

**EL PASO COUNTY DETENTION FACILITY SEWER UPGRADE**

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**County of El Paso – Bid# 22-XXX**

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## SECTION 01 10 00 – SUMMARY OF WORK

### PART 1 – GENERAL

#### 1.1. SECTION INCLUDES

- A. Contract description.
- B. Work by Owner.
- C. Owner supplied products.
- D. Contractor's use of site and premises.
- E. Work sequence.
- F. Owner occupancy.

#### 1.2. CONTRACT DESCRIPTION

- A. Work of the Project includes the construction, installation, and alteration of the facilities for the COUNTY OF EL PASO JAIL DETENTION FACILITY SEWER UPGRADE as detailed on the drawings and in these specifications.
- B. THIS FACILITY WILL BE OCCUPIED AND OPERATIONAL 24/7 DURING THE ENTIRE CONSTRUCTION PHASE. THE BUILDING OPERATING HOURS ARE 24 HOURS PER DAY SEVEN DAYS PER WEEK.
- C. THE WORK FOR THIS PROJECT SHALL BE DONE IN THE EVENING, OVER NIGHT AND DURING WEEKENDS. THE CONTRACTOR SHALL COORDINATE ALL SHUTDOWNS WITH THE OWNER AND ENGINEER A MINIMUM OF **TWO WEEKS** BEFORE THE SHUTOFF.
- D. Perform Work of Contract under a stipulated fixed cost contract with the Owner in accordance with the Conditions of Contract.
- E. The facility project's work to be performed is listed below:
  - 1. Removal and replacement of the existing building entire main sewer and venting piping.
  - 2. Adding two (2) lift stations: one interior to the building in the Sally Port and the other exterior to the building.
  - 3. Adding a grease interceptor and lint interceptor to the Sally Port area with associated sewer waste piping from the Kitchen and Laundry.

#### 1.3. CONTRACTOR'S USE OF SITE AND PREMISES

- A. Limit use of site and premises to allow:
  - 1. Owner occupancy.
  - 2. Access to Site:
  - 3. Emergency Building Exits during Construction:
  - 4. Construction Operations: Limited to areas noted on Drawings.
  - 5. Time Restrictions for Performing Interior Work per Preconstruction Meeting requirements
  - 6. Utility Outages and Shutdown: Coordinate with Owner.

#### 1.4. WORK SEQUENCE

- A. Construct Work in to accommodate Owner's occupancy requirements during the construction period, coordinate construction schedule and operations with Owner and Engineer:

#### 1.5. OWNER OCCUPANCY

- A. The Owner will occupy the facility on a 24/7 basis during the entire period of construction.
- B. Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

### PART 2 – PRODUCTS

- 2.1. Not Used.

### PART 3 – EXECUTION

- 3.1. Not Used.

END OF SECTION 01 10 00

## **SECTION 01 20 00 – PRICE AND PAYMENT PROCEDURES**

### **PART 1 – GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Schedule of Values.
- B. Applications for payment.
- C. Change procedures.
- D. Defect assessment.
- E. Alternates.

#### **1.2. SCHEDULE OF VALUES**

- A. Submit printed schedule on AIA Form G703 Continuation Sheet for G702.
- B. Submit Schedule of Values in duplicate within 7 days after date of Owner-Contractor Agreement as established in 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 bonds and insurance.
- D. Revise schedule to list approved Change Orders, with each Application for Payment.

#### **1.3. APPLICATIONS FOR PAYMENT**

- A. Submit four 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.
- F. Submit lien waivers.

- G. Substantiating Data: When Engineer requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:
1. Partial release of liens from major subcontractors and vendors.
  2. Record documents as specified in Section, for review by Owner which will be returned to Contractor.
  3. Affidavits attesting to off-site stored products.
  4. Construction progress schedules revised and current as specified this Section.

#### 1.4. 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. The 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.
- C. The Engineer may issue a Proposal Request and Notice of Change 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 5 days.
- D. Stipulated Sum/Price Change Order: Based on Proposal Request and Notice of Change and Contractor's fixed price quotation or Contractor's request for Change Order as approved by Engineer.
- E. Document each quotation for change in cost or time with sufficient data to allow evaluation of quotation.
- F. Change Order Forms: AIA Format
- G. Execution of Change Orders: Engineer will issue Change Orders for signatures of parties as provided in Conditions of the Contract.
- H. 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.

## PART 2 – PRODUCTS

2.1. Not Used.

## PART 3 – EXECUTION

3.1. Not Used

END OF SECTION 01 20 00

## **SECTION 01 31 00 – COORDINATION AND MEETINGS**

### **PART 1 – GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Coordination and project conditions.
- B. Field engineering.
- C. Preconstruction meeting.
- D. Site mobilization meeting.
- E. Progress meetings.
- F. Pre-installation meetings.
- G. Equipment electrical characteristics and components.
- H. Examination.
- I. Preparation.
- J. Cutting and Patching.
- K. Alteration project procedures.

#### **1.2. COORDINATION AND PROJECT CONDITIONS**

- A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. The Facilities exist and occupied by the Owner, coordinate work with operations of the Owner.
- C. 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, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical Work which are 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.

- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's occupancy.
- G. 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.
- H. This is a high security facility and all personnel working at the site will have to be cleared prior to them working at the site. The security clearances procedure will be discussed at the prebid meeting.

### 1.3. PRECONSTRUCTION MEETING

- A. Owner in conjunction with the Engineer will schedule a meeting after Notice of Award.
- B. Attendance Required: Owner, Engineer, and Contractor.
- C. Agenda:
  - 1. Submission of executed bonds and insurance certificates.
  - 2. Distribution of Contract Documents.
  - 3. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
  - 4. Designation of personnel representing the parties in Contract, and the Engineer.
  - 5. Procedures and processing of field decisions, submittals, and substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  - 6. Procedures for security clearances for personnel.
  - 7. Operating and security procedures during construction.
  - 8. Scheduling.
  - 9. Scheduling of weekly meetings.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer and Owner, participants, and those affected by decisions made.

#### 1.4. EACH SITE MOBILIZATION MEETING

- A. Engineer in conjunction with the Owner will schedule a meeting for each Project site prior to Contractor occupancy.
- B. Attendance Required: Owner, Engineer, and Contractor and major Subcontractors.
- C. Agenda:
  - 1. Use of premises by Owner and Contractor.
  - 2. Construction facilities and controls provided by Owner.
  - 3. Temporary utilities provided by Owner.
  - 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 two days after meeting to participants, with two copies to Engineer, Owner, participants, and those affected by decisions made.

#### 1.5. PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum weekly intervals as established at the Preconstruction meeting.
- B. Make arrangements for meetings, send notification of meeting to Owner, Engineer and other participants, prepare agenda with copies for participants, and preside at meetings.

#### 1.6. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Engineer, as appropriate to agenda topics for each meeting.

- A. Agenda:
  - 1. Review minutes of previous meetings.
  - 2. Review of Work progress.
  - 3. Field observations, problems, and decisions.
  - 4. Identification of problems which impede 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.

- B. Record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer, Owner, participants, and those affected by decisions made.

## PART 2 – PRODUCTS

### 2.1. EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.
- B. Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

## PART 3 – EXECUTION

### 3.1. CUTTING AND PATCHING

- A. Employ skilled and experienced installer to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements which affect:
  1. Structural integrity of element.
  2. Integrity of weather-exposed or moisture-resistant elements.
  3. Efficiency, maintenance, or safety of element.
  4. Visual qualities of sight exposed elements.
  5. Work of Owner or separate Contractor.
- C. 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.
- D. Execute work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- E. Cut masonry and concrete materials using masonry saw or core drill.
- F. Restore Work with new Products in accordance with requirements of Contract Documents.
- G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- I. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.
- J. Identify hazardous substances or conditions exposed during the Work to the Engineer for decision or remedy.

### 3.2. ALTERATION PROJECT PROCEDURES

- A. Materials: As specified in Product sections; match existing Products and work for patching and extending work.
- B. Employ skilled and experienced installer to perform alteration work.
- C. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- D. Remove, cut, and patch Work in a manner to minimize damage and to provide means of restoring Products and finishes to original or specified condition.
- E. Refinish existing visible surfaces to remain in renovated rooms and spaces, to original or specified condition for each material, with a neat transition to adjacent finishes.
- F. Where new Work abuts or aligns with existing, provide a smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
- G. When finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division and submit recommendation to Engineer for review.

H. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.

I. Finish surfaces as specified in individual Product sections.

END OF SECTION 01 31 00

## SECTION 01 33 00 – SUBMITTAL PROCEDURES

### PART 1 – GENERAL

#### 1.1. SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Proposed products list.
- D. Product data.
- E. Shop drawings.
- F. Design data.
- G. Test reports.
- H. Certificates.
- I. Manufacturer's instructions.
- J. Manufacturer's field reports.

#### 1.2. SUBMITTAL PROCEDURES

- A. Transmit each submittal with AIA Form G810.
- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- C. Identify Project, Contractor, subcontractor and supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite the Project and deliver to Engineer at business address. Coordinate submission of related items.
- F. For each submittal for review, allow 7 days excluding delivery time to and from the Contractor.

- G. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of the completed Work.
- H. Provide space for Contractor, Code review approval, and Engineer review stamps.
- I. When revised for resubmission, identify all changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- K. Submittals not requested will not be recognized or processed.

### 1.3. CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedules within 7 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 a computer-generated horizontal bar chart with separate line for each major portion of Work or operation and School identifying first work day of each week.
- F. Submit computer generated network analysis diagram.
- G. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
- H. Indicate estimated percentage of completion for each item of Work at each submission.
- I. Provide separate schedule of submittal dates for shop drawings, product data, and dates reviewed submittals will be required from Engineer. Indicate decision dates for selection of finishes.

### 1.4. PROPOSED PRODUCTS LIST

- A. Within 7 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.

#### 1.5. PRODUCT DATA

- A. Product Data: Submit to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents. Provide copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 01 70 00.
- B. Submit the number of copies which the Contractor requires, plus one copy which will be retained by the Engineer.
- 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 distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section 01 70 00.

#### 1.6. SHOP DRAWINGS

- A. Shop Drawings: Submit to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 01 70 00.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Submit in the form of one reproducible transparency and one opaque reproduction.

- D. Submit the number of opaque reproductions which Contractor requires, plus two copies which will be retained by Engineer.

#### 1.7. DESIGN DATA

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

#### 1.8. TEST REPORTS

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

#### 1.9. CERTIFICATES

- A. When specified in individual specification sections, submit certification by the manufacturer, installation/application subcontractor, or the Contractor to 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 Engineer.

#### 1.10. MANUFACTURER'S INSTRUCTIONS

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

#### 1.11. MANUFACTURER'S FIELD REPORTS

- A. Submit reports for the Engineer's benefit as contract administrator or for the Owner.

- B. Submit report in duplicate within 7 days of observation to Engineer for information.
- C. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

PART 2 – PRODUCTS

2.1. Not Used.

PART 3 – EXECUTION

3.1. Not Used.

END OF SECTION 01 33 00

## SECTION 01 40 00 – QUALITY REQUIREMENTS

### PART 1 – GENERAL

#### 1.1. SECTION INCLUDES

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

#### 1.2. 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. Should manufacturers' instructions conflict with Contract Documents, request clarification from 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 that field measurements are as indicated on Shop Drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

#### 1.3. TOLERANCES

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

- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding?
- C. Adjust products to appropriate dimensions; position before securing products in place.

#### 1.4. REFERENCES

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

#### 1.5. MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- C. Refer to Section 01 33 00 – SUBMITTAL PROCEDURES, MANUFACTURERS' FIELD REPORTS article.

### PART 2 – PRODUCTS

- 2.1. Not Used.

## PART 3 – EXECUTION

### 3.1. EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that 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 that utility services are available, of the correct characteristics, and in the correct locations.

### 3.2. 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 any new material or substance in contact or bond.

END OF SECTION 01 40 00

## SECTION 01 42 00 – REFERENCE STANDARDS

### PART 1 – GENERAL

#### 1.1. SECTION INCLUDES

- A. Quality assurance.

#### 1.2. QUALITY ASSURANCE

- A. For Products or workmanship specified by association, trades, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents.
- C. Obtain copies of standards when required by the Contract Documents.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from the Engineer before proceeding.
- F. Neither the contractual relationship, duties, nor responsibilities of the parties in Contract nor those of the Engineer shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

### PART 2 – PRODUCTS

- 2.1. Not Used.

### PART 3 – EXECUTION

- 3.1. Not Used.

END OF SECTION 01 42 00

## SECTION 01 50 00 – TEMPORARY FACILITIES AND CONTROLS

### PART 1 – GENERAL

#### 1.1. SECTION INCLUDES

- A. Temporary Utilities:
  - 1. Telephone service.
  - 2. Facsimile service.
  - 3. Temporary sanitary facilities
- B. Construction Facilities:
  - 1. Vehicular access.
  - 2. Parking.
  - 3. Project identification.
- C. Temporary Controls:
  - 1. Protection of the Work.
  - 2. Security.
- D. Removal of utilities, facilities, and controls.

