work and 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.
- C. The Contractor shall be responsible for gathering all information required by the connecting utility service provider (i.e. drawings, load information, completing and submitting required forms, etc.) The contractor may utilize the design team to obtain information, however, the contractor is responsible for submitting all required documentation to the utility provider. This includes, but is not limited to, new gas service, medium pressure gas request forms, water meter sizing forms, etc.).
- D. The Contractor shall provide the utility service provider a date that the utility connection is needed. This date shall be coordinated with the utility service provider to take into consideration the design time and mobilization.

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.
- 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 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 PRODUCTS NOT FURNISHED BUT INSTALLED UNDER DIVISION 22.

- A. Rough-in for and make final connection to Owner furnished fixtures and equipment requiring plumbing services.
- B. Rough-in for and make final connection to fixtures and equipment furnished under other divisions of these Contract Specifications requiring plumbing services.

3.06 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 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. 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.

3.07 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.

3.08 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, 22 11 23, 22 13 00 and 22 14 00),
 - 2. Domestic water disinfection tests (per Section 22 11 00),
 - 3. Backflow prevention assembly certifications (per Section 22 11 00),
 - 4. Domestic hot water systems tests (per Section 22 11 00),
 - 5. Boiler certification (per Section 22 33 00 or 22 34 00), and
 - 6. Medical Gas system verification tests (per Section 22 60 13).

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. Cleanouts.
3. Interceptors.

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 26 05 03 – Equipment Wiring Connections: Execution requirements for electric connections to equipment specified by this section.
6. Division 31 sections for excavation, trench and backfill required by this section.
7. Section 33 41 00 – Storm Utility Drainage Piping: Catch basins and manholes.

1.02 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME A112.14.1 – Backwater Valves.
2. ASME A112.21.1 – Floor Drains.
3. ASME B16.1 – Cast Iron Pipe Flanges and Flanged Fittings.
4. ASME B16.3 – Malleable Iron Threaded Fittings.
5. ASME B16.4 – Gray Iron Threaded Fittings.
6. 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.
5. Pumps: Submit pump type, capacity, certified pump curves showing pump

performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

- 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.
- B. Furnish 1 set of pump seals.

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 F656, Lo-VOC (SCAQMD 116/316A) Purple Primer; ASTM D2855; solvent weld with ASTM D2564 solvent cement.

2.02 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.

2.03 SOLIDS INTERCEPTORS/OIL INTERCEPTORS

- A. Refer to Plumbing Equipment Schedule on Drawings.

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 – 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.

3.04 DRAINS, CLEANOUTS AND SIMILAR COMPONENTS

- A. Exterior cleanouts, single or double, shall be set in reinforced concrete (minimum 18 inches by 18 inches by 6 inches thick or as indicated on Drawings) at finished grade level. Provide countersunk brass cleanout plugs in cast iron ferrules. PVC plugs shall not be acceptable. Exception: Where cleanouts are located in architectural flatwork (sidewalks, patios, etc.), cleanouts shall be floor cleanout style as indicated on drawing schedules.

3.05 PLASTIC PIPE AND JOINT FABRICATION

- A. Cut plastic pipe with pipe cutters using a cutting wheel specifically designed for plastic pipe.
- B. Remove all burrs, chips, filings, etc. from both the I.D. and O.D. of the pipe before joining. Use a knife, deburring tool, or a half-pound coarse file to remove all burrs.
- C. Bevel all pipe ends to minimize the chances of wiping the solvent cement from the I.D. of the fitting as the pipe is socketed. Use a beveling tool designed to bevel pipe at a 10° to 15° angle and a depth of 1/16" to 3/32".
- D. Using a clean, dry, cotton rag, wipe away all loose dirt and moisture from the I.D. and O.D. of the pipe end and the I.D. of the fitting. Do not solvent weld wet surfaces.

- E. Apply primer to the pipe surface in the same manner, making sure that the length of pipe evenly brushed is at least equal to the fitting socket depth.
- F. For checking penetration, scratch or scrape away the primed surface until a few thousandths of an inch can be so removed. Repeat applications of primer to either or both surfaces as necessary. In cold weather, allow more time for proper penetration.
- G. Cover the outer pipe surface literally with solvent cement for a length at least equal to that of the fitting socket depth.
- H. Continue alternate application to the fitting socket with a medium layer of solvent cement. Avoid puddling in the socket. On belled end pipe, do not coat beyond the socket depth or allow cement to run beyond the bell.
- I. Apply a second coat of cement to the pipe. Cement layers must be without voids and sufficient to fill any gaps in the joints.
- J. Immediately upon finishing cement application and before it starts to set, insert the pipe to the full socket depth while rotating the pipe or fitting 1/4 turn to ensure complete and even distribution of the cement. Hold joint together for a minimum of 10 to 15 seconds to make sure that pipe does not move back out of the socket.
- K. Immediately after joining and before joint is set, gently place joint onto a level surface, and wipe off all excess cement from the circumference of the joint.
- L. Do not perform joining operations if ambient temperature is below 40 F. Allow a minimum of 72 hours of joint drying time before subjecting joints to any appreciable internal pressure.

3.06 DRAIN PIPE AND FITTINGS

- A. Offsets and Fittings.
 - 1. Use reduction fittings to connect two pipes of different diameter.
 - 2. Change directions by appropriate use of 45-degree wyes, long-sweep quarter-bends, and sixth-, eighth-, and sixteenth-bends. Sanitary tees may be used on vertical stacks. Use long sweeps at the base of risers.
 - 3. Provide a separate trap at each fixture, unless a trap is built into the fixture. Provide a Deep Seal trap at each floor drain and hub drain. Place traps so that the discharge from any fixture will pass through only one trap before reaching a building drain.
 - 4. For sets of fixtures installed in 4-inch walls, provide a separate waste and vent line for each fixture (do not interconnect in wall). Connect the waste lines underfloor and the vent lines above the ceiling. Maintain structural and aesthetic integrity of walls.
 - 5. Do not route any piping above electrical control panels and related electrical equipment. Prior to installation of any piping, determine the actual space requirements and the location of all electrical panels and related electrical equipment. Make all offsets and adjustments as required.

6. Discharge from the oil separator to a floor drain with a funnel to maintain an indirect connection to the sanitary sewer.
- B. Floor Drains. Provide all required floor drains complete with drain lines and vent lines as required by the section on Drains, Hydrants and Cleanouts.
- C. Cleanouts.
 1. Provide drainage lines with properly specified cleanouts. Provide all as required by the section on drains, hydrants and cleanouts.

3.07 VENT PIPING

- A. Make vent connections to vent stacks with inverted wye fittings. Extend full-size vents through the roof to at least 6-inches above the roof.
- B. Coordinate location of vent penetrations with roofing trades; flashing to be done by roofer.
- C. Offset all vents located near building edge such that no vent through roof piping is located within 5-feet from the building edge (measured from building line not building eave). Make offsets in roof structure space.
- D. Terminate vent through roof not less than 15-feet away from any shaft, window or outside air intake openings.
- E. All vent and vent branch pipes shall be graded and connected to drip back to sanitary waste piping by gravity.