#### 1.2. TELEPHONE SERVICE

- A. Provide, maintain, and pay for telephone service to field office at time of project mobilization.

#### 1.3. FACSIMILE SERVICE

- A. Provide, maintain and pay for facsimile service and a dedicated telephone line to field office at time of project mobilization.

#### 1.4. TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide at time of project mobilization.
- B. At end of construction, return facilities to same or better condition as original condition.

#### 1.5. VEHICULAR ACCESS

- A. Location as indicated and approved by Owner.

- B. Provide unimpeded access for emergency vehicles.
- C. Provide means of removing mud from vehicle wheels before entering streets.

#### 1.6. PARKING

- A. The contractor must arrange for surface parking area to accommodate construction personnel with Owner. When site space is not adequate, the contractor must provide additional off-site parking.

#### 1.7. PROGRESS CLEANING AND WASTE REMOVAL

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

#### 1.8. NOISE CONTROL

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

#### 1.9. REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

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

#### 1.10. SECURITY

- A. This facility is a secure facility manned and operated 24/7.
- B. All personnel will be required to have background checks and receive approval prior to working at the facility.

- C. All personnel and company equipment, tools, and materials shall be secured at all times. The establishment and coordinate these secured locations shall be made with the Owner.

## PART 2 – PRODUCTS

- 2.1. Not Used.

## PART 3 – EXECUTION

- 3.1. Not Used.

END OF SECTION 01 50 00

## SECTION 01 60 00 – PRODUCT REQUIREMENTS

### PART 1 – GENERAL

#### 1.1. SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.
- E. Product substitution procedures.

#### 1.2. PRODUCTS

- A. Provide products of qualified manufacturers suitable for intended use. Provide products of each type by a single manufacturer unless specified otherwise.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- C. Provide interchangeable components of the same manufacturer for components being replaced.

#### 1.3. PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure that 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.

#### 1.4. PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. All personnel and company equipment, tools, and materials shall be secured at all times. The establishment and coordinate these secured locations shall be made with the Owner.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.

- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- G. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- H. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- I. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- J. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

#### 1.5. PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: products of one of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

#### 1.6. PRODUCT SUBSTITUTION PROCEDURES

- A. Instructions to Bidders specify time restrictions for submitting requests for Substitutions during the bidding period to requirements specified in this section.
- B. Engineer will consider requests for Substitutions only within 7 days prior to bidding.
- C. Substitutions will not be considered when a product becomes unavailable through no fault of the Contractor.

- D. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- E. A request constitutes a representation that the Bidding Contractor:
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  - 2. Will provide the same warranty for the Substitution as for the specified product.
  - 3. 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.
  - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
  - 5. Will reimburse Owner Engineer] for review or redesign services associated with re-approval by authorities.
  - 6. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

## PART 2 – PRODUCTS

- 2.1. Not Used.

## PART 3 – EXECUTION

- 3.1. Not Used.

END OF SECTION 01 60 00

## SECTION 01 77 00 – CONTRACT CLOSEOUT

### PART 1 – GENERAL

#### 1.1. SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Adjusting.
- D. Project record documents.
- E. Spare parts and maintenance Products.
- F. Warranties and bonds.
- G. Maintenance service.

#### 1.2. RELATED SECTIONS

- A. Section 01 50 00 – Construction Facilities and Temporary Controls: Progress cleaning.
- B. Section 01 78 23 – Operation and Maintenance Data.

#### 1.3. 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 Engineer's review.
- B. Provide submittals to Engineer and Owner that are required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

#### 1.4. FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum soft surfaces.

- C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- D. Remove waste and surplus materials, rubbish, and construction facilities from the site.

#### 1.5. ADJUSTING

- A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

#### 1.6. PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. Reviewed Shop Drawings, Product Data, and Samples.
  - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- 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 locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  - 2. Field changes of dimension and detail.
  - 3. Details not on original Contract drawings.
- G. Submit documents to Engineer with claim for final Application for Payment.

## 1.7. SPARE PARTS AND MAINTENANCE PRODUCTS

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

## 1.8. WARRANTIES AND BONDS

- A. Provide duplicate notarized copies.
- B. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.
- C. Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.
- D. Submit prior to final Application for Payment.
- E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 7 days after acceptance, listing date of acceptance as start of warranty period.
- F. All extended warranties shall be noted and copies shall be provided to the Owner.

## 1.9. MAINTENANCE SERVICE

- A. Furnish service and maintenance of components indicated in specification sections for one (1) year from date of Substantial Completion.
- B. Examine system components at a 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 the manufacturer of the original component.
- D. Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the Owner.

## PART 2 – PRODUCTS

- 2.1. Not Used.

PART 3 – EXECUTION

3.1. Not Used.

END OF SECTION 01 77 00

## **SECTION 01 78 23 – OPERATION AND MAINTENANCE DATA**

### **PART 1 – GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Format and content of manuals.
- B. Instruction of Owner's personnel.
- C. Schedule of submittals.

#### **1.2. RELATED SECTIONS**

- A. Section 01 33 00 – Submittals: Submittals procedures and Shop drawings and product data.
- B. Section 01 40 00 – Quality Control: Manufacturers' instructions.
- C. Section 01 77 00 – Contract Closeout: Contract closeout procedures and project record documents.
- D. Individual Specifications Sections: Specific requirements for operation and maintenance data.

#### **1.3. QUALITY ASSURANCE**

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

#### **1.4. FORMAT**

- A. Prepare data in the form of an instructional manual.
- B. Binders: Commercial quality, 8-1/2 x 11 three D side ring capacity expansion binders with durable plastic covers; 2-inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- C. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- D. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.
- E. Text: Manufacturer's printed data, or typewritten data on 20-pound paper.

- F. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- G. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, in three parts as follows:
  - 1. Part 1: Directory, listing names, addresses, and telephone numbers of 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). Provide guidelines on calibration of system including time intervals.
  - 3. Part 3: Project documents and certificates, including the following:
    - a). Shop drawings and product data.
    - b). Certificates.
    - c). Photocopies of warranties.

#### 1.5. CONTENTS, EACH VOLUME

- A. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Engineer, Sub-consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.
- B. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- E. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 40 00.

F. Warranties: Bind in copy of each including any extended warranties.

#### 1.6. MANUAL FOR EQUIPMENT AND SYSTEMS

A. 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.

B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

C. Include color coded wiring diagrams as installed.

D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and any special operating instructions.

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

F. Provide servicing and lubrication schedule, and list of lubricants required.

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

H. Include sequence of operation by controls manufacturer.

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

J. Provide control diagrams by controls manufacturer as installed.

K. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

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

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

- N. Additional Requirements: As specified in individual Product specification sections.
- O. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

#### 1.7. INSTRUCTION OF OWNER PERSONNEL

- A. Before final inspection, instruct Owner's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times.
- B. Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- C. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

#### 1.8. SUBMITTALS

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit 1 copy of completed volumes 7 days prior to final inspection. This copy will be reviewed and returned before final inspection, with Engineer comments. Revise content of all 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.

### PART 2 – PRODUCTS

2.1. Not Used.

### PART 3 – EXECUTION

3.1. Not Used.

END OF SECTION 01 78 23

## **SECTION 03 05 00 – BASIC CONCRETE MATERIALS AND METHODS**

### **PART 1 - GENERAL**

#### **1.1. SUMMARY**

- A Section includes formwork, reinforcement, accessories, cast-in place concrete, finishing and curing.

#### **1.2. SUBMITTALS**

- A Product Data: Indicate admixtures and anchors.
- B Design Data: Submit mix design.

#### **1.3. QUALITY ASSURANCE**

- A Construct and erect concrete formwork in accordance with ACI 301 and 318.
- B Perform concrete reinforcing work in accordance with ACI 301.
- C Perform cast-in-place concrete work in accordance with ACI 301.

### **PART 2 – PRODUCTS**

#### **2.1. FORM MATERIALS AND ACCESSORIES**

- A Form Materials: At discretion of Contractor.
- B Form Release Agent: Colorless mineral oil not capable of staining concrete or impairing natural bonding characteristics of coating intended for use on concrete.
- C Formed Construction Joints for Slab-on-Grade: Extruded plastic, tongue and groove type profile, knockout holes to receive doweling.
- D Slab Edge Joint Filler: ASTM D1751, Pre-molded asphaltic board, ½ inch thick.

#### **2.2. REINFORCEMENT MATERIALS**

- A Reinforcing Steel: ASTM A615, 40 ksi yield grade for #3 and 60 ksi yield grade for #4 and larger; deformed billet steel bars.

B Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for support of reinforcing; plastic tipped or non-corroding for supports in slabs forming finished ceilings or where supports are exposed to weather.

C Fabricate concrete reinforcing in accordance with ACI 315.

### 2.3. CONCRETE MATERIALS

A Cement: ASTM C150, Normal-Type I.

B Fine and Coarse Aggregates: ASTM C33.

C Water: Clean and not detrimental to concrete.

D Air Entrainment Admixture: ASTM C260.

E Bonding Agent: Polymer resin emulsion.

F Non-shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.

### 2.4. COMPOUNDS, HARDENERS AND SEALERS

A Absorptive Mats: ASTM C171, Burlap-Polyethylene.

### 2.5. CONCRETE MIX

A Mix and deliver concrete in accordance with ASTM C94, Alternative 2.

B Furnish concrete of the following strength:

1. Compressive Strength: See general structural notes on drawings.
2. Compressive strength: See general structural notes on drawings.
3. Slump 3 inches plus or minus 1 inch.
4. Maximum water/cement ratio: 0.50.

C Select admixture proportions for normal weight concrete in accordance with the ACI 301 Method 1.

D Add air entraining agent to concrete mix for concrete work exposed to exterior.

### 2.6. WATERSTOPS

A Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

B Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Greenstreak.
2. Williams Products, Inc.
3. Profile: Ribbed with center bulb.
4. Dimensions: 4 inches by 3/16 inch thick (100 mm by 4.75 mm thick); non tapered.

### PART 3 - EXECUTION

#### 3.1. FORMWORK ERECTION

- A Erect formwork, shoring and bracing to achieve design requirements.
- B Provide bracing to ensure stability of formwork.
- C Form external corners with 1 inch chamfer.
- D Apply form release agent to formwork prior to placing form accessories and reinforcement.
- E Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings affected by agent.
- F Clean forms as erection proceeds, to remove foreign matter.

#### 3.2. INSERTS, EMBEDDED COMPONENTS, AND OPENINGS

- A Provide formed openings where required for work to be embedded in and passing through concrete members.
- B Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
- C Install concrete accessories straight, level, and plumb.
- D Install void forms. Protect forms from moisture before concrete placement and from crushing during concreting.

#### 3.3. REINFORCEMENT PLACEMENT

- A Place reinforcement, supported and secured against displacement.

- B Ensure reinforcing is clean, free of loose scale, dirt, or other foreign coatings.

#### 3.4. PLACING CONCRETE

- A Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.
- B Separate slabs-on-grade from vertical surfaces with 1/2-inch-thick joint filler, extended from bottom of slab to within 1/4 inch of finished slab surface.
- C Place concrete continuously between predetermined expansion, control and construction joints. Do not break or interrupt successive pours creating cold joints.
- D Screed slabs-on-grade level.

#### 3.5. FORM REMOVAL

- A Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B Remove formwork progressively and in accordance with code requirements.

#### 3.6. CURING

- A Place absorptive matting, moisten, and keep damp.
- B Immediately after placement, protect concrete from premature drying.
- C Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete for not less than 7 days.

#### 3.7. FORMED SURFACES

- A Provide concrete surfaces to be left exposed and concrete walls; sand float finish.

#### 3.8. FIELD QUALITY CONTROL

- A Three (3) Concrete Test Cylinders: Taken for every 100 or less cu yds. Of concrete placed.
- B One (1) Additional Test Cylinder: Taken during cold weather concreting and cured on job site under same conditions as concrete incorporated into the Work.

C One (1) Slump Test: Taken for each set of test cylinders taken.

### 3.9. DEFECTIVE CONCRETE

A Modify or replace concrete not conforming to required lines, details, elevations, slump and/or strengths as directed by Engineer.

END OF SECTION 03 05 00

## SECTION 07 84 00 – FIRESTOPPING

### PART 1 – GENERAL

#### 1.1. RELATED DOCUMENTS

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

#### 1.2. SUMMARY

- A. This Section includes firestopping for the following:
  - 1. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing pipes, conduits, and other penetrating items.
  - 2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing pipes, conduits, and other penetrating items.
  - 3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
  - 4. Sealant joints in fire-resistance-rated construction.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 7 Section "Joint Sealants" for non-fire-resistive-rated joint sealants.
  - 2. Division 22 and 23 Sections specifying piping penetrations.
  - 3. Division 26 Sections specifying cable and conduit penetrations.

#### 1.3. SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.
- B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
- C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items

exposed to contact with adjacent materials in occupy floor areas. T-rated assemblies are required where the following conditions exist:

1. Where firestop systems protect penetrating items larger than a 4-inch-diameter nominal pipe or 16 sq. in. in overall cross-sectional area.
- D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
- E. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
  2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- F. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

#### 1.4. SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.
1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.
- C. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.
1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.
- D. Environmental Performing Construction Products Statement: Submit manufacturer's literature that demonstrates the product shall not exceed of the Volatile Organic Compounds (VOC) limit as determined by U.S. Environmental Protection Agency (EPA) Reference Test Method 24, Code of Federal Regulations Title 40, Part 60, Appendix A.

- E. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.
- F. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.
- G. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience.

#### 1.5. QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:
  - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.
  - 2. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:
    - a). Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
    - b). Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory," by Warnock Hersey, or by another qualified testing and inspecting agency.
  - 3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water, as measured 0.78 inch from the face exposed to furnace fire. Provide systems complying with the following requirements:
    - a). Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
    - b). Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.
- B. Information on drawings referring to specific design designations of through-penetration firestop systems is intended to establish requirements for performance based on conditions that are expected to exist during installation. Any changes in conditions and designated systems require the Architect's prior approval. Submit documentation showing that the performance of proposed

substitutions equals or exceeds that of the systems they would replace and are acceptable to authorities having jurisdiction.

- C. Installer Qualifications: Engage an experienced Installer who has completed firestopping that is similar in material, design, and extent to that indicated for Project and that has performed successfully.
- D. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.
- E. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."
- F. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

#### 1.6. DELIVERY, STORAGE, AND HANDLING

- A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.
- B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

#### 1.7. PROJECT CONDITIONS

- A. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

### PART 2 – PRODUCTS

#### 2.1. FIRESTOPPING, GENERAL

- A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as

demonstrated by firestopping manufacturer based on testing and field experience.

- B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:
1. Permanent forming/damming/backing materials including the following:
    - a). Semi refractory fiber (mineral wool) insulation.
    - b). Ceramic fiber.
    - c). Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
    - d). Fire-rated form board.
    - e). Joint fillers for joint sealants.
  2. Temporary forming materials.
  3. Substrate primers.
  4. Collars.
  5. Steel sleeves.
- C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

## 2.2. FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

- A. Ceramic-Fiber and Mastic Coating: Ceramic fibers in bulk form formulated for use with mastic coating, and ceramic fiber manufacturer's mastic coating.
- B. Ceramic-Fiber Sealant: Single-component formulation of ceramic fibers and inorganic binders.
- C. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.
- D. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.
- E. Intumescent Putty: No hardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum foil on one side.
- G. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.

- H. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogenous mortar.
- I. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- J. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, nonshrinking foam.
- K. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:
  - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping/ gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
- L. Solvent-Release-Curing Intumescent Sealant: Solvent-release-curing, single-component, synthetic-polymer-based sealant of grade indicated below:
  - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping/ gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
- M. Available Products: Subject to compliance with requirements, products from Manufacturers that may be incorporated in the Work include, but are not limited to, the following:
  - 1. 3M Fire Protection Products.
  - 2. Bio Fireshield, Inc.
  - 3. Dow Corning Corp.
  - 4. FireMaster Bulk and FireMaster Mastic, Thermal Ceramics.
  - 5. General Electric Co.
  - 6. Hilti Construction Chemicals, Inc.
  - 7. International Protective Coatings Corp.
  - 8. Percora Corporation
  - 9. The RectorSeal Corporation.
  - 10. Tremco Inc.
  - 11. United States Gypsum Co.

### 2.3. FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.
- B. Sealant Colors: Provide color of exposed joint sealants to comply with the following:
  - 1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.
- C. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.
  - 1. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage changes in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated:
    - a). 50 percent movement in both extension and compression for a total of 100 percent movement.
- D. Multicomponent, Nonsag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.
  - 1. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage change in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated:
    - a). 40 percent movement in extension and 25 percent in compression for a total of 65 percent movement.
- E. Single-Component, Nonsag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.
- F. Available Products: Subject to compliance with requirements, products from Manufacturers that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Dow Corning
  - 2. General Electric Co.
  - 3. Harry S. Peterson Co., Inc.
  - 4. Mameco International Inc.
  - 5. Pecora Corp.

6. Sika Corp.
7. Sonneborn Building Products Div., ChemRex Inc.
8. Tremco Inc.

## 2.4. MIXING

- A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

## PART 3 – EXECUTION

### 3.1. EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2. PREPARATION

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
  1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
  2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
  3. Remove laitance and form release agents from concrete.
- B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

### 3.3. INSTALLING THROUGH-PENETRATION FIRESTOPS

- A. General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
  - 1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
  - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4. INSTALLING FIRE-RESISTIVE JOINT SEALANTS

- A. General: Comply with the "System Performance Requirements" article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
- C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
- D. Tool non-sag sealant immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

### 3.5. FIELD QUALITY CONTROL

- A. Do not proceed to enclose firestopping with other construction until reports of examinations are issued.
- B. Where deficiencies are found, repair or replace firestopping so that it complies with requirements.

### 3.6. CLEANING

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.
- B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

END OF SECTION 07 84 00

## SECTION 07 92 00 – JOINT SEALANTS

### PART 1 – GENERAL

#### 1.1. RELATED DOCUMENTS

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

#### 1.2. RELATED SECTIONS

- A. This Section includes joint sealants for the following locations:
  1. Exterior joints in vertical surfaces and non-traffic horizontal surfaces.
  2. Exterior joints in horizontal traffic surfaces
  3. Interior joints in vertical surfaces and horizontal non-traffic surfaces.
  4. Interior joints in horizontal traffic surfaces.

#### 1.3. SUBMITTALS

- A. Product data from manufacturers for each joint sealant product required.
  1. Environmental Performing Construction Products Statement: Submit manufacturer's literature that demonstrates the product shall not exceed of the Volatile Organic Compounds (VOC) limit as determined by U.S. Environmental Protection Agency (EPA) Reference Test Method 24, Code of Federal Regulations Title 40, Part 60, Appendix A.
  2. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.
  3. Manufacturer's Literature and Data:
    - a). Caulking compound.
    - b). Primers.
    - c). Sealing compound, each type, including compatibility when different sealants are in contact with each other.

#### 1.4. QUALITY ASSURANCE

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

#### 1.5. DELIVERY, HANDLING AND STORAGE

- A. Deliver materials in manufacturers' original unopened containers, with brand names, date of manufacture, shelf life, and material designation.

- B. Carefully handle and store to prevent inclusion of foreign materials.
- C. Do not subject to sustained temperatures exceeding 90 degrees Fahrenheit or less than 40 degrees Fahrenheit.

#### 1.6. WARRANTY

- A. Warranty exterior sealing against leaks, adhesion, and cohesive failure, and subject to terms of "Warranties" specified in Section 01 78 36, for a period of two years.

### PART 2 – PRODUCTS

#### 2.1. MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide color of exposed joint sealants made by Architect from manufacturers' color selection.
- C. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.
- D. Solvent-Release-Curing Joint Sealants
  1. Acrylic Sealant: Manufacturer's standard one-part, non-sag, solvent-release-curing acrylic terpolymer sealant complying with AAMA 808.3 or FS TT-S-00230 or both, with capability when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand 7-1/2 percent movement in both extension and compression for a total of 15 percentage change in joint width existing at time of application and remain adhered to joint substrates indicated for Project without failing cohesively.
  2. Butyl Sealant: Manufacturer's standard one-part, non-sag, solvent-release-curing, polymerized butyl sealant complying with ASTM C 1085 and formulated with minimum of 75 percent solids to be non-staining, paintable, and have a tack-free time of 24 hours or less.
  3. Pigmented Narrow Joint Sealant: Manufacturer's standard, solvent-release-curing, pigmented synthetic rubber sealant complying with AAMA 803.3 and formulated for sealing joints 3/16 inch or smaller in width.
- E. Latex Joint Sealants

1. General: Provide manufacturer's standard one-part, non-sag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.
2. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.
3. Silicone Emulsion Sealant: Provide product complying with ASTM C 834 and, except for weight loss measured per ASTM C 792, with ASTM C 920 that accommodates joint movement of not more than 25 percent in both extension and compression for a total of 50 percent.

F. Acoustical Joint Sealants

1. Acoustical Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834, effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90 and has flame spread and smoke developed ratings of less than 25 per ASTM E 84.
2. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

G. Tape Sealants

1. Tape Sealant: Manufacturer's standard, solvent-free, butyl-based tape sealant with a solids content of 100 percent formulated to be non-staining, paintable, and non-migrating in contact with nonporous surfaces with or without reinforcement thread to prevent stretch and packaged on rolls with a release paper on one side.

H. Preformed Foam Sealants

1. Preformed Foam Sealants: Manufacturer's standard preformed, pre-compressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellent agent; factory-produced in pre-compressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following requirements:
  - a). Properties: Permanently elastic, mildew-resistant, non-migratory, non-staining, and compatible with joint substrates and other joint sealants.

- b). Impregnating Agent: Manufacturer's standard.
- c). Density: Manufacturer's standard.
- d). Backing: Pressure-sensitive adhesive factory applied to one side with protective wrapping.

I. Joint Sealant Backing

- 1. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- 2. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
  - a). Open-cell polyurethane foam.
  - b). Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, non-outgassing in un-ruptured state.
  - c). Proprietary, reticulated, closed-cell polymeric foam, non-outgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 gms/cc per ASTM C 1083.
  - d). Any material indicated above.

J. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26 deg F (-32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

K. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.2. MISCELLANEOUS MATERIALS

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

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

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

## PART 3 – EXECUTION

### 3.1. EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

### 3.2. PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer's requirements.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3. INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Installation of Sealant Backings: Install sealant backings to comply with the joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

- E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.
  
- F. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

END OF SECTION 07 92 00

## SECTION 09 24 23 – PORTLAND CEMENT PLASTER

### PART 1 – GENERAL

#### 1.1. RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Interior Portland cement plasterwork on metal lath.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other work.

#### 1.4 QUALITY ASSURANCE

- A. Fire-Resistance Ratings: Where indicated, provide portland cement plaster assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- B. Pre-installation Conference: Conduct conference at Project site.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

#### 1.6 PROJECT CONDITIONS

- A. Comply with ASTM C 926 requirements
- B. Interior Plasterwork: Maintain room temperatures at greater than 40 deg F for at least 48 hours before plaster application, and continuously during and after application.
  - 1. Avoid conditions that result in plaster drying out during curing period. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
  - 2. Ventilate building spaces as required to remove water in excess of that required for hydrating plaster in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.
- C. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes to match existing.

## PART 2 – PRODUCTS

### 2.1. METAL LATH

- A. Expanded-Metal Lath: ASTM C 847 with ASTM A 653, G60, hot-dip galvanized zinc coating.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
    - b. CEMCO.
    - c. Clark Western Building Systems.
    - d. Dietrich Metal Framing; a Worthington Industries company.
    - e. MarinoWARE.
    - f. Phillips Manufacturing Co.
  - 2. Diamond-Mesh Lath: 3/8-inch (10-mm) Rib lath: 3.4 lb./sq.yd. (1.8 kg/sq.m.)

### 2.2 ACCESSORIES

- A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Metal Accessories:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
    - b. CEMCO.

- c. Clark Western Building Systems.
- d. Dietrich Metal Framing; a Worthington Industries company.
- e. MarinoWARE.
- f. Phillips Manufacturing Co.
- 2. External-Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot- dip galvanized zinc coating.
- 3. Cornerbeads: Fabricated from zinc-coated (galvanized) steel.
  - a. Small nose cornerbead with expanded flanges; use unless otherwise indicated.
- 4. Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
- 5. Control Joints: Fabricated from zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
- 6. Expansion Joints: Fabricated from zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.

## 2.3 MISCELLANEOUS MATERIALS

- A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminants, manufactured for use in Portland cement plaster.
- C. Bonding Compound: ASTM C 932.
- D. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of no fewer than three exposed threads.
- E. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.
- F. Wire: ASTM A 641, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter, unless otherwise indicated.

## 2.4 PLASTER MATERIALS

- A. Portland Cement: ASTM C 150, Type I.