3.08 ROUGH-IN AND FINAL CONNECTIONS

- A. Make rough-in and final connection of all services to all fixtures requiring plumbing connections. Contractor shall be responsible for installing fixtures at locations shown on the Architectural drawings and providing all service connections at required locations.
- B. Rough-in and final connection of services to all equipment shall be installed in accordance with the latest edition of the manufacturer's rough-in measurements manual. Contractor shall obtain all such documents.
- C. Use threaded sanitary tapped tee pipe fittings for p-trap connections at walls.
- D. Provide service connections to all plumbing fixtures specified and to all equipment furnished by others.
- E. Install all piping and associated equipment in accordance to manufacturer's recommendations using recommended tools.
- F. Provide all fittings and appurtenances required for a complete and working system.

3.09 COORDINATION

- A. Making adjustments to field conditions is considered a part of the work required. Do not use contract drawings accompanying these specifications for rough-in locations but only for pipe sizing and general routing.

- B. Contractor shall examine and familiarize himself with the Architectural, Structural, Electrical and Mechanical Drawings to be knowledgeable of all plumbing connections required and space limitations.
- C. The Drawings are diagrammatic and are not intended to show all the fittings required. Contractor shall include in his bid, costs for items of material and labor which are not specifically called for in drawings or specifications, but which are required to make plumbing installation. Contractor shall make any necessary changes to avoid beams, footings, columns, piers, vents, ducts, equipment or other obstructions.
- D. In any case where a pipe shown on a plan sheet differs from that shown on a riser, schematic or detail, use the larger of the two sizes shown.

3.10 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, grease waste, chemical resistant 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 14 29 – SUMP PUMPS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Sump pumps.

B. Related Sections:

1. Section 22 00 01 – Basic Plumbing Requirements.
2. Section 22 05 13 – Common Motor Requirements for Plumbing Piping.
3. Section 33 31 00 - Sanitary Utility Sewerage Piping.

1.02 DESIGN REQUIREMENTS

A. Design Criteria:

1. Refer to Schedule on Drawings.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:

1. Submit installation details for pumps, piping, controls and accessories including wiring schematics.

C. Product Data: Submit data for specified Products.

1.04 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Operation and Maintenance Data: Submit installation instructions, servicing requirements, assembly views, lubrication instructions, and replacement parts list.

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 3 years documented experience.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing and protecting products.
- B. Prepare pumps and accessories for shipment to prevent entry of foreign matter into product body.
- C. Store products in areas protected from weather, moisture, or possible damage; do not store products directly on ground; handle products to prevent damage to interior or exterior surfaces.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

1.08 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

PART 2 PRODUCTS

2.01 SUMP PUMPS

- A. Manufacturers: As Scheduled.
 - 1. Substitutions: Not Permitted.
- B. Impeller: Cast iron, semi-open, non-clog.
- C. Casing: Cast iron.
- D. Mechanical Seal: Silicon carbide.
- E. Shaft: Stainless steel.
- F. Designed for continuous operation.
- G. Bearings: Upper and lower heavy duty ball bearings.

2.02 PUMP MOTORS

- A. Fully submerged in high-grade turbine oil for lubrication and efficient heat transfer.
- B. Power Cable: Severe duty rated, oil and water resistant, epoxy seal on motor end.
- C. Built-in overload with automatic reset.

- D. Class B insulation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify connections, size, and location are as indicated on Drawings.

3.02 INSTALLATION

- A. Install sump pumps in accordance with Drawings and manufacturer's instructions.
- B. Provide necessary piping, fittings, and valves as indicated on Drawings.

3.03 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements, 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Upon completion of installation, examine, adjust and test each pump for proper operation.
- C. Test each pump with clean water through minimum of four complete cycles.

3.04 MANUFACTURER'S FIELD SERVICES

- A. Section 01 40 00 - Quality Requirements: Requirements for manufacturer's field services.
- B. Provide services of manufacturer's representative to inspect installations and for performance testing.

3.05 SCHEDULES – Refer to Plumbing Equipment Schedule on 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 03 – EQUIPMENT WIRING CONNECTIONS

PART 1 GENERAL

1.01 SUMMARY

- A. The work under this section includes electrical connections to equipment specified under other Divisions and/or Sections, or furnished by Owner, including, but not limited to:
 - 1. HVAC motors, VFDs and panels.
 - 2. Plumbing motors, VFDs and panels.
- B. Related Sections:
 - 1. Section 26 05 19 - Building Wire and Cable.
 - 2. Section 26 05 33 - Raceway and Boxes for Electrical Systems.

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.

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures.
- B. Product Data: Submit wiring device manufacturer's catalog information showing dimensions, configurations and construction.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Submittal procedures.
- B. Project Record Documents: Record actual locations, sizes and configurations of equipment connections.

1.05 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
- C. Determine connection locations and requirements.
- D. Sequence rough-in of electrical connections to coordinate with installation of equipment.

- E. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 PRODUCTS

2.01 CORD AND PLUGS

- A. Attachment Plug Construction: Conform to NEMA WD 1.
- B. Configuration: NEMA WD 6; match receptacle configuration with outlet furnished for equipment.
- C. Cord Construction: Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
- D. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

2.02 RACEWAYS, BUILDING WIRE AND CABLE, AND ENCLOSED SWITCHES

- A. As specified in other Division 26 sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify equipment is ready for electrical connection, for wiring and to be energized.

3.02 INSTALLATION

- A. Make electrical connections. Utilize cord, receptacles and attachment plugs for portable equipment or for any equipment furnished by manufacturer with cord and plug connections. Install receptacle outlet to accommodate connection with attachment plug. Install cord and cap for field-supplied attachment plug. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes. Provide wire basket type strain reliefs, both ends for any suspended cords. Connect all other equipment with raceways and provide suitably rated disconnecting means, capable of being locked in the "off" position.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- E. Install terminal block jumpers to complete equipment wiring requirements.

- F. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements. Install in accordance with equipment vendor's requirements.
- G. HVAC and Plumbing Connections:
 - 1. Provide all power wiring including all circuitry carrying electrical energy from panelboard or other source through starters, variable frequency drives (VFDs), and disconnects to motors or to packaged control panels. Packaged control panels may include disconnects and starters and overcurrent protection. Provide all wiring between packaged control panels and motors.
 - 2. VFD Installations: Install VFD input wiring and output wiring in separate conduit systems. Do not mix VFD input power and output power, or control wiring in a common raceway.
 - 3. Provide 120 volts to each temperature control panel. Coordinate requirements with HVAC/DDC contractors.
 - 4. Unless otherwise specified, all control devices such as aquastats, float and pressure switches, fan-powered VAV boxes, switches, electro-pneumatic switches, solenoid valves and damper motors requiring mechanical connections shall be furnished and installed and wired under other divisions of these specifications.
 - 5. Each motor terminal box shall be connected with a minimum 12", maximum 36" piece of flexible PVC-coated metal conduit to a fixed junction box. Conduit must be installed perpendicular to direction of equipment vibration to allow conduit to freely flex.
 - 6. Check for proper rotation of each motor.

3.03 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting and balancing.
- B. Cooperate with utilization equipment installers and field service personnel during checkout and starting of equipment to allow testing and balancing and other startup operations. Provide personnel to operate electrical system and checkout wiring connection components and configurations.

3.04 EQUIPMENT TO BE CONNECTED

- A. Unless specifically noted otherwise, each piece of utilization equipment shown on the Drawings, whether Owner furnished or Contractor furnished, shall be connected by the Contractor.