- B. Colorants for Job-Mixed Finish Coats: Colorfast mineral pigments that produce finish plaster color to match Architect's existing. Only if existing plaster is color job-mixed.
- C. Sand Aggregate: ASTM C 897.
  - 1. Color for Job-Mixed Finish Coats: Color match existing
- D. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
- E. Sand Aggregate: ASTM C 897.
  - 1. Color for Job-Mixed Finish Coats: [White][In color matching Architect's sample.]
- F. Perlite Aggregate: ASTM C 35

## 2.5 PLASTER MIXES

- A. General: Comply with ASTM C 926 for applications indicated.
  - 1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb. of fiber/cu. yd. of cementitious materials.
- B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:
  - 1. Portland and Masonry Cement Mixes:
    - a. Scratch Coat: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
    - b. Brown Coat: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.
    - c. Factory-Prepared Finish-Coat Mixes: For ready-mixed finish-coat plasters acrylic-based finish coatings, comply with manufacturer's written instructions

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
- B. Prepare solid substrates for plaster that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

### 3.3 INSTALLING METAL LATH

- A. Expanded-Metal Lath: Install according to ASTM C 1063.
  - 1. Vertical Furring: Install flat diamond-mesh lath.
  - 2. Flat-Ceiling and Horizontal Framing: Install flat diamond-mesh lath.

### 3.4 INSTALLING ACCESSORIES

- A. Install according to ASTM C 1063 and at locations indicated on Drawings
- B. Reinforcement for External Corners:
  - 1. Install cornerbead at interior and exterior locations.
- C. Install all expansion joints, casing beads, and corner beads in approved fashion in accordance with ASTM C1063
  - 1. Verify lath overlaps at all components a minimum of 1 inch.
  - 2. Minimize number of splices in components.
  - 3. All splices shall overlap a minimum of 1-inch and be bedded in sealant.
  - 4. All expansion joint, corner beads, and accessories are to be tied into the existing lath in approved fashion. Maximum spacing of ties is 9 inches on center.

- D. Control Joints: Install control joints at locations indicated on Drawings or in specific locations approved by Architect for visual effect as follows:
1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
    - a. Horizontal and other Non-vertical Surfaces: 100 sq. ft.
  2. At distances between control joints of not greater than 18 feet o.c.
  3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
  4. Where control joints occur in surface of construction directly behind plaster.
  5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

### 3.5 PLASTER APPLICATION.

- A. General: Comply with ASTM C 926.
1. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot straightedge placed on surface.
  2. Finish plaster flush with existing plaster surface and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
  3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
- B. Bonding Compound: Apply on unit masonry and concrete plaster bases.
- C. Ceilings; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 7/8-inch thickness – match existing plaster thickness.
1. Portland and masonry cement mixes.
- D. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.

### 3.6 PLASTER REPAIRS

- A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing

and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

### 3.7 PROTECTION

- A. Remove temporary protection and enclosure of other work. Promptly remove plaster from other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 09 24 23

## SECTION 09 25 00 – GYPSUM WALLBOARD

### PART 1 - GENERAL

#### 1.1 SCOPE

- A. Work includes, but is not limited to:
  - 1. Gypsum board.
  - 2. Corner beads and edge trim
  - 3. Joint and screw head finishing
  - 4. Texture and paint finish to match existing

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. General: Provide systems that comply with the following performance requirements:
  - 1. Regular Board: shall conform to ASTM C36, be 5/8 inch thick, and have tapered edges.
  - 2. Fire Rated Board: Where shown on drawings, fire rated board shall be 5/8" thick, Type X, with tapered edges, per ASTM C36.
- B. Joint reinforcing tape and joint compound shall comply with ASTM C475.
- C. Metal trim shall comply with ASTM C475, zinc coated metal. Provide corner beads for all external corners, and metal casings for all exposed edges. Metal casing beads shall be galvanized steel, L shaped with 1-inch knurled flange. Provide casing beads for all external corners, and metal casings for all exposed edges.
- D. Fasteners shall be type W bugle head screws. Fastener length and spacing shall be as recommended by Gypsum Association publication GA-216.
- E. Drywall clips. Use drywall clips at ceilings.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. General: All materials, installation and workmanship shall be in accordance with manufacturer's recommendations, best standards of the trade, and local area practices. Installation of gypsum wall board shall comply with the gypsum wallboard manufacturer's installation

requirements. Contractor is required to submit the wallboard manufacturer's installation requirements and demonstrate proof of compliance.

- B. Wallboard shall be so staggered that the corners of any four boards will not meet at a common point except in vertical corners. Wallboard shall be applied in such lengths as to reduce joints to a minimum, unless use for shear panel construction makes other method more practical.
- C. Attachment: Except as specified herein, fastenings shall conform to "Gypsum Construction Handbook" as published by U.S.G., and GA-216 as published by the Gypsum Association.
- D. Finishing Attachment Depressions: Boards shall fit tightly against the supporting framework before finish compound is applied. The depressions shall be filled with at least three applications of joint compound, with each coating allowed to dry before the succeeding coating is applied. Sand the finish coat lightly to leave a smooth finish flush with the paper face of the wallboard.
  - 1. Prior to painting, gypsum board shall receive a level #4 finish and finish texture to match existing.
- E. Corner Treatment:
  - 1. Internal corner shall be treated in the manner specified for joints, except that the reinforcing tape shall be folded lengthwise through the middle and fitted neatly into the corner.
  - 2. External corners shall have a corner bead fitted neatly over the corner and embedded into the joint compound. After the corner piece has been secured in place, the corner shall be treated with joint cement. The joint cement shall be feathered out on both sides of the corner.
  - 3. Splices: All metal corner treatment shall be installed in single lengths between changes of direction.
- F. Cleaning shall be done as work proceeds. Daily remove waste and debris from jobsite at direction of Turnkey General Contractor.
- G. In lieu of wood nailers and/or blocking, drywall clips shall be used for interior corner attachment either at ceilings or walls. Install in accordance with manufacturer's recommendations. Product shall be "Prest-on" by Gold Bond or "HYDE Repair Clips".

END OF SECTION 09 25 00

## SECTION 09 51 10 - ACOUSTICAL PANEL CEILINGS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes acoustical panels and exposed suspension systems for ceilings.

#### 1.3 DEFINITIONS

- A. AC: Articulation Class.
- B. CAC: Ceiling Attenuation Class.
- C. LR: Light Reflectance coefficient.
- D. NRC: Noise Reduction Coefficient.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
  - 1. Acoustical Panel: Set of 6-inch- (150-mm-) square Samples of each type, color, pattern, and texture.
  - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- (300- mm-) long Samples of each type, finish, and color.

#### 1.5 QUALITY ASSURANCE

- A. Source Limitations:
  - 1. Acoustical Ceiling Pane and Suspension System: Obtain each type through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings

that comply with the following requirements:

1. Surface-Burning Characteristics: Provide acoustical panels with the following surface- burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
- C. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
  1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM C 635, ASTM C 636, The structural requirements in IBC 2006, Chapter 16 and ASCE7, Section 13.5.6.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

#### 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

#### 1.8 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

#### 1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
  - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.

#### 1.10 WARRANTY

- A. Special Warranty for Acoustical Panel Ceiling: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Limited Lifetime of Acoustical Panel Ceiling 30 years from date of Final Acceptance.

### PART 2 – PRODUCTS

#### 2.1 GENERAL: Provide systems that comply with the following performance requirements:

- A. Surface-Burning Characteristics: Comply with ASTM e 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
  - 2. Smoke-Developed Index: 50 or less.
  - 3. Flame-Spread Index: 25 or less.

#### 2.2 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
  - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface per ASTM E 795.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics

indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products for selection from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.
- C. Coating-Base Antimicrobial Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273.

### 2.3 WET FORMED MINERAL FIBER-BASE ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

- A. GENERAL: provide systems that comply with the following performance requirements.

1. Color: White. Factory applied vinyl latex paint.
2. LR: Not less than 0.89.
3. CAC: Not less than 33.
4. Edge Detail: Square Lay-in.
5. Thickness: 5/8 inch (15.88 mm).
6. Size: 24 by 24 inches (610 by 610 mm).

### 2.4 VINYL – COVERED GYPSUM PANEL CEILING (KITCHEN)

- A. GENERAL: provide system that comply with the following performance requirements.

1. Color: White. Factory applied vinyl covered.
2. LR: Not less than 0.81.
3. NRC: Not less than 0.55.
4. CAC: Not less than 30.
5. AC: Not less than 170.
6. Edge Detail: Square Lay-in.
7. Thickness: 3/4 inch (19 mm).
8. Size: 24 by 24 inches (610 by 610 mm).

### 2.5 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.
  - 1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
  - 1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
  - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.
- E. Hanger Rods and Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- F. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04- inch- (1-mm-) thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.
- G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

## 2.6 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

- A. GENERAL: Provide systems that comply with the following performance

requirements;

- B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation, with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.
  - 1. Structural Classification: Heavy-duty system.
  - 2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
  - 3. Face Design: Flat, flush.
  - 4. Cap Material: Steel or aluminum cold-rolled sheet.
  - 5. Cap Finish: Painted white.

## 2.7 METAL EDGE MOLDINGS AND TRIM

- A. GENERAL: Provide systems that comply with the following performance requirements;
- B. Roll-Formed Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders and comply with layout shown on reflected ceiling plans.

### 3.3 INSTALLATION, GENERAL

- A. General: Install acoustical panel ceilings to comply with UBC Standard 25-2 and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counters playing, or other equally effective means.
  - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacing's that interfere with location of hangers at spacing's required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
  - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
  - 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  - 7. Do not attach hangers to steel deck tabs.
  - 8. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.

- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post installed anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
  - 1. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.66 m). Miter corners accurately and connect securely.
  - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
  - 1. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

### 3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 10

## SECTION 22 00 00 – GENERAL MECHANICAL REQUIREMENTS

### PART 1 – GENERAL

#### 1.1. RELATED DOCUMENTS

- A. Drawings, General Conditions of the Contract for Construction, Supplementary Conditions and Division 1 – General Requirements apply to work of this section.

#### 1.2. DESCRIPTION

- A. Work covered by this Division shall consist of furnishing all labor, equipment, supplies and materials and in performing all operations necessary for the installation of complete and operating mechanical systems as required by these specifications and/or shown on the drawings, subject to the terms and conditions of the contract. The work shall also include the completion of such mechanical and electrical details not mentioned or shown which are necessary for the successful operation of all systems described on the drawings or required by these specifications; this includes the furnishing all materials for the filling the systems to make them operable, including water, refrigerant, oil and grease. Prove satisfactory operation of all equipment and controls to the Engineer on request.
- B. Work not included – Certain labor, material and equipment may be furnished and/or installed under other divisions of these specifications. This Contractor shall coordinate with other trades and arrange his work to make the parts fit together. The following items are to be accomplished under other divisions of these specifications:
  - 1. Temporary Heat: Refer to paragraph in this Section.
  - 2. Temporary Water and Toilet: Refer to General Conditions.
  - 3. Electrical Equipment and Wiring: Refer to paragraph in this Section.
  - 4. Concrete: Refer to paragraph in this Section.
- C. Equipment Furnished by Owner – Rough-in services pipes to locations as required by mechanical drawings, existing site conditions, and equipment shop drawings. Provide service valves on all pipes except waste and vent pipes. Plug and cap all waste and vent pipes. Final Connection to equipment will be made by this Contractor.

#### 1.3. BIDDING

- A. All mechanical equipment shall be new unless specified otherwise in the specifications or on the drawings.
- B. All bids must be based only on the equipment and materials as scheduled on the drawings and as specified or on equivalent equipment and materials from a

preapproved alternative manufacturer. No bid may be based on a substituted or other alternative without specific written prior approval from the Engineer. Any Contractor who assumes equivalence of products and who bases his bid on that assumption does so at his own risk.

- C. A listing of approved alternative manufacturers does not mean that all products of a particular alternative manufacturer are acceptable alternative to the scheduled items; it merely means that for bidding prior approval is not required. All fixtures and devices must still be submitted according to the prescribed procedures. In addition, some items that have an important visual affect, e.g. electric water coolers, may be required to receive Owner's approval also.

#### 1.4. EXISTING UTILITIES

- A. The drawings indicate the locations, type and sizes of various utilities within the site where known. These utilities are indicated as accurately as possible. If the Contractor encounters any utilities or differing conditions during construction, which are not shown on the drawings, they shall request in writing for written instructions from the Engineer. Any relocation or remodeling required will then be directed by a change order. This Contractor shall assume all responsibility for protection of all utilities, shown or not, and for repair required by this construction.
- B. Contractor shall verify location, size, elevation, pressure and any other pertinent data of the existing utilities. The Contractor shall provide a written report with drawings indicating this existing utilities information, such as utility locations and sewer invert information. Additional costs incurred due to failure to verify such data and to coordinate associated work with respective utility providers shall not be the Owner's responsibility but shall be borne by the Contractor.
- C. All costs associated with providing utilities including, but not limited to, connection fees, meters, boring under roads, etc., shall be included in the Contractor's bid price whether such costs are incurred by Contractor or charged by the utility company.
- D. Submission of a bid by the Contractor shall be considered an acknowledgment by the contractor of his compliance with this section.
- E. The Contractor shall coordinate with Owner and this Engineer's office any work that has the potential to hinder mechanical and plumbing services to areas outside this contract. All shut downs or tie-ins relating to these systems shall be scheduled and submitted in writing to be approved by the Owner and this Engineer's office. Contractor shall submit in writing a schedule of construction phasing that indicates areas of first priority during each phase and anticipated completion times. Schedules shall be submitted a minimum of 7 days prior to commencing work. Owner and this Engineer's office shall review these schedules and notify the contractor of acceptance prior to commencement of work.

## 1.5. CODES, PERMITS AND FEES

- A. Contractor shall comply with all local, state and national codes and shall pay for all applicable costs, meter costs, fees, permits, licenses and inspections for this division
- B. The mechanical work shall be performed in strict accordance with the applicable and Adopted provisions of the International Building Code International Plumbing Code, International Mechanical Code and International Energy Conservations Code as adopted and interpreted by the State of Texas, City of El Paso and the National Fire Protection Association (NFPA) regulations, current adopted edition regarding mechanical systems, fire systems and electrical systems. All materials and labor necessary to comply with Rules, regulations and ordinances shall be provided. Where the drawings and/or Specifications indicate materials or construction in excess of code requirements, the Drawings and/or specifications shall govern. The contractor shall hold and save the Owner and Engineers free and harmless from liability of any nature or kind Arising from his failure to comply with all applicable codes and ordinances.

## 1.6. TEMPORARY HEAT

- A. Temporary heat will be furnished by the General Contractor. Use of the permanent heating system will not be allowed without written authorization from the Engineer and Owner. In case the permanent heating system is used for temporary heat, the General Contractor shall pay all the costs until acceptance by the Owner. Warranty of equipment shall not start until acceptance by the Owner.

## 1.7. DRAWINGS

- A. Contract drawings are diagrammatic only and are not intended to be scaled for dimensions. All dimensions shall be taken from certified equipment drawings and from the structure itself before fabricating and work. All space requirements shall be verified, coordinated with other trades, as it is the various Contractors' responsibility to install the systems complete in the space provided without extra charges to the Owner.
- B. It is intended that anything, including labor and materials, which is usually furnished as part of any equipment specified and which is necessary for operation shall be furnished as part of the Contract without additional cost, whether or not shown or described.
- C. All piping in finished areas of the building shall be concealed except where otherwise noted on the drawings.

- D. All equipment shall be installed in accordance with manufacturer's recommendations, unless approval is given in writing by the Consulting Mechanical Engineer for deviation prior to commencement of work.

#### 1.8. REQUIREMENTS OF REGULATORY AGENCIES

- A. The mechanical work shall be performed in strict accordance with the local and state codes, ordinances, and regulations governing the particular work involved. Furnish, without extra charge, any additional material and labor when and where required to comply with these Rules and Regulations, though the work is not mentioned in the Specifications or shown on the Drawings. When the Specifications or Drawings call for or describe materials or construction of a better quality or larger sizes than required by the above mentioned Rules and Regulations, the provisions of these Specifications and accompanying Drawings shall take precedence.

#### 1.9. QUALIFICATIONS

- A. All mechanics shall be capable journeymen, apprentices or helpers, skilled in the work assigned to them with licensing required by the inspecting authority. All welders must have been certified within the past three years to perform the work, which they are doing.

#### 1.10. WARRANTY

- A. All materials and equipment shall be new unless otherwise specified.
- B. Guarantee all workmanship, material and equipment and replace any found defective without cost to the Owner, for ONE year after final acceptance, as defined in General Conditions.
- C. Each warranty for longer than one year as described above (that comes with equipment used on the job) shall be passed into the Owner in the Operation and Maintenance Manual, along with the dates of start and end of warranty.
- D. Refer to General Conditions for additional information regarding specific warranty requirements.

#### 1.11. PROJECT RECORD DOCUMENTS

- A. Before final payment, provide the Engineer with one clean set of drawings and specifications corrected up-to-date as job progress. These documents shall reflect the As-Built conditions. Refer to General Conditions for additional information.

#### 1.12. SUBMITTALS

- A. The intent of this section is to give general submittal information, refer to specific submittal information in the subsequent mechanical sections.
- B. Within 10 days after award of the contract, and before orders are placed, Contractor shall submit specific information on list of equipment and principal materials specified. Contractor shall indicate and/or provide names of manufacturers, catalog and model numbers, cut sheets, and such other supplementary information as necessary for evaluation. Minimum of six (6) copies, or as directed by the Engineer, of each shall be submitted and shall include all items mentioned by model number and/or manufacturer's name in the specifications or in schedules on the drawings.
- C. Requirements for each submittal:
  - 1. Bear a dated stamp or specific written indication that the Contractor has reviewed and approved all submittal prior to submission to Engineer,
  - 2. Have all information deleted by Contractor that pertains to the means and methods of construction or to fabrication, assembly, installation, or erection (approval by Engineer shall not extend to these areas unless specifically noted by Engineer),
  - 3. **BE CLEARLY AND SPECIFICALLY** marked as to which specific piece of equipment is being submitted, by use of a permanent marker, stamp, etc., so as to distinguish it from other pieces of equipment that may occur on the same page,
  - 4. **BE CLEARLY AND SPECIFICALLY** marked as to which available options are being submitted that are associated with a piece of equipment, and
  - 5. Be complete with respect to quantities, dimensions, specific performance, materials, and similar data to enable the Engineer to review the proposed equipment.
  - 6. Omission by Contractor of any of the above requirements or submittals will subject submittal to automatic rejection without review.
  - 7. Any submittals received by Engineer that were not requested shall be returned without review of any kind.
  - 8. Submittals shall indicate minimum access and service clearances if required by the submitted equipment.
- D. Installation Instructions – For certain products or systems as identified in subsequent specifications sections or on the drawings, the Contractor shall be required to provide copies of manufacturer's installation instructions with the submittal. When required as such, the installation instructions are considered part of the submittal and their omission may result in automatic rejection of the submittal. Where more than one identical device are scheduled, only one set of installation instructions needs to be submitted, e.g. if seven five-ton split systems air conditions are scheduled, only one five-ton unit installation instruction needs to be submitted. Similarly, if one set of installation instructions is identified by the manufacturer and on the instructions to be applicable to more than one type or size

of devices, e.g. if one set of air conditioner instructions is good for three, four, five-ton units, then only one instruction set is required for these devices.

- E. This Engineer will review the submittals for approval twice. Any additional reviews that are required by the engineer for whatever reason after the initial two reviews will result in additional compensation for the Engineer's time by the submitting Contractor at the Engineer's rate.

#### 1.13. PRIOR APPROVAL OF SUBSTITUTED PRODUCTS

- A. Material or equipment specified by Manufacturer's name and model number is being used as a basis of standard and performance. No substitution is allowable without Engineer's written approval **FOURTEEN (14) DAYS PRIOR TO BID DUE DATE** unless the manufacturer is listed on the drawings or in the specification as being a preapproved alternative manufacturer.
- B. A prior approval submittal package shall at a minimum consist of the following items:
  - 1. One copy of the product submittal in accordance with the paragraph in this section titled SUBMITTALS.
  - 2. Plan layouts sketches of mechanical rooms or systems of the substituted equipment showing that the proposed equipment will fit within the space allocated with the manufacturers and code required clearances for the substituted equipment as well as the other equipment in the space.
  - 3. Indications of any structural modifications required for the proposed substitution, such as additional weight or opening size changes.
  - 4. Indications of any electrical modifications required for the proposed substitution, such as changes in breaker sizes, wiring requirements.
  - 5. Indication of any deviations from the specified equipment or their performance.
- C. It shall be the Manufacturer and/or their authorized Representative's responsibility to verify that submitted substitute equipment will fit in space available. The Manufacturer and/or their authorized Representative's submittal for acceptance of the substitute shall include a written statement of whether or not such acceptance would require any subsequent or associated changes to the drawings or specifications. Any such changes shall be described in writing, briefly but complete.
- D. The Manufacturer and/or their authorized Representative's shall be responsible for the costs of any such modifications due to substitution of materials or equipment for that which was specified or scheduled. The cost shall be complete, that is, it shall include the cost affect of any and all other trades.

#### 1.14. SUBSTITUTED PRODUCTS

- A. Material or equipment specified by Manufacturer's name is being used as a basis of standard. No substitution is allowable without Engineer's written approval ten (10) days prior to bid due date unless the manufacturer is listed on the drawings or in the specification as being a preapproved alternative manufacturer. Any submittal received without such written approval or prior approval is subject to unqualified rejection.
- B. It shall be the Contractor's responsibility to verify that submitted substitute equipment will fit in space available. The contractor's submittal for acceptance of the substitute shall include a written statement of whether or not such acceptance would require any subsequent or associated changes to the drawings or specifications. Any such changes shall be described in writing, briefly but complete.
- C. The Contractor shall be responsible for the costs of any such modifications due to substitution of materials or equipment for that which was specified or scheduled. The cost shall be complete, that is, it shall include the cost affect of any and all other trades.
- D. The Engineer may request detailed shop drawing or plan layouts of mechanical rooms or systems of the substituted equipment.

#### 1.15. SAFETY

- A. General – Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work, and Contractor shall comply with all laws governing safety, specifically the "Occupational Safety and Health Standards" and the "Safety and Health Regulations for Construction", state and federal.
- B. According to OSHA, a hazardous chemical is any chemical, which is a physical hazard or a health hazard. This may include items such as paints, solvents, adhesives, sealants, cleaners, etc. If a contractor produces, uses, or stores hazardous chemicals at the workplace, them contractor shall develop, implement, and maintain a hazard communication program in compliance with the latest OSHA requirements. In projects with multiple tenants in which the building is partially occupied during all or part of the project, Contractor shall inform the building manager or Owner, according to OSHA guidelines, of any hazardous chemicals being produced, stored, or used in the building so that other tenants may be notified. Contractor shall employ required methods of training, information, handling, ventilation, labeling, storing, disposal, and removal of hazardous chemicals.

#### 1.16. LABELING

- A. Each device for which an independent testing authority has established a standard shall have affixed a label indicating its compliance and listing. Refer to General Conditions for list of such independent testing authorities.

#### 1.17. SITE VISIT REPORTS

- A. During the course of the job, the Engineer will make site visits to observe work in progress and will subsequently prepare a written site visit report, which will be sent to the Contractor and to whomever else the Engineer desires. The Contractor shall prepare a written and typed response within seven (7) calendar days of his receiving the site visit report. The Contractors shall accompany the Engineer during this final punchlist visit upon the request of the Engineer. The General Contractor shall include in his response the following information.

1. Date of site visit by the Engineer,
2. Date of receipt of the site visit report,
3. Name and title of the preparer of the response,
4. An item number referenced to the site report,
5. A brief three or four word description of the item,
6. The Contractor or Subcontractor affected,
7. The proposed course of action, and
8. An expected time of completion of the action.

#### 1.18. FINAL PUNCH REPORTS

- A. At the completion of the job, the Engineer will make punchlist site visits to observe completed work and will subsequently prepare a written site visit punchlist report, which will be sent to the Contractor and to whomever else the Engineer desires. The Contractor upon completion of the listed punchlist items shall prepare a type written response to the list indicating completion of each item. The Contractor shall include in his response the resolution of each item. The Contractors shall accompany the Engineer during this final punchlist visit upon the request of the Engineer.

#### 1.19. CUTTING AND PATCHING

- A. No joists, beams, girders, columns, slabs, or other structural elements shall be cut, drilled, or altered in any way by the Contractor without first obtaining written permission and instructions from the Engineer.
- B. Where it is necessary to cut through any non-structural elements of walls, floors, or ceilings to permit the installation of any work under this contract, or to repair any defects that may appear up to expiration of the guarantee, such cutting shall be done by the Contractor with as little damage as reasonably possible to the element being cut or to adjacent elements.

- C. After the necessary work has been completed, the damage shall be repaired by the respective Contractor, who shall pay all costs of such cutting, repairs and patching. All patching or sealing of cuts and penetrations, including final appearance of same, shall be done to the approval of the Engineer.
- D. The Contractor shall fire stop all penetrations through fire and smoke rated barriers as required by code. Refer to Division 7 for fire stopping material information.

#### 1.20. INSURANCE

- A. The Contractor shall have required insurance. Required insurance shall be provided by this Contractor for protection against public liability and property damage for the duration of work.

#### 1.21. CONFLICTS AND CORRECTION OF WORK

- A. Promptly correct work rejected or failing to conform to the requirements of the Contract, whether observed before or after substantial completion and whether or not fabricated, installed or completed. The Contractor shall bear cost of correcting such rejected and nonconforming work including additional testing and inspections and including compensation for observing mechanical and electrical engineering firm's services and expenses made necessary thereby.
- B. If a conflict occurs on the bid documents, the Contractor shall contact the Engineer's offices with a written request for clarification. If the conflict is unresolvable at the time of bid, the most expensive interpretation of the conflict shall be bid so the conflict can be resolved in a deductive manner at a later time if necessary.
- C. If a conflict is discovered during construction, the Contractor shall stop work and that portion of the project and contact the appropriate party for clarification. The request for clarification shall be in written form. The Contractor shall bare the burden of replacing work that has been installed incorrectly as a result of a conflict on the drawings where he has not sought the Engineer's guidance for clarification.
- D. If during construction a conflict is discovered between the drawings, the specifications, and/or the manufacturer's installation requirements the most stringent shall apply unless written clarification is obtained from the Engineer.