END OF SECTION

SECTION 26 05 05 – ELECTRICAL DEMOLITION

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. Electrical demolition for remodeling.
- B. Electrical/control portion of HVAC work covered by Division 23 pertaining electrical demolition shall follow the requirement set forth by this specification.

1.02 RELATED WORK

- A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for minor electrical demolition for remodeling.
 - 1. Section 26 00 00 - Basic Electrical Requirements.
- B. In the event of conflict regarding minor electrical demolition requirements between this Section and any other Section, the provisions of this Section shall govern.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: as specified in individual Sections.
- B. Provide all materials necessary for work.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. All demolitions or modifications to existing systems shall be coordinated through Owner's Representative. Demolition Drawings are based on casual field observation and existing record documentations. Therefore the accuracy or exactness of the Drawings is not guaranteed. The Contractor shall verify that field measurements and circuiting arrangements are as shown on Drawings and abandoned wiring and equipment serve only abandoned facilities. The Contractor shall be responsible for reporting discrepancies to Engineer before disturbing existing installation.
- B. Beginning of demolition means Contractor accepts existing conditions.

3.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal. Provide temporary wiring and connections to maintain remaining systems in service during demolition and/or modification. Owner reserve the right up to 24 hours prior to any scheduled event to delay or suspend shutdowns or outages to more convenient times at no additional cost.
- B. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. No work shall begin without proper permits and

authorizations. Disable system only to make switchovers and connections. Obtain permission from Owner at least (2) weeks before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

- C. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Notify Owner at least (2) weeks before partially or completely disabling system. Minimize outage duration. Provisions for manual fire watch shall be provided in areas where services are interrupted. Make temporary connections to maintain service in areas adjacent to work area.
- D. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Notify Owner at least (2) weeks before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new plan drawings.
- B. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes full length from source to device. Cut embedded or concealed conduit flush with walls and floors, and patch surfaces.
- C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- D. Disconnect and remove abandoned panelboards and distribution equipment.
- E. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- F. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers and other accessories.
- G. Repair adjacent construction and finishes damaged during demolition and extension work.
- H. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- I. Extend existing installations using materials and methods compatible with existing electrical installation or as specified.
- J. The level of completion shall be demonstrated to Owner's Representative.
- K. Where equipment is indicated to be demolished and returned to Owner, the Contractor shall include the delivery of this equipment to the Owner's site storage area. Remove with care all equipment to be relocated. Repair or replace of newly damaged equipment is the responsibility of the Contractor.

3.04 CLEANING AND REPAIR

- A. The Contractor shall follow Owner's clean work policy and shall include the removal of trash and demolished material from the building or work area at the end of the each day and removal from the site once a week.
- B. The Contractor shall be responsible for repairing adjacent construction and finishes damaged during demolition and/or modification. The Contractor shall be responsible for the removal of ceiling tiles required in the demolition work. The Contractor shall be responsible for the replacement of damaged tiles and reinstallation of the ceiling prior to final acceptance.
- C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts, and broken electrical parts.

3.05 DISPOSITION OF MATERIAL AND EQUIPMENT

- A. Review with the Owner materials that have been removed and are no longer required, to determine any which the Owner may desire to keep. Deliver those materials that the Owner desires to the Owner's specified location.
- B. For those materials not required by the Owner, dispose of them in accordance with applicable regulations.

END OF SECTION

SECTION 26 05 19 – 600-VOLT BUILDING WIRE AND CABLE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes building wire; armored cable; metal-clad cable; and wiring connectors and connections.

1.02 REFERENCES

- A. NFPA 70 – National Electrical Code

1.03 SYSTEM DESCRIPTION

- A. Conductors intended for power wiring and control wiring operating at above 50 volts to 600 volts nominal. Section includes both individual conductors and cable assemblies.

1.04 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit for building wire and each cable assembly type.

1.05 QUALIFICATIONS

- A. Manufacturer: Company supplying products listed by UL or CSA.

PART 2 PRODUCTS

2.01 GENERAL

- A. All conductors shall be copper unless specifically noted or otherwise allowed in specifications or on Drawings. Conductor sizing shown on plans and schedules is based on copper unless specifically noted otherwise.
- B. All conductors shall be new, delivered to site in unbroken original packaging out of manufacturer's stock.

2.02 CONDUCTORS

- A. Conductor: Copper in sizes #14 and larger.
 - 1. #12 AWG and larger for power and lighting circuits.
 - 2. #10 AWG and smaller shall utilize solid conductors.
 - 3. #8 AWG and larger shall utilize stranded conductors.
 - 4. Use stranded conductors for all feeders and branch circuits #10 AWG and larger.

- B. Conductor: Aluminum conductors may be used where copper conductors are scheduled in sizes 1/0 or larger, under the following requirements:
1. Aluminum alloy conductors shall be compact stranded conductors of a recognized Aluminum Association 8000 Series aluminum alloy conductor material (AA-8000 series alloy).
 2. The contractor shall increase the size of the raceways and enclosures, if necessary, to accommodate the aluminum conductors and meet applicable code requirements.
 3. The contractor shall increase the size of the aluminum conductor to match or exceed the ampacity of the copper conductor circuit shown on the Drawings.
 4. The contractor shall submit a feeder schedule to the Engineer for all conductor substitutions indicating the aluminum conductor wire size and the conduit size. The contractor shall not begin the installation until reviewed by the Engineer.
- C. Terminations:
1. Split Bolt Connectors: Not Acceptable.
 2. Solderless Pressure Connectors: High copper alloy terminal. May be used only for conductor terminations to equipment pads or terminals. Not approved for splicing.
 - a. 3M
 - b. Ideal
 - c. T & B
 - d. Substitutions: Section 01 60 00 - Product Requirements.
 3. Spring Wire Connectors: Solderless spring type pressure connector with insulating covers for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller.
 - a. Buchannan
 - b. Ideal
 - c. T & B
 - d. Substitutions: Section 01 60 00 - Product Requirements.
 4. Compression (Crimp) Connectors: Long barrel; seamless, with internally beveled barrel ends. Connector shall be dual rated (AL7CU or AL9CU) and Listed by UL for use with aluminum and copper conductors, and sized to accept conductors of the required ampacity. Connectors shall be marked with wire size, die index, number and location of crimps and shall be suitably color-coded. Using a suitable stripping tool, remove insulation from the required length of the conductor. Crimp the connection per the connector manufacturer's recommendation.
 - a. Burndy
 - b. T & B
 - c. Substitutions: Section 01 60 00 - Product Requirements.
 5. Mechanical Connectors: For use on copper conductors only. Bolted type tin-plated; high conductivity copper alloy; spacer between conductors; beveled cable entrances, unless otherwise noted specifically on plans.

- a. Burndy
 - b. IlSCO
 - c. T & B
 - d. Substitutions: Section 01 60 00 - Product Requirements.
6. All aluminum conductors shall terminate on a compression-type connector, IlSCO series or equal, or listed copper pigtail type adapters only. Wire brush the conductor and apply a Listed joint compound. Wipe off any excess joint compound after crimping.
7. When terminating conductors to plated bus, prepare a compression-type connection. Bolts shall be plated or galvanized medium carbon steel; heat treated, quenched and tempered equal to current ASTM standard or SAE grade 5. Nuts shall conform to current ANSI standards. Washers shall be steel, Type A plain, standard wide series conforming to current ANSI standards. Belleville conical spring washers shall be of hardened steel, cadmium plated or silicone bronze. Lubricate and tighten the hardware per manufacturer's recommendations.
8. Underground Connectors: All wire connectors used in underground or exterior pull boxes shall be gel filled twist connectors or a connector designed for damp and wet locations.

2.03 BUILDING WIRE

- A. Product Description: Single conductor insulated wire.
- B. Insulation Types and Permitted Uses:
 1. Type THHN/THWN, XHHW for all interior copper branch circuits and feeders.
 2. Type XHHW-2 for all exterior conductors.
 3. Type XHHW-2 for all aluminum conductors.

2.04 ARMORED CABLE

- A. Product Description: NEC Type 'AC' Armored Cable.
- B. Conductor: Copper, sizes 12 AWG through 1 AWG.
- C. Armor Material: Flexible metal tape Per NEC 320.100.
- D. Insulation: Type THHN/THWN.

2.05 METAL-CLAD CABLE

- A. Product Description: NEC Type 'MC' Metal Clad Cable
- B. Conductor:
 1. Copper in sizes 12 AWG and larger

- 2. Aluminum in sizes 1/0 and larger
- C. Armor Material: Metallic covering per NEC 330.116
- D. Insulation: Type THHN/THWN

2.06 PERMITTED USES – TYPES MC AND AC CABLE

- A. Home Runs: All home runs shall be in conduit.
- B. Uses Permitted, type AC or MC Cable:
 - 1. Fixture whips, 6 foot maximum, from individual fixtures to junction boxes only. Direct connections between fixtures are not acceptable.

2.07 WIRE COLOR

- A. General
 - 1. Provide color coding in accordance with local code or Owner's established requirements. If not governed by local code requirements, verify with Owner if any special requirements apply. If not, provide colors as follows:
 - a. Black and red for single phase circuits at 120/240 volts.
 - b. Orange color reserved for high leg of 120/240V delta systems.
 - c. Black, red, and blue for circuits at 120/208 volts single or three phase.
 - d. Purple, brown, and yellow for circuits at 277/480 volts single or three phase.
 - e. Neutral Conductors: 120/240V and 120/208V systems, White; 277/480V systems, Gray.
 - f. Ground Conductors: Green. Isolated ground conductors: green with yellow trace.
 - 2. For wire sizes 10 AWG and smaller, install wire with insulation colors in accordance with the above.
 - 3. For wire sizes 8 AWG and larger, provide insulation colors as above or identify wire with colored tape at terminals, splices and boxes.
- B. Neutral Conductors: White. When two or more neutrals are located in one conduit, individually identify each with proper circuit numbers.
- C. Branch Circuit Conductors: Install multi-wire circuits with each phase uniquely color coded.

2.08 MISCELLANEOUS ACCESSORY MATERIALS

- A. Conductor Phase Marking Tape:
 - 1. Furnish materials in accordance with referenced standards and authority having jurisdiction.

2. Tape: Colored adhesive tape, equal to 3M Type 35.
- B. Wire Markers
 1. Furnish materials in accordance with referenced standards and authority having jurisdiction.
 2. Description: Split sleeve type wire markers.
 3. Legend:
 - a. Control Circuits: Control wire number as indicated on schematic and interconnection diagrams.
- C. Cable Pulling Lubricant
 1. Products: Ideal 'Yellow 77+' or equal
- D. Aluminum Joint Termination Compound
 1. Products: ALNOX or equal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify interior of building has been protected from weather.
- C. Verify mechanical work likely to damage wire and cable has been completed.
- D. Verify raceway installation is complete and supported.
- E. Verify field measurements are as indicated on Drawings.

3.02 COORDINATION

- A. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required to meet project conditions.
- B. Wire and cable routing is approximate unless dimensioned.

3.03 EXISTING WORK

- A. Remove exposed abandoned wire and cable, including abandoned wire and cable above accessible ceiling finishes. Patch surfaces where removed cables pass through building finishes.
- B. Disconnect abandoned circuits and remove circuit wire and cable. Remove abandoned boxes when wire and cable servicing boxes is abandoned and removed. Install blank

cover for abandoned boxes not removed.

- C. Provide access to existing wiring connections remaining active and requiring access. Modify installation or install access panel.
- D. Extend existing circuits using materials and methods compatible with existing electrical installations, and as specified.

3.04 INSTALLATION

- A. All wiring shall be installed as individual conductors contained in raceway systems, unless specifically noted otherwise on the Drawings or otherwise specified. Cables are not raceways.
- B. Provide separate neutral conductors for all single phase circuits. The use of multi-wire circuits with common neutrals is not allowed.
- C. Neatly train and lace wiring inside boxes, equipment and panelboards.
- D. Provide minimum 10 AWG conductors for 20 ampere, 120 volt branch circuit home runs longer than 75 feet.
- E. Provide minimum 10 AWG conductors for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.
- F. Special Techniques – Building Wire in Raceway:
 - 1. Pull conductors into raceway at same time.
 - 2. Install building wire 1/0 AWG and larger with motorized pulling equipment.
 - 3. Use Listed wire pulling lubricant for pulling 4 AWG and larger wires and for other conditions when necessary.
 - 4. Place all conductors of a given circuit in the same raceway. This includes phase wires, neutral (if any), and ground conductor. If parallel phase and/or neutral wires are used, place an equal number of phase and neutral conductors in same raceway.
 - 5. Maintain equal lengths on all parallel conductors.
 - 6. Completely and thoroughly swab raceway before installing wire.
- G. Special Techniques – Types AC and MC Cable:
 - 1. Protect exposed cable from damage.
 - 2. Support cables above accessible ceiling, using spring metal clips to support cables from structure. Supporting methods utilizing either ceiling support or dedicated hanger wires are not acceptable. Do not rest cable on ceiling panels.
 - 3. Use suitable cable fittings and connectors.

4. Each cable shall be supplied by only one (1) branch circuit breaker (one, two or three poles).

H. Special Techniques - Direct Burial Cable:

1. Trench and backfill for direct burial cable installation. Refer to Section 31 23 23 and Section 31 23 17. Install warning tape along entire length of direct burial cable, within 6 inches of grade.
2. Use suitable direct burial cable fittings and connectors.

I. Special Techniques - Wiring Connections:

1. Clean conductor surfaces before installing lugs and connectors.
2. Make splices, taps and terminations to carry full ampacity of conductors with no perceptible temperature rise.
3. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
4. Split bolt connectors are unacceptable for any purpose. Listed compression type connectors installed with compatible tooling may be used. Utilize manufacturer's preformed insulating devices when available and listed for use with installed connection.
5. Install solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
6. Install insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
7. Install suitable reducing connectors or mechanical connector adaptors for connecting aluminum conductors to copper conductors.

J. Do not place stranded conductors directly under wiring device screws.

K. Conductor Phase Marking Tape:

1. Install to identify phasing on all conductors #8 and larger, at each termination and in junction boxes, gutters and pull boxes.