#### 1.22. COORDINATION

- A. In a timely manner, coordinated with all work involved for the following areas:
  - 1. Where new work of three or more trades or subcontractors is installed.
  - 2. Where new work is installed in existing areas.
  - 3. Where lead times are critical to the project schedule.

4. Provide construction grade drawing as needed to acquire approval of work plan.
  5. Access or service spaces required for HVAC and plumbing equipment.
- B. Any occasion that requires the Engineer to be in attendance, the Contractor shall give the Engineer 24-hour notification.

## PART 2 – PRODUCTS

### 2.1. MATERIALS

- A. All materials shall be new and of specified quality, unless specifically noted otherwise. Materials shall be free from defects. Where manufacturer names are mentioned in the specifications or on the drawings, it has been done in order to establish a standard of quality and construction.
- B. Contractor will be responsible for transportation of his material to and from the job site, and will be responsible for the storage and protection of his materials and work until the final acceptance of the job. At the end of each day of work, each Contractor is responsible for covering or protecting his work and/or materials that may be susceptible to damage even if such damage is the result of unforeseen causes, e.g. an overnight thunderstorm. Failure to do so will be sufficient cause for rejection of any item in question, and any such item shall be replaced by Contractor at no cost to the Owner.
- C. Contractor shall verify that all pieces of equipment will fit through available openings in the building and that all equipment can be installed without modification of building structure.

### 2.2. EQUIPMENT SCHEDULE

- A. All equipment major items are specified in the equipment schedules on the drawings and shall be new and furnished complete with all accessories normally supplied with the catalog item listed and all other accessories necessary for a complete and satisfactory installation.
- B. Equipment items so noted will require start-up by factory-trained personnel. Equipment items so noted will require factory approved service personnel who shall provide all service, including all parts and all labor, as requested by the Owner, during the full period of equipment warranty.

### 2.3. EQUIPMENT RATINGS

- A. Equipment capacities as scheduled on the drawings are at project site altitude. Capacities of submitted equipment must be corrected for project site altitude unless otherwise noted.

2.4. WORKMANSHIP

- A. The workmanship shall, in all respects, be of the highest grade, and all construction shall be done according to the best practices of the trade. Piping, ducting and conduit shall be concealed unless otherwise noted, and installed square to the building lines. Any work not meeting this requirement shall be replaced or rebuilt without extra expense to the Owner.

2.5. ELECTRICAL EQUIPMENT AND WIRING FOR AND MECHANICAL DIVISION

A. Responsibility

- 1. Unless otherwise indicated, all motors, conduit, wiring, and controls (including temperature) shall be furnished, set in place, and wired in accordance with the following schedule. (MD is Mechanical Division and ED is Electrical Division)

<b>MECHANICAL-ELECTRICAL COORDINATION</b>			
<b>TABLE 1</b>			
ITEM	FURNISHED UNDER	SET IN PLACE OR MOUNTED UNDER	WIRED AND CONNECTED UNDER
1. Equipment Motors and Thermal Overloads	MD	MD	ED
2. Motor Controllers(HOA): magnetic starters, reduced voltage starters and overload relays	MD (1)	ED (1)	ED
3. Disconnect switches, fused or unfused, HP rated switches, variable frequency drive controllers(HOA), thermal overload switches and fuses, manual operating switches	ED (1)	ED (1)	ED
4. Pushbutton stations(HOA), pilot lights, multi-speed switches, variable speed switches, float switches, thermostats, control relays, time clocks, control transformer, control panels, motor valves, damper motors, solenoid valves, and interlocks	MD	MD (2)	MD (2)
5. Contactors, 120V control circuit outlets for control panels and for boiler controls and fire protection control and fire/smoke detectors	ED	ED	ED

Notes:

1. If furnished as part of factory wired equipment, wiring, conduit, and connection only be ED
2. If float switches, line voltage thermostats, PE switches, time switches etc., carry the FULL LOAD CURRENT of any motor, they shall be furnished by the Mechanical Division, but shall be set in place, wired and connected by the Electrical Division, except that where such items are and integral part of the mechanical equipment, or directly attached to ducts, piping, etc., they shall be set in place under the Mechanical Division and wired and connected by the Electrical Division. If they do not carry the FULL LOAD CURRENT to any motor they shall be furnished, set in place and wired under the Mechanical Division.
3. Wiring and conduit from alarm contacts to alarm system and conduit for control functions by ED; all control function wiring by MD.

B. Connections

1. Connection to all control directly attached to ducts, piping and mechanical equipment shall be made with flexible connections not to exceed 3 linear feet.

2.6. ELECTRICAL WIRING AND CONTROL EQUIPMENT

- A. All disconnects, motor starters, relays, wiring, conduits, etc. shall be provided by and comply with all requirements of 26 05 00 Sections of the electrical specifications.
- B. The Mechanical Contractor must refer to the electrical control equipment and wiring shown on the Electrical Drawings. Any changes or additions required by specified equipment furnished shall be the complete responsibility of the Contractor furnishing the equipment.
- C. All electrical equipment characteristics (voltage, phase, etc.) must be verified by the Contractor prior to ordering. It is imperative that voltage and phase characteristics are checked with the electrical drawings.
- D. All motors shall be built in accordance with the current applicable IEEE, ASA and NEMA standards. All general-purpose motors shall be open drip-proof machines for installation indoors and/or in protected locations. Totally enclosed fan cooled (TEFC) motors shall be used in all areas of exposure to weather or other environmental contamination. Motors shall be rated explosion-proof when located in hazardous atmospheres. Type II weather-protected motors may be used in lieu of TEFC motors on roof fan units and similar equipment. Motors mounted in direct sun shall be provided with a shield to forbid direct radiation from the sun when the sun is 45 degrees or greater above the horizon.

- E. Unless indicated otherwise, motors shall be NEMA design B with a service factor of 1.15 with 40°C rise and total temperature rise of 65°C ambient and when powered from the system voltage feeding the motor. TEFC motors shall have a service factor of 1.00 with total temperature rise of 65°C in the above conditions. Single-phase motors shall be NEMA Type N split phase induction motors with built-in thermal protectors. Single-phase motors connected on loads requiring high starting torque shall be capacitor-start induction motors.
- F. All motors shall be all copper wound, high power factor, high efficiency motors. Electric motors shall be an energy efficient type as defined in the latest edition of NEMA document no. MG1. Motor efficiency shall be made available to the Engineer as required.

## 2.7. PROTECTION OF PENETRATION

- A. All penetrations of fire or smoke barriers shall be sealed, sleeves (if any), insulation (if any), and vibration isolation (if any) that maintain the fire or smoke resistance of the barrier in accordance with the latest edition of NFPA 101 Life Safety Code.
- B. Contractor shall verify locations and type of all partitions penetrations from the drawings. Sealing material and methods shall be per UL recommendations. The Contractor shall fire stop all penetrations through fire and smoke rated barriers as required by code. Refer to Division 7 for fire stopping material information.

## 2.8. EQUIPMENT AND PIPING SUPPORTS

- A. All supporting systems for piping, equipment, and materials supported by the building structure shall be submitted to the Engineer for approval prior to purchase and installation.

## 2.9. ACCESSIBILITY

### A. Access Panels

1. Access panels shall be provided wherever necessary for possible future replacement, adjustment, or maintenance of operating devices such as machinery, valves, dampers, switches, relays, plumbing fixtures such as trap primers and air gap fittings, or to other critical non-operating devices such as pull boxes, inspection parts, and gauges. Such access panels shall be provided and install by Contractor, whether or not shown on the drawings, and shall be brought to the attention of the Engineer for approval of type, color, fire rating. Where access is provided in rated members,, the access panels shall be of a type that maintains the integrity of the member penetrated

### B. Access to Equipment

1. All pipes, tubing, conduit, etc. including, but not limited to, draining piping of any type, electrical conduit, wiring not in conduit, and pneumatic control tubing shall be installed in such a way so as not to prevent and/or not to make necessary difficult the removal, operation, use, or maintenance of equipment, access panels or doors, pathways (especially in attics or crawlspaces), observation ports, measurement or balancing devices, junction boxes.
2. If access for these purposes is prevented or made unreasonably difficult in the opinion of the Engineer, then the Contractor shall make modifications or repairs at no cost to anyone except the Contractor. Such modifications or repairs shall be considered neither complete nor adequate until the Engineer is satisfied that access for the above purpose is achieved.

## PART 3 – EXECUTION

### 3.1. STORAGE

- A. Provide for proper storage of all materials and equipment and assume responsibility for losses due to any cause. All storage shall be within the contract limits of the building site or in a bonded warehouse. All equipment and materials must be covered and stored out of the elements; any item, which has become rusted, will not be permitted to be used.
- B. Each Contractor shall provide temporary storage facilities suitable for equipment stored at the job site. Storage facilities shall be rainproof and lockable as required. Materials or equipment stored on site but not in a lockable rainproof storage facility shall be stored above ground or above slab. Contractor shall take necessary precautions to prevent entry of and/or damage from dirt, trash, water, or vermin. Equipment not properly stored and protected shall be, at the discretion of the Engineer, replaced at no cost to the Owner. Roofs are not acceptable storage areas unless specifically allowed in writing by the Engineer.

### 3.2. INSTALLATION AND ARRANGEMENT

- A. Install all work to permit removal (without damage to other parts) of coils, heat exchanger bundles, boiler tubes, fan shafts and wheels, filters, belt guards, sheaves and drives, plumbing fittings, and all other parts which might require periodic replacement or maintenance. Arrange pipes, ducts and equipment to permit ready access to valves, traps, starters, motors, control components and to clear opens of doors and of access panels.
- B. Offsets, transitions and changes in direction in pipes and ducts shall be made as required to maintain proper head room and pitch of sloping pipes whether or not indicated on the drawings. Furnish and install all traps, air vents, sanitary vents, as required to affect these offsets, transitions and changes in direction.

- C. Mechanical Contractor shall coordinate with other trade with regards to equipment going under mechanical equipment.
- D. Mechanical Contractor shall install HVAC and plumbing equipment in a manner to provide the manufacturer's recommended service clearance and access space. The Mechanical Contractor shall be responsible for maintaining these clearances, coordinating them with the other trades and have installed work modified to maintain these clearances at no additional charge to the project or the Owner.

### 3.3. PROTECTION OF WORK AND PROPERTY

- A. Where there are existing facilities, be responsible for protection thereof, whether or not such facility is to be removed or relocated or remain as installed. Moving or removing any facility must be done so as not to cause interruption the work or Owner's Operation.
- B. All pipe and duct openings shall be closed with caps or plugs during installation. All fixtures shall be covered and protected against injury. At final completion, all work shall be cleaned and delivered in an unblemished condition, or refinished and repainted at the desecration of the Engineer.

### 3.4. CONCEALED AND EXPOSED WORK

- A. "Concealed" is intended to mean within such spaces as pipe chases, pipe trenches, above plaster ceilings, in walls and buried pipe is inaccessible when building is completed. "Exposed" is intended to be within equipment rooms, unfinished spaces, above "pushup" ceilings, accessible pipe tunnels, where pipe is accessible.

### 3.5. PROTECTION OF PENETRATION

- A. All penetrations of fire or smoke barriers shall be sealed, sleeves (if any), insulation (if any), and vibration isolation (if any) that maintain the fire or smoke resistance of the barrier in accordance with the latest edition of NFPA 101 Life Safety Code.
- B. Contractor shall verify and coordinate locations and type of all partitions penetrations from the drawings. Sealing material and methods shall be per UL recommendations. The Contractor shall fire stop all penetrations through fire and smoke rated barriers as required by code. Refer to Division 7 for fire stopping material information.

### 3.6. CONCRETE

- A. This Contractor shall coordinate all requirements for concrete. All concrete shall be furnished under the Division 3 of these specifications.

- B. For outdoor equipment on grade and indoor floor mounted mechanical equipment, the Contractor shall construct level 3000 psi concrete slabs with finished edges, wire reinforced, minimum 3 1/2" thick, and minimum 6" larger on all sides than the equipment being supported.

### 3.7. TRENCHING AND BACKFILLING

- A. All excavation, trenching and backfilling required for the mechanical installation shall be provided by this Contractor. Excavation and backfilling shall be done in strict accordance with the specification section for trenching, excavation, and backfilling, see Division 2.

### 3.8. FIELD MEASUREMENTS

- A. The Contractor shall verify the dimensions and conditions governing work at the project site. He shall examine adjoining work on which his work is dependent, for perfect efficiency, and shall report any work, which must be corrected.