L. Wire Marker Installation:

1. Install wire marker for each conductor at equipment cabinets, pull boxes, outlet and junction boxes.

3.05 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. Provide visual and mechanical inspections on all conductors 1/0 AWG and larger as follows:
 - 1. Inspect exposed sections for physical damage.
 - 2. Verify cable is supplied and connected in accordance with single line diagram.
 - 3. If cables are terminated through window-type CTs, make an inspection to verify that neutrals and grounds are properly terminated for normal operation of protective devices.
 - 4. Inspect for visual jacket and insulation condition.
 - 5. There shall be NO tests performed on existing cable without specific direction from the Engineer.
 - 6. Visually inspect cables, lugs, connectors and all other components for physical damage and proper connections.
 - 7. Check all cable connectors for tightness (with a torque wrench) and clearances. Torque test conductor and bus terminations to manufacturer's recommendations.
- C. Provide electrical tests on conductors as follows:
 - 1. All secondary conductors from the utility transformers to service equipment and all phase conductors 1/0 and larger shall be subjected to insulation tests using a 500 vdc megger.
 - 2. Check for proper grounding resistance at all services and at transformers. Resistance shall be 2 ohms maximum.
- D. Test results and report shall be provided to the engineer.
- E. Contractor shall correct all deficiencies reported in the test report.

END OF SECTION

SECTION 26 05 26 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Rod electrodes.
2. Active electrodes.
3. Wire.
4. Grounding well components.
5. Mechanical connectors.
6. Exothermic connections.
7. Bus

B. Related Sections:

1. Section 03 20 00 – Concrete Reinforcing: Bonding or welding bars when reinforcing steel is used for electrodes.

1.02 REFERENCES

A. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

B. National Fire Protection Association:

1. NFPA 70 - National Electrical Code (NEC), Articles 250 and 517.

C. ANSI/IEEE 142 (Latest edition):

1. Recommended Practice for Grounding of Industrial and Commercial Power Systems.

1.03 SYSTEM DESCRIPTION

- A. All ground and bonding as required by NEC Article 250.**

1.04 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.**

B. Product Data: Submit data on grounding connections. Submit data on made electrodes (as defined by NEC) only when made electrodes are required specifically by the project Drawings.

C. Manufacturer's Installation Instructions: Submit for active electrodes.

1.05 CLOSEOUT SUBMITTALS

A. Section 01 70 -00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of components and grounding electrodes.

1.06 QUALITY ASSURANCE

A. Provide grounding materials conforming to requirements of NEC, and listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

B. Perform Work in accordance with NEC Article 250 and any other special requirements adopted by Authorities Having Jurisdiction.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section.

1.08 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.

1.09 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Complete grounding and bonding to building reinforcing steel prior to concrete placement.

PART 2 PRODUCTS

2.01 ROD ELECTRODES

A. Product Description:

1. Material: Copper-clad steel.

2. Diameter: 3/4 inch.
3. Length: 10 feet (3.5 m) minimum. Rod shall be driven at least 9' 6" deep.
4. Connector: Connector for exothermic welded connection or listed U-bolt clamp.
5. Provide only when shown on the Drawings or when made electrodes per NEC Article 250 are required.

2.02 ACTIVE ELECTRODES

A. Manufacturers:

1. Apache Grounding/Erico Inc.
2. Copperweld, Inc.
3. Erico, Inc.
4. O-Z Gedney Co.
5. Thomas & Betts, Electrical

B. Product Description:

1. Material: Metallic-salt-filled copper-tube electrode.
2. Shape: As indicated on Drawings.
3. Length: 8 feet.
4. Connector: Connector for exothermic welded connection or listed compatible U-bolt clamp.

2.03 WIRE

- A. Material: Stranded copper.
- B. Foundation Electrodes/Ufer Grounds: Bare copper sized per NEC Article 250, but not smaller than #2 AWG, or as shown on Drawings.
- C. Grounding Electrode Conductor: Copper conductor bare, sized per NEC Article 250, but not smaller than #2 AWG or as shown on Drawings.
- D. Bonding Conductor: Copper conductor sized per NEC Article 250.
- E. Equipment Grounding Conductors: Insulated copper run with circuit conductors and sized as indicated on the Drawings or per NEC Article 250 where size is not indicated on the Drawings. Provide an equipment grounding conductor in all feeders and branch circuits.

2.04 GROUNDING WELL COMPONENTS

- A. Well Pipe: 8 inches NPS by 24 inches long fiberglass pipe with belled end.
- B. Well Cover: Cast iron with legend "GROUND" embossed on cover.

2.05 MECHANICAL CONNECTORS

A. Manufacturers:

- 1. Copperweld, Inc.
- 2. Erico, Inc.
- 3. ILSCO Corporation
- 4. O-Z Gedney Co.
- 5. Thomas & Betts, Electrical

B. Description:

- 1. The mechanical connector bodies shall be manufactured from high-strength, high conductivity cast copper alloy material. Bolts, nuts, washers and lockwashers shall be made of Silicon Bronze and supplied as a part of the connector body and shall be of the two bolt type.
- 2. Split bolt connector types are NOT allowed. Exception: the use of split bolts is acceptable for grounding of wire-basket type cable tray, and for cable shields/straps of medium voltage cable.
- 3. The connectors shall meet or exceed UL 467 and be clearly marked with the catalog number, conductor size and manufacturer.

2.06 EXOTHERMIC CONNECTIONS

A. Manufacturers:

- 1. Cadweld, Inc.
- 2. Erico, Inc.

B. Product Description: Listed exothermic materials, accessories and tools for preparing and making permanent field connections between grounding system components.

2.07 GROUNDING BUS

A. Material:

- 1. Copper (aluminum not permitted).

B. Size:

- 1. 1/4" X 2" minimum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify final backfill and compaction has been completed before driving rod electrodes.

3.02 PREPARATION

- A. Remove paint, rust, mill oils, surface contaminants at connection points.
- B. Mechanical connections shall be accessible for inspection and checking. No insulation shall be installed over mechanical ground connections.
- C. Ground connection surfaces shall be cleaned and all connections shall be made so that they are immovable.
- D. Attach grounds permanently before permanent building service is energized.
- E. All grounding electrode conductors shall be installed in PVC conduit, in exposed locations.

3.03 EXISTING WORK

- A. Modify existing grounding system to maintain continuity to accommodate renovations.
- B. Extend existing grounding system using materials and methods compatible with existing electrical installations, and as specified.

3.04 INSTALLATION

- A. Install in accordance with NEC and in accordance with manufacturer's instructions. Unless specifically indicated otherwise on the Drawings, Contractor may utilize any arrangement of components which fully complies with both.
- B. Install grounding and bonding conductors concealed from view to extent practical.
- C. Install grounding well pipe with cover at rod locations as indicated on Drawings. Install well pipe top flush with finished grade.
- D. Install grounding electrode conductor and connect to reinforcing steel in foundation footing utilizing a connection method listed for the purpose.
- E. Bond together reinforcing steel and metal accessories in pool and fountain structures.
- F. Bond exposed structural steel elements not intentionally grounded as required by NEC 250.104 (C).
- G. Provide code sized copper grounding electrode conductors where required by NEC

Article 250.

- H. Install ground grid under access floors where indicated. Construct grid of #4 AWG bare copper wire installed on 72 inch centers both ways. Bond each access floor support pedestal to grid.
- I. Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Bond to underfloor ground grid. Use #4 AWG bare copper conductor.
- J. Equipment Grounding Conductor: Provide separate, insulated equipment grounding conductor within each raceway. Terminate each end on suitable lug, bus, enclosure or bushing. Provide a ground wire from each device to the respective enclosure.
- K. Provide communications system grounding conductor at point of service entrance and connect to building common grounding electrode system.