### 3.9. LUBRICATION

- A. The Contractor shall provide all oil and grease for the operating of all equipment until acceptance. The Contractor shall be held responsible for all damage to bearings while the equipment is being operated by him up to the date of acceptance of the equipment. The Contractor shall protect all bearings and shafts during installation and shall thoroughly grease the steel shafts to prevent corrosion.

### 3.10. MANUFACTURER'S DIRECTION

- A. The Contractor shall install all equipment in strict accordance with all directions and recommendations furnished by the manufacturer. Where such directions are in conflict with the plans and specifications, the Contractor shall report such conflicts to the Engineer who shall make changes deemed necessary and desirable.

### 3.11. FLUSHING, CLEANING & STERILIZING

- A. Before final connections are made in the piping systems, all piping shall be blown out with air and then completely washed out with cleaning compounds. The systems shall be flushed for complete removal of all foreign materials. Furnish all temporary connections, equipment, and valves required for this purpose.
- B. After flushing, sterilize the domestic water systems with an approved chlorinating agent to provide a dosage on not less than 50 ppm. After minimum contact period of twenty-four (24) hours, the system shall be flushed with clean water until the residual chlorine is no greater than the city water.

C. Refer to specific sections for testing requirements.

### 3.12. TESTS:

A. Tests shall be complete prior to final inspection and prior to covering with insulation or earth.

B. All pressure tests shall be charted using a stripe chart recorder with enough paper for the duration of the test shown. Refer to other specifications for additional requirements. The test results shall include test run, test date, person doing the testing, and Engineer or authority having jurisdiction signature.

C. All tests shall be witnessed and approved by the Engineer and the local authority having jurisdiction before covering or insulating. Provide Engineer with a minimum of 24 hour written notice prior to any testing.

D. Test all storm drain, vent and waste lines with standing water test of 12 feet of head. Test to be held for a minimum of six (6) hours.

E. The satisfactory operation of blowers, pumps and other equipment with moving parts shall be demonstrated to the Engineer. Equipment without movable parts shall have pressure or other tests performed by the Contractor to demonstrate satisfactory operation.

F. Furnish all instruments, pumps, blowers and equipment required for the testing.

G. Provide written approved copies of these test reports for inclusion on the Operations and Maintenance Manuals.

### 3.13. PAINTING

A. Surfaces of all equipment and material not provided with a factory finish coat shall be thoroughly cleaned, primed (if not factory primed) and finish coated with a high quality alkyd industrial enamel of a color chosen by the Owner.

### 3.14. SPECIAL OPENINGS

A. The contractor shall attempt to schedule delivery of all large equipment requiring special openings for installation prior to enclosing of area. Where this is not possible written notice of required openings which must be provided shall be listed by size and location and submitted to the General Contractor prior to enclosing of areas involved. Work required to construct openings and the associated cost of enclosing them shall be done at no additional cost to the Owner.

### 3.15. PLACING IN OPERATION

- A. All ducts, pipes, equipment, controls, hangers and supports shall be cleaned of plaster and other foreign debris.
- B. Before final acceptance, all strainers shall be thoroughly cleaned or replaced, all bearings shall be oiled or greased and all drains shall be cleaned out and primed. All permanent filters shall be cleaned; throwaway type filters shall be replaced with new filters.
- C. The systems shall be placed in operation.
- D. The contractor shall verify that all controls are set to meet operating conditions specified.
  - 1. Example: Boiler operating control set at 200° F. Limit control set at 220° F.
- E. The Contractor shall verify that all pieces of equipment are operable and that all sequences of controls are being met.
- F. Contractor to adjust seating through the first (1<sup>st</sup>) year as required by Engineer.

### 3.16. BALANCING, TESTING AND ADJUSTING THE MECHANICAL SYSTEMS

- A. Balancing the mechanical systems shall be part of this contract, refer to subsequent mechanical specification section for details. This Contractor is to include in their bid the cost of balancing, testing and adjusting.

### 3.17. OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Contractor shall prepare and provide a minimum of four (4) copies of operating and maintenance manuals. Contractor shall deliver four bound sets to the Engineer for approval. Each manual shall be in a ring binder and shall be indexed with dividers for each section. Delivery of required documents is a condition of final acceptance.
- B. Each manual shall contain, but not limited to, the following general sections:
  - 1. Certificates of acceptance from the inspecting authorities including approval of backflow preventer installation and certification,
  - 2. Waiver of all liens if required by Division 1 requirements,
  - 3. Warranties with starting dates and end dates for each pieces of equipment and/or for each system (warranties shall begin on date of substantial completion and acceptance by the Owner),
  - 4. Names, telephone and fax numbers and addresses of all subcontractors, vendors, manufacturer's representatives, and warranties providers, (On Contractor's letterhead stationary),

5. Certification letters from each Contractor that each system furnished and installed by that contractor and/or subcontractors is started-up, balanced, adjusted and checked for proper operation in accordance with the intent of the contract documents,
  6. Spare parts lists for each piece of equipment,
  7. Lubrication charts showing type of lubrication and application methods and frequencies,
  8. Filter cleaning or replacement schedule (On Contractor's letterhead stationary),
  9. Preventative maintenance schedule for checking all items such as belt drives, safety controls, oil and refrigerant charges, and seasonal changer over recommendations. Cleaning of all strainers, traps, coils, tower pans, tubes, sprays, etc. (on Contractor's letterhead stationary),
  10. Normal operating instructions including a sequence of operations (on Contractor's letterhead stationary),
  11. Instructions as to procedures to be followed for emergency situations, such as alarms or safety items being tripped. (on Contractor's letterhead stationary),
  12. Instruction on who to call for service during guarantee period, (on Contractor's letterhead stationary),
  13. Include copies of all start-up reports on the equipment.
  14. Include copies of sewer line cleaning report as required by Section 22 13 16.
  15. Complete AS-BUILT temperature control diagrams including written control descriptions, system sequence of operations, schematics, parts or component lists, and operating instructions shall also be provided. In addition one copy of the schematic pneumatic and/or electrical control diagrams shall be framed under glass and mounted on an equipment room wall in the vicinity of the installed equipment. Coordinate with requirements in the control specifications
  16. Approved copy of the Testing, Adjusting and Balancing Reports,
  17. Copies of As-Built drawings on reproducible vellum as produced by a Xerox or photographic process or on CD or DVD and,
  18. Copies of all **APPROVED** shop drawing submittals including nameplate date, design parameters, name, telephone and fax numbers, address of vendor, manufacturer's representative and warrantee provider.
- C. Approval will not be given for final payment until the tests, balancing, and operating instruction portions have been completed.

### 3.18. INSTRUCTIONS TO THE OWNER

- A. Contractor shall instruct the Owner's operating personnel in the operations and maintenance of all mechanical systems and equipment. There shall be a minimum of four (4) hours of training. Contractor shall furnish any special servicing tools required for maintenance.

- B. Contractor shall conduct a demonstration of 'the installation upon completion and final acceptance of the work. There shall be a minimum four (4) hour demonstration. Prior to this all work shall have been completed, tested, balanced and placed in operation. Qualified personnel must be present at the demonstration to operate all the systems and prove the performance of the equipment. The schedule for this demonstration shall be coordinated with the Engineer.

### 3.19. INSTALLATION CHECK

- A. An experienced, competent, and authorized representative of the manufacturer or supplier of each item of equipment indicated below shall visit the site of the work and inspect, check, adjust if necessary, and approve the equipment installation. IN each case, the equipment supplier's representative shall be present when the equipment is placed in operation. The equipment supplier's representative shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation is satisfactory to the Manufacturer's Representative and Engineer.
- B. Each equipment supplier's representative shall furnish to the Engineer a written report certifying that the equipment (1) has been properly installed and lubricated; (2) is in accurate alignment; (3) is free from any undue stress imposed by connecting piping or anchor bolts; and, (4) has been operated satisfactorily.
  - 1. Equipment Requiring Installation Check:
    - a). Interior Lift Station
    - b). Exterior Lift Station

### 3.20. OPERATIONAL TEST

- A. After completion of testing, adjusting and balancing work (see related specification section) the Contractor shall perform an operating test covering all equipment furnished and installed under Divisions 22 and 23. This test shall cover a period of not less than 24 hours. The Contractor shall have all of his equipment operating and check all equipment for adjustments. The Contractor will instruct the Owner's operating personnel in the operation and maintenance the system following this operational test. The operational test shall be a demonstration of the operation of the systems in all specified modes. Operational test shall be conducted by the Contractor with the assistance of the Testing and Balancing Sub-Contractor. Tests as required shall be conducted in the presence of the Owner and the Mechanical Engineers. Coordinate operation testing with requirements in other specification sections.

### 3.21. INTERRUPTING SERVICES

- A. The Contractor shall coordinate the installation of all work within the building in order to minimize interference with the operation of existing mechanical, plumbing,

and utility systems during construction. Connections to existing systems requiring the interruption of services within the building shall be carefully coordinated with the Owner to minimize system downtimes. Requests for the interruption of existing services shall be submitted to the Owner and Engineer in writing a minimum of two (2) weeks before the scheduled date. Absolutely no interruption of the existing services will be permitted without the written approval of the Owner and Engineer.

### 3.22. CONSTRUCTION POWER

- A. Electrical power for conducting construction activities shall be acquired as indicated by Engineer and carefully coordinated with Owner's personnel.

END OF SECTION 22 00 00

## SECTION 22 05 00 – BASIC MECHANICAL MATERIALS AND METHODS

### PART 1 – GENERAL

#### 1.1. RELATED DOCUMENTS

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

#### 1.2. SUMMARY

- A. This Section includes the following basic mechanical materials and methods to complement other Division 22 and 23 Sections.
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Concrete equipment base construction requirements.
  - 3. Equipment nameplate data requirements.
  - 4. Labeling and identifying mechanical systems and equipment is specified in Division 23 Section "Mechanical Identification."
  - 5. Nonshrink grout for equipment installations.
  - 6. Field-fabricated metal and wood equipment supports.
  - 7. Installation requirements common to equipment specification Sections.
  - 8. Cutting and patching.
  - 9. Touchup painting and finishing.

- B. Pipe and pipe fitting materials are specified in piping system Sections.

#### 1.3. DEFINITIONS

- A. Pipe, pipe fittings, and piping include tube, tube fittings, and tubing.
- B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- C. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- D. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- E. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- F. Concealed Exterior Installations: Concealed from view and protected from weather

conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

#### 1.4. SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for following piping specialties:
  - 1. Mechanical sleeve seals.
- C. Samples of color, lettering style, and other graphic representation required for each identification material and device.
- D. Coordination drawings for access panel and door locations.
- E. Prepare coordination drawings according to Division 1 Section "Submittals" to a 1/4 inch equals 1 foot (1:48) scale or larger. Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Show where sequence and coordination of installations are important to the efficient flow of the Work. Include the following:
  - 1. Proposed locations of piping, ductwork, equipment, and materials. Include the following:
    - a). Planned piping layout, including valve and specialty locations and valve stem movement.
    - b). Planned duct systems layout, including elbow radii and duct accessories.
    - c). Clearances for installing and maintaining insulation.
    - d). Clearances for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
    - e). Equipment service connections and support details.
    - f). Exterior wall and foundation penetrations.
    - g). Fire-rated wall and floor penetrations.
  - 2. Scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
  - 3. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
  - 4. Reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items.

#### 1.5. QUALITY ASSURANCE

- A. Qualify welding processes and operators for piping according to ASME "Boiler and

Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions of ASME B31 Series "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.

B. ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

C. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.

#### 1.6. DELIVERY, STORAGE AND HANDLING

A. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Protect stored plastic pipes from direct sunlight. Support to prevent sagging and bending.

#### 1.7. SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.

E. Coordinate connection of electrical services.

- F. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in this Section."
- H. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces. Install identifying devices prior to installing acoustical ceilings and similar concealment.

## PART 2 – PRODUCTS

### 2.1. PIPE AND PIPE FITTINGS

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

### 2.2. JOINING MATERIALS

- A. Refer to individual piping system specification Sections in Division 22 for special joining materials not listed below.
- B. Pipe Flange Gasket Materials: Suitable for the chemical and thermal conditions of the piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, except where thickness or specific material is indicated.
    - a). Full-Face Type: For flat-face, Class 125 cast-iron and cast-bronze flanges.
    - b). Narrow-Face Type: For raised-face, Class 250 cast-iron and steel flanges.
  - 2. ASME B16.20 for grooved, ring-joint, steel flanges.
  - 3. AWWA C110, rubber, flat face, 1/8 inch thick, except where other thickness is indicated; and full-face or ring type, except where type is indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, except where other material is indicated.
- D. Plastic Pipe Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, except where other type or material is indicated.