3.05 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS.
- B. Grounding and Bonding: Perform inspections and tests listed in NETA ATS.
- C. Perform ground resistance testing in accordance with IEEE 142. The following tests are acceptable methods for the resistance-to-ground verification:
 - 1. Clamp-on Induced Frequency Resistance-to-Ground method.
 - 2. 3-point Fall-of-Potential method.

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.
- 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. Eaton
 - 2. Hubbell: CSB Series.
 - 3. Leviton: CSB Series.
 - 4. 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. Eaton
 - b. Hubbell: HBL5362 Series
 - c. Leviton: 5362 Series
 - d. Substitutions: Section 01 60 00 - Product Requirements.
- B. 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.

2.03 DEVICE PLATES, COVERS AND COLORS

- A. Manufacturers: To match device manufacturer.
- B. Device Colors:
 1. Wall Devices: White
 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.

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.
- K. Section 26 51 00 – Identification: Faceplates for healthcare.

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.
 - 3. Operation of each type of photocell/ambient lighting control zone.
- C. Furnish 4 hours to instruct Owner's personnel in operation and maintenance of system. 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.
4. Sleeves.
5. Mechanical sleeve seals.
6. Equipment bases and supports.

B. Related Sections:

1. Section 03 30 00 - Cast-In-Place Concrete: Product requirements for concrete for placement by this section.

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.

2.04 MECHANICAL AND CONDUIT SLEEVE SEALS

- A. Manufacturers:
 - 1. O-Z/Gedney.
 - 2. Thunderline Link-Seal, Inc.
 - 3. Substitutions: Section 01 60 00 - Product Requirements.

- B. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- C. Product Description: Mechanical type, consisting of rubber sealing elements to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

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.

3.03 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 3 inches beyond supported equipment, under all switchboards, motor control centers, floor mounted transformers, and other locations as indicated on the Drawings. Refer to Section 03 30 00.
- B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

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 53 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Nameplates.
2. Labels.
3. Faceplates for Healthcare.
4. Wire markers.
5. Conduit markers.
6. Underground Warning Tape.
7. Lockout Devices.
8. 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 white lettering on red 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/phase/wire rating, color of each phase/neutral/grounding, available fault current, date, 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 FACEPLATES FOR HEALTHCARE

- A. Furnish materials in accordance with referenced standards and authority having jurisdiction.
- B. Product Description: Engraved red faceplate for critical branch system components.
- C. Identify serving panelboard and circuit number.

2.04 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.

2.05 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.

2.06 UNDERGROUND WARNING TAPE

- A. Provide detectable underground warning tape, yellow background, black letters, 6" width, equal to Ideal #42-251, with suitable warning legend describing buried electrical lines.

2.07 LOCKOUT DEVICES

A. Lockout Hasps:

1. Anodized aluminum hasp with erasable label surface; size minimum 7-1/4 x 3 inches.

2.08 PANELBOARD DIRECTORIES

- 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.
4. Label junction box covers with panelboard and circuit number information. Label junction boxes exposed in finished spaces on the inside of the junction box cover. Use permanent marker or machine printed labels.
5. Label conduits at panelboards and where conduits penetrate walls with panelboard and circuit number information. Use permanent marker or machine printed labels.
6. Provide labels on equipment indicating warranty expiration dates.
7. Provide machine printed labels on the coverplate of each wiring device identifying panelboard and circuit number.

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 4 to 6 inches below finished grade, directly above buried conduit, raceway, or cable.

END OF SECTION

SECTION 26 24 13 – SWITCHBOARDS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes non-drawout type switchboards.

1.02 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C12.1 - Code for Electricity Metering.
 - 2. ANSI C39.6 - Requirements, Electrical Digital Indicating Instruments.
 - 3. ANSI C57.13 – Requirements for Instrument Transformers.
- B. National Electrical Manufacturers Association:
 - 1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
 - 2. NEMA FU 1 - Low Voltage Cartridge Fuses.
 - 3. NEMA KS 1 - Enclosed Switches.
 - 4. NEMA KS 2 – Bolted Pressure Contact Switches.
 - 5. NEMA PB 2 - Deadfront Distribution Switchboards.
 - 6. NEMA PB 2.1 - Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less.
- C. Underwriters Laboratories
 - 1. UL-891 – Dead Front Switchboards

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures.
- B. Shop Drawings: Include front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; one-line diagrams; size and number of bus bars per phase; and switchboard instrument details.
- C. Product Data: Submit electrical characteristics including voltage; frame size and trip ratings; fault current interrupting and withstand ratings; and time-current curves of all equipment and components.
- D. Test Reports: Indicate results of factory production and field tests.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations, configurations, and ratings of switchboards and their components on single line diagrams and plan layouts.
- C. Operation and Maintenance Data: Submit spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.05 QUALIFICATIONS

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

1.06 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing and protecting products.
- B. Accept switchboards on site. Inspect for damage.
- C. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle in accordance with NEMA PB 2.1. Lift only with lugs provided. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Conform to NEMA PB 2 service conditions during and after installation of switchboards.

1.08 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.09 SEQUENCING

- A. Section 01 10 00 – Summary of Work: Work sequence.
- B. Sequence Work to avoid interferences with building finishes and installation of other products.

1.10 MAINTENANCE MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish two of each key.

1.11 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish three of each size and type of fuse installed.

PART 2 PRODUCTS

2.01 DISTRIBUTION SWITCHBOARDS

- A. Acceptable manufacturers are listed alphabetically below:
 - 1. Eaton/Cutler-Hammer.
 - 2. Schneider Electric/Square D.
 - 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: NEMA PB 2, enclosed switchboard with electrical ratings and configurations as indicated on Drawings.
- C. Device Mounting:
 - 1. Main Section: Individually mounted.
 - 2. Distribution Section: Group mounted.
 - 3. Where spaces are indicated for future breakers, extend bus bars, drill and tap bus, and fully equip for future breakers including all connectors and mounting hardware.
 - 4. All breakers shall be bolted, quick make, quick break, trip indicating.
- D. Buses:
 - 1. Material: Aluminum with tin plating, sized to meet UL 891 temperature rise requirements.
 - 2. Connections: Bolted accessible from front for maintenance.
 - 3. Neutral Bus: extend length of switchboard.
 - 4. Ground Bus: extend length of switchboard.
- E. Line and Load Terminations: Accessible from front only or rear of switchboard per switchboard schedule, suitable for conductor materials and sizes as indicated on Drawings or as scheduled.
- F. Pull Box (When indicated on the Drawings or scheduled): Same construction as switchboard; depth to match; covers removable top, sides and front.
- G. Pull Section (When indicated on the Drawings, scheduled or otherwise required): Depth and height to match switchboard. Arrange as indicated on Drawings

- H. Enclosure: NEMA Type 1 General Purpose or Type 3R Weather Resistant as scheduled.
- I. Align sections at front and rear.
- J. Switchboard Height: 90 inches (230 mm), excluding floor sills, lifting members and pull boxes.
- K. Finish: Manufacturer's standard gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.

2.02 FUSIBLE SWITCH ASSEMBLIES

- A. Product Description: NEMA KS 1, Type HD, load interrupter knife switch. Handle lockable in OFF position.
- B. Fuse Clips: Designed to accommodate NEMA FU 1, Class R, or J fuses as scheduled.

2.03 FUSIBLE SWITCH ASSEMBLIES LARGER THAN 800 AMPERES OR LARGER

- A. Product Description: NEMA KS 1, bolted pressure contact switch.
- B. Fuse Provisions: Designed to accommodate NEMA FU 1, Class L fuses.

2.04 MOLDED CASE CIRCUIT BREAKER

- A. Product Description: NEMA AB 1, molded-case circuit breaker; provide 100% rated breakers where scheduled.
- B. Trip Units:
 - 1. Manufacturer's standard thermal magnetic type unless otherwise scheduled.
 - 2. Provide solid-State when specifically scheduled with electronic sensing, timing and tripping circuits for adjustable current settings, and with trip functions as scheduled.
- C. Current Limiting Circuit Breaker:
 - 1. Circuit breaker indicated as current-limiting to have automatically-resetting current limiting elements in each pole.
 - 2. Let-through Current and Energy: Less than permitted for same size Class RK-5 fuse.
 - 3. Coordinate limiter size with trip rating of circuit breaker to prevent nuisance tripping and to achieve interrupting current rating specified for circuit breaker.
- D. Accessories: Conform to NEMA AB 1; provide when specifically scheduled.
 - 1. Shunt Trip Device: 120 volts, AC.
 - 2. Undervoltage Trip Device.

3. Auxiliary Switch.
4. Alarm Switch.
5. Electrical Operator.

2.05 INSULATED CASE CIRCUIT BREAKER

- A. Product Description: NEMA AB 1, enclosed, insulated-case circuit breaker.
- B. Solid-State Trip Unit: Electronic sensing, timing, and tripping circuits for adjustable current settings; provide trip functions as scheduled.
- C. Accessories: Conform to NEMA AB 1; provide when specifically scheduled.
 1. Shunt Trip Device: 120 volts, AC Undervoltage Trip Device.
 2. Auxiliary Switch.
 3. Alarm Switch.
 4. Electrical Operator.

2.06 GROUND FAULT DEVICES

- A. Ground Fault Sensor: Zero sequence or residual type. Ground return type is NOT ACCEPTABLE.
- B. Ground Fault Relay: Adjustable ground fault sensitivity from 200 to 1200 amperes, time delay adjustable from 0 to 15 seconds. Furnish monitor panel with lamp to indicate relay operation, TEST and RESET control switches or equivalent indicators and controls.

2.07 METERING TRANSFORMERS

- A. Current Transformers: IEEE C57.13; 5 ampere secondary, with winding and secondary shorting device, primary/secondary ratio as required for application, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.
- B. Potential Transformers: IEEE C57.13; 120 volt secondary, disconnecting type with integral fuse mountings, primary/secondary ratio as required for application, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.

2.08 SOURCE QUALITY CONTROL

- A. Furnish shop inspection and testing in accordance with NEMA PB 2.

PART 3 EXECUTION

3.01 EXAMINATION

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

- B. Verify surface is suitable for switchboard installation.

3.02 INSTALLATION

- A. Install in accordance with NEMA PB 2.1.
- B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.
- C. Install fuses in each switch and coordinate sizes with connected load.
- D. Install engraved plastic nameplates in accordance with Section 26 05 53.
- E. Install breaker circuit directory.
- F. Ground and bond switchboards in accordance with Section 26 05 26.

3.03 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting and balancing.

3.04 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirement: Testing, adjusting and balancing.
- B. Adjust operating mechanisms for free mechanical movement.
- C. Tighten bolted bus connections.
- D. Adjust circuit breaker trip and time delay settings to approved settings.

3.05 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Touch up scratched or marred surfaces to match original finish.

END OF SECTION

SECTION 26 24 16 – PANELBOARDS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Distribution and branch circuit panelboards.
2. Electronic grade branch circuit panelboards.

1.02 REFERENCE STANDARDS

A. National Electrical Manufacturers Association:

1. NEMA PB 1 - Panelboards.
2. NEMA PB 1.1 - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.

B. National Fire Protection Association:

1. NFPA 70 - National Electrical Code.

C. Underwriters Laboratories Inc.:

1. UL 50 - Cabinets and Boxes.
2. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
3. UL 1283 - Electromagnetic Interference Filters.
4. UL 1449 - Transient Voltage Surge Suppressors.
5. UL 1699 - Arc-Fault Circuit Interrupters.

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.**
- B. Product Data:** Submit catalog data showing specified features of standard products.
- C. Shop Drawings:** Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.
- D. Field Quality Control Submittals:** Indicate results of Contractor furnished tests and inspections.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of panelboards and record actual circuiting arrangements.
- C. Operation and Maintenance Data: Submit spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.05 MAINTENANCE MATERIAL SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance products.

1.06 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years of experience.

PART 2 PRODUCTS

2.01 PANELBOARDS

- A. Acceptable Manufacturer List: Manufacturers are listed alphabetically:
 - 1. Eaton/Cutler-Hammer.
 - 2. Schneider Electric/Square D.
- B. Substitution Limitations:
 - 1. Section 01 60 00 - Product Requirements: Requirements for substitutions for other manufacturers and products.
- C. Description: NEMA PB 1, panelboard.
- D. Operation:
- E.
 - 1. Service Conditions:
 - a. Temperature: <105 degrees F
 - b. Altitude: <6000 feet above sea level.
 - 2. Minimum integrated short circuit rating: as scheduled.
- F. Materials:
 - 1. Panelboard Bus: Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.

2. Fusible Switch Assemblies: NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Furnish interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses unless otherwise scheduled.
3. Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide electronic trip units when specifically scheduled in lieu of thermal type. Furnish circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
4. Molded Case Circuit Breakers with Current Limiters: UL 489, circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole. Provide electronic trip units when specifically scheduled in lieu of thermal type.
5. Current Limiting Molded Case Circuit Breakers: UL 489, circuit breakers with integral overcurrent and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse.
6. Circuit Breaker Accessories: Trip units and auxiliary switches as scheduled.
7. Enclosure: NEMA PB 1, Type as scheduled.
8. Cabinet Front: Surface hinged trim type, fastened with screws.
9. Contractor shall determine feed arrangement, top or bottom, to match installation. Where specific feed arrangements are shown on the drawings, the contractor shall adhere to those requirements.
10. Furnish circuit directory inside door.

G. Finishes:

1. Covers, trim and doors: Manufacturer's standard gray enamel. Provide full height side-hinged trim type covers. Door-in-door type construction is not acceptable.
2. Enclosure: Galvanized.

2.02 ELECTRONIC GRADE PANELBOARD

A. Description:

1. Integral Surge Suppressor: Component recognized in accordance with UL 1449 and UL 1283.
2. Panelboard: UL 67 listed and TVSS device UL 1449 Component Recognized. TVSS device meets UL 1449. Furnish panelboard markings with clamp voltage at TVSS terminals and clamp voltage at panelboard line terminals.

B. Performance:

1. Integral Surge Suppressers:

a. Meet or exceed the following criteria:

- 1) Maximum single impulse current rating 80 kA, 120 kA, 160 kA, or 200 kA as scheduled for each phase.
- 2) Pulse Lift Test: Capable of protecting against and surviving 5000 IEEE C62.41 Category C transients without failure or degradation.
- 3) Clamping voltage not exceeding the following:
- 4)

Voltage	L-N	N-G	L-G
208Y/120	500 V	500 V	500 V
480Y/277	1000 V	1000 V	1000 V

C. Fabrication:

1. Integral Surge Suppressor:

- a. Furnish copper bus bars for surge current path.
- b. Construct using surge current modules (MOV based). Each module fused with user replaceable 200,000 AIR rated fuses. Status of each module monitored on front cover of panelboard enclosure and on module.
- c. Furnish with audible alarm activated when one of surge current modules has failed. Furnish alarm on/off to silence alarm and alarm push-to-test switch to test alarm. Locate switches and alarm on front cover of panelboard enclosure.
- d. Furnish response time no greater than five nanoseconds for individual protection modes.
- e. Designed to withstand maximum continuous operating voltage (MCOV) of not less than 115 percent of nominal RMS voltage.
- f. Furnish visible indication of proper suppressor connection and operation. Lights indicate operable phase and module.
- g. Furnish minimum EMI/RFI filtering of 34 dB at 100 kHz with insertion loss ratio of 50: 1 using Mil Std. 220A methodology.

2. Panelboards:

- a. Furnish one circuit breaker, rating as recommended by manufacturer with appropriate number of poles, as dedicated disconnect for TVSS.
- b. Furnish 200 percent rated neutral assembly with aluminum neutral bus.
- c. Furnish with insulated ground bus and non-insulated equipment grounding bus.
- d. Remainder of specification requirements shall be per Article 2.1.

2.03 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Independently test integral surge suppressors with category C3 high exposure waveform (20 kV-1.2/50us, 10kA-8/20 us) per IEEE C62.41.

PART 3 EXECUTION

3.01 DEMOLITION

- A. Disconnect abandoned panelboards. Install blank cover for abandoned panelboards where specifically indicated on the Drawings.
- B. Maintain access to existing panelboard remaining active and requiring access. Modify installation or provide access panel.

3.02 INSTALLATION

- A. Install panelboards plumb.
- B. Install recessed panelboards flush with wall finishes.
- C. Height: Where height of panelboard permits, 6' above finished floor or working surface. Otherwise, mount higher but to remain in compliance with NEC Article 404.8(A) requirements.
- D. Install filler plates for unused spaces in panelboards.
- E. Provide typed circuit directory for each branch circuit panelboard. Identify each circuit as to its clear, evident and specific purpose of use.
- F. Install engraved plastic nameplates in accordance with Section 26 05 53.
- G. Install spare conduits out of each recessed panelboard to accessible location above ceiling. Minimum spare conduits: 3 empty 1 inch (DN27). Identify each as SPARE.
- H. Ground and bond panelboard enclosure according to Section 26 05 26. Connect equipment ground bars of panels in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

3.04 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- B. Measure and record steady state load currents at each panelboard feeder. Submit results to Engineer as part of close-out documents.

3.05 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean existing panelboards to remain or to be reinstalled.

END OF SECTION

SECTION 26 28 16 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes fusible switches, non-fusible switches, and molded case and insulated case circuit breakers in individual enclosures.
- B. Related Sections:
 - 1. Section 26 28 13 - Fuses.

1.02 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA FU 1 - Low Voltage Cartridge Fuses.
 - 2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
 - 3. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures.
- B. Product Data: Submit switch ratings and enclosure dimensions.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of enclosed switches and circuit breakers with ratings of installed fuses.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section.

PART 2 PRODUCTS

2.01 FUSIBLE SWITCH ASSEMBLIES

- A. Manufacturers:
 - 1. Eaton/Cutler Hammer.
 - 2. Schneider Electric/Square D.

3. Substitutions: Section 01 60 00 - Product Requirements

- B. Product Description: NEMA KS 1, heavy-duty enclosed load interrupter knife switch. Handle lockable in OFF position.
- C. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses.
- D. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R or 4 as noted on plans.
- E. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.
- F. Furnish switches with entirely copper current carrying parts.

2.02 NON-FUSIBLE SWITCH ASSEMBLIES

- A. Manufacturers:
 - 1. Eaton/Cutler Hammer.
 - 2. Schneider Electric/Square D.
 - 3. Substitutions: Section 01 60 00 - Product Requirements
- B. Product Description: NEMA KS 1, heavy-duty enclosed load interrupter knife switch. Handle lockable in OFF position.
- C. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R or 4 as noted on plans.
- D. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.
- E. Furnish switches with entirely copper current carrying parts.

2.03 SWITCH RATINGS

- A. Switch Rating: Horsepower rated for AC or DC as indicated on Drawings.
- B. Short Circuit Current Rating: UL listed for 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses (30-600 ampere switches employing appropriate fuse rejection schemes). 200,000 rms symmetrical amperes when used with or protected by Class L fuses (800-1200 ampere).

2.04 MOLDED CASE CIRCUIT BREAKER

- A. Manufacturers:
 - 1. Eaton/Cutler Hammer.
 - 2. Schneider Electric/Square D.
 - 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Enclosed, molded-case circuit breaker conforming to NEMA AB 1, suitable for use as service entrance equipment where applied.
- C. Service Conditions:
 - 1. Temperature: 104 degrees F maximum.
 - 2. Altitude: 6,000 feet maximum.
- D. Field-Adjustable Trip Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have mechanism for adjustment as noted on Drawings.
- E. Current Limiting Circuit Breaker: Circuit breaker indicated as current-limiting have automatically-resetting current limiting elements in each pole. Let-through Current and Energy: Less than permitted for same size Class RK-5 fuse.
- F. Solid-State Circuit Breaker: Electronic sensing, timing, and tripping circuits for adjustable current settings; and delays as noted on Drawings.
- G. Current Limiter: Designed for application with molded case circuit breaker.
 - 1. Coordinate limiter size with trip rating of circuit breaker to prevent nuisance tripping and to achieve interrupting current rating specified for circuit breaker.
 - 2. Interlocks trip circuit breaker and prevent closing circuit breaker when limiter compartment cover is removed or when one or more limiter is not in place or has operated.
- H. Accessories: As indicated on Drawings. Conform to NEMA AB 1. Typical devices include breaker locks, pad lock provisions, auxiliary switch, shunt-trip operators, and others as indicated.
- I. Enclosure: NEMA AB 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R or 4 or as noted on Drawings.
- J. Service Entrance: Circuit breakers identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

PART 3 EXECUTION

3.01 EXISTING WORK

- A. Disconnect and remove abandoned enclosed switches and circuit breakers.
- B. Maintain access to existing enclosed switches and circuit breakers and other installations remaining active and requiring access. Modify installation or provide access panel.
- C. Clean and repair existing enclosed switches to remain or to be reinstalled.

3.02 INSTALLATION

- A. Install enclosed switches and circuit breakers plumb. Provide supports in accordance with Section 26 05 29.
- B. Height: 5 feet to operating handle.
- C. Install fuses for fusible disconnect switches. Refer to Section 26 28 13 for product requirements.
- D. Install engraved plastic nameplates in accordance with Section 26 05 53.
- E. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.03 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements and Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing and adjusting.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.

3.04 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting and balancing.
- B. Adjust trip settings to coordinate circuit breakers with other overcurrent protective devices in circuit.
- C. Adjust trip settings to provide adequate protection from overcurrent and fault currents

END OF SECTION