- E. Solder Filler Metal: ASTM B 32.
  - 1. Alloy Sn95 or Alloy Sn94: Tin (approximately 95 percent) and silver (approximately 5 percent), having 0.10 percent lead content.
- F. Brazing Filler Metals: AWS A5.8.
  - 1. BCuP Series: Copper-phosphorus alloys.
  - 2. BAg1: Silver alloy.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon steel bolts and nuts.
- I. Couplings: Iron body sleeve assembly, fabricated to match outside diameters of plain-end pressure pipes.
  - 1. Sleeve: ASTM A 126, Class B, gray iron.
  - 2. Followers: ASTM A 47 (ASTM A 47M), Grade 32510 or ASTM A 536 ductile iron.
  - 3. Gaskets: Rubber.
  - 4. Bolts and Nuts: AWWA C111.
  - 5. Finish: Enamel paint.

### 2.3. PIPING SPECIALTIES

- A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type where required to conceal protruding fittings and sleeves.
  - 1. Inside Diameter: Closely fit around pipe, tube, and insulation.
  - 2. Outside Diameter: Completely cover opening.
  - 3. Cast Brass: One-piece, with setscrew.
    - a). Finish: Rough brass.
    - b). Finish: Polished chrome plate.
  - 4. Cast Brass: Split casting, with concealed hinge and setscrew.
    - a). Finish: Rough brass.
    - b). Finish: Polished chrome plate.
  - 5. Stamped Steel: One-piece, with setscrew and chrome-plated finish.
  - 6. Stamped Steel: One-piece, with spring clips and chrome-plated finish.
  - 7. Stamped Steel: Split plate, with concealed hinge, setscrew, and chrome-plated finish.
  - 8. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome-plated finish.
  - 9. Cast-Iron Floor Plate: One-piece casting.

- B. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals to prevent galvanic action and stop corrosion.
1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.
  2. Insulating Material: Suitable for system fluid, pressure, and temperature.
  3. Dielectric Unions: Factory-fabricated, union assembly for 250-psig minimum working pressure at an 180° F temperature.
  4. Dielectric Flanges: Factory-fabricated, companion-flange assembly for 150- or 300-psig minimum pressure to suit system pressures.
  5. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
    - a). Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure to suit system pressures.
  6. Dielectric Couplings: Galvanized-steel coupling, having inert and noncorrosive, thermoplastic lining, with threaded ends and 300-psig minimum working pressure at 225°F temperature.
  7. Dielectric Nipples: Electroplated steel nipple, having inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig working pressure at 225°F temperature.
- C. Mechanical Sleeve Seals: Modular, watertight mechanical type. Components include interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve. Connecting bolts and pressure plates cause rubber-sealing elements to expand when tightened.
- D. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
1. Steel Sheet Metal: 24-gage or heavier galvanized sheet metal, round tube closed with welded longitudinal joint.
  2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
  3. Cast-Iron: Cast or fabricated wall pipe equivalent to ductile-iron pressure pipe, having plain ends and integral water stop, except where other features are specified.
  4. Wall Penetration Systems: Wall sleeve assembly, consisting of housing, gaskets, and pipe sleeve, with 1 mechanical-joint end conforming to AWWA C110 and 1 plain pipe-sleeve end.
    - a). Penetrating Pipe Deflection: 5 percent without leakage.
    - b). Housing: Ductile-iron casting having waterstop and anchor ring, with ductile-iron gland, steel studs and nuts, and rubber gasket, conforming to AWWA C111, of housing and gasket size as required to fit penetrating pipe.

- c). Pipe Sleeve: AWWA C151, ductile-iron pipe.
- d). Housing-to-Sleeve Gasket: Rubber or neoprene push-on type of manufacturer's design.
- 5. Cast-Iron Sleeve Fittings: Commercially made sleeve having an integral clamping flange, with clamping ring, bolts, and nuts for membrane flashing.
  - a). Underdeck Clamp: Clamping ring with setscrews.

#### 2.4. GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
  - 1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi 28-day compressive strength.
  - 3. Packaging: Premixed and factory-packaged.

#### 2.5. ACCESS DOORS

- A. Flush mounted steel access doors with 16 ga. frame and 14 ga. Panel. Prime coat finish. Concealed spring hinges, screwdriver cam-lock. Doors in fire rated surfaces shall be U.L. listed and labeled. Doors to be Milcor or approved equivalent.

#### 2.6. DRIP PANS

- A. Provide drip pans under fluid conducting piping, including steam supply piping, which runs over the following electrical work or as indicated on the drawings:
  - 1. Switchgear
  - 2. Busways
  - 3. Motor Starters
  - 4. Electrical Panels and Enclosures
  - 5. Disconnect Switches
- B. Pans shall be made of 22 gauge galvanized steel. Pans shall be 2 inches deep, with hemmed top edges, and shall extend 6 inches beyond the equipment below. Pans shall be kept as close to the underside of the pipes as practicable. All seams shall be soldered, and pans shall be cross braced as required to prevent sagging and warping.
- C. Each pan shall be pitched to drain connection, and a 3/4 inch or larger copper drain pipe shall be piped to discharge where shown on drawings, or if not shown, to discharge over nearest available open drain; open end sluices discharging to intercepting pans will not be accepted.

#### 2.7. ROOF PENETRATIONS

## A. Piping

1. Contractor shall provide a factory-made penetration assembly as follows:
  - a). For pipes, conduits, etc. up to 3-inches in diameter that can or are intended to be turned to horizontal after passing through the roof (e.g. small electrical conduit, gas piping, refrigerant lines, water pipes, etc.) the device shall consist of a curb assembly with a welded 18 gauge galvanized steel shell and base, 1-1/2 inches thick 3 pcf rigid insulation, 0.50 inch aluminum or 20 gauge galvanized cap with minimum 3 inch over hang and 1-inch rigid insulation, and 2" x 6" wood nailer. Product shall be Custom Curb Model CPC, ThyCurb Model RP-2 with TC-1, 2, or 3 curb, or approved equivalent.

## B. General

1. All roof flashing assemblies and roof curbs shall be closely coordinated with other work through the Roofing Contractor to insure that the flashing, canting, insulation type and location, etc., is correct and appropriate for the particular roof construction type.
2. Each roof curb shall be selected and provided so that the top of the curb shall be level after installation. The curb shall provide a minimum clearance of 10 inches between the top of the finished roof surface and the top of the wood nailer, continuous around the curb perimeter.
3. Provide each roof curb with other options as scheduled on the drawings.

## 2.8. PROTECTION OF PENETRATION

- A. All penetrations of fire or smoke barriers shall be sealed, sleeves (if any), insulation (if any), and vibration isolation (if any) that maintain the fire or smoke resistance of the barrier in accordance with the latest edition of NFPA 101 Life Safety Code.
- B. Contractor shall verify locations and type of all partitions penetrations from the drawings. Sealing material and methods shall be per UL recommendations. The Contractor shall fire stop all penetrations through fire and smoke rated barriers as required by code. Refer to Division 7 for fire stopping material information.

## PART 3 – EXECUTION

### 3.1. PIPING SYSTEMS--COMMON REQUIREMENTS

- A. General: Install piping as described below, except where system Sections specify otherwise. Individual piping system specification Sections in Division 22 specify piping installation requirements unique to the piping system.
- B. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems. Indicated locations

and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.

- C. Coordinate excavation, trenching, and backfilling requirements necessary to accomplish mechanical work with those respective sections in Division 2.
- D. Coordinate the thickness of the wall to accommodate the concealed piping and its associated insulation, if required. I.E., 4 inch sewer or vent line required a 6 inch thick wall.
- E. Install piping at indicated slope.
- F. All pipes, ducts, and conduit shall be hung as high as possible. Electrical work shall be hung above other work.
- G. Exact location of electric outlets, piping, ducts, and the like shall be coordinated to avoid interferences between lighting fixtures, piping, ducts, structural elements, and similar items.
- H. Install components having pressure rating equal to or greater than system operating pressure.
- I. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- J. Install piping free of sags and bends.
- K. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated.
- L. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- M. Install piping to allow application of insulation plus 1-inch clearance around insulation.
- N. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- O. Install fittings for changes in direction and branch connections.
- P. Install couplings according to manufacturer's printed instructions.
- Q. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:

1. Chrome-Plated Piping: Cast-brass, one-piece, with setscrew, and polished chrome-plated finish. Use split-casting escutcheons, where required, for existing piping.
  2. Uninsulated Piping Wall Escutcheons: Cast-brass or stamped-steel, with setscrew.
  3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
  4. Insulated Piping: Cast-brass or stamped-steel, with concealed hinge, spring clips, and chrome-plated finish.
  5. Piping in Utility Areas: Cast-brass or stamped-steel, with setscrew or spring clips.
- R. Sleeves are required for core drilled holes.
- S. Install sleeves for pipes passing through concrete and masonry walls, concrete floor and roof slabs, and where indicated.
- T. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, concrete floor and roof slabs, and where indicated.
1. Cut sleeves to length for mounting flush with both surfaces.
    - a). Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 4 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring where specified.
  2. Build sleeves into new walls and slabs as work progresses.
  3. Install large enough sleeves to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a). Steel Pipe Sleeves: For pipes smaller than 6 inches.
    - b). Steel Sheet-Metal Sleeves: For pipes 6 inches and larger that penetrate gypsum-board partitions.
    - c). Cast-Iron Sleeve Fittings: For floors having membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 4 inches above finished floor level. Flashing is specified in Division 7 Section "Flashing and Sheet Metal."
      - 1). Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.
  4. Except for below-grade wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants specified in Section 07 92 00 "Joint Sealants."
- U. Above Grade, Exterior Wall, and Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installation of mechanical seals.
1. Install steel pipe for sleeves smaller than 6 inches.

2. Install cast-iron wall pipes for sleeves 6 inches and larger.
  3. Assemble and install mechanical seals according to manufacturer's printed instructions.
- V. Below Grade, Exterior Wall, and Pipe Penetrations: Install cast-iron wall pipes for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installation of mechanical seals.
- W. Protection of Penetrations
1. All penetrations of fire or smoke barriers shall be sealed, sleeves (if any), insulation (if any), and vibration isolation (if any) that maintain the fire or smoke resistance of the barrier in accordance with the latest edition of NFPA 101 Life Safety Code.
  2. Contractor shall verify locations and type of all partitions penetrations from the drawings. Sealing material and methods shall be per UL recommendations. The Contractor shall fire stop all penetrations through fire and smoke rated barriers as required by code. Refer to Section 07 84 00 for fire stopping material information.
  3. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping sealant material. Firestopping materials are specified in Section 07 84 00 "Firestopping."
- X. Verify final equipment locations for roughing in.
- Y. Refer to equipment specifications in other Sections for roughing-in requirements.
- Z. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping system Sections.
1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
  2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
  3. Soldered Joints: Construct joints according to AWS "Soldering Manual," Chapter 22 "The Soldering of Pipe and Tube."
  4. Brazed Joints: Construct joints according to AWS "Brazing Manual" in the "Pipe and Tube" chapter.
  5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full inside diameter. Join pipe fittings and valves as follows:

- a). Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
  - b). Apply appropriate tape or thread compound to external pipe threads (except where dry seal threading is specified).
  - c). Align threads at point of assembly.
  - d). Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
  - e). Damaged Threads: Do not use pipe or pipe fittings having threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
6. Welded Joints: Construct joints according to AWS D10.12 "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe" using qualified processes and welding operators according to the "Quality Assurance" Article.
  7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
  8. No union shall be placed in a location which will be inaccessible after completion of the project.
  9. A union or flange shall be installed so equipment may be readily disconnected:
    - a). On each side of each control valve, regulator, and similar items.
    - b). On one side of each check valve and each trap.
    - c). At all connections to pieces of equipment such as chillers, boilers, pumps, compressors, tanks, and similar items
- AA. Piping Connections: Except as otherwise indicated, make piping connections as specified below.
1. Install unions in piping 2 inches and smaller adjacent to each valve and at final connection to each piece of equipment having a 2-inch or smaller threaded pipe connection.
  2. Install flanges in piping 2-1/2 inches and larger adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
  3. Dry Piping Systems (Gas): Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  4. Wet Piping Systems (Water): Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.
- BB. Access To Valves
1. Valves, bearings, and other operating parts located in equipment rooms, installed more than 6'-6" to center line above the floor or platform or are not

readily accessible due to the proximity of the other equipment shall be provided with chain wheels, extension stems, extension oil pipes, and similar devices. The above provision does not apply to finished spaces.

#### CC. Drip Pans

1. Provide and install drip pans as indicated on the drawings.

#### 3.2. EQUIPMENT INSTALLATION--COMMON REQUIREMENTS

- A. Install equipment to provide the maximum possible headroom where mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Engineer.
- C. Install equipment level and plumb, parallel, and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.
- D. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
- E. Install equipment, giving right-of-way to piping systems installed at a required slope.
- F. Provide means for making adjustments to mechanical equipment without bending, springing, or otherwise deforming any part (items such as belt drives, damper linkages, and pulleys). Adjustments shall incorporate set-screws or similar means for positive settings.

#### 3.3. PAINTING AND FINISHING

- A. Refer to Division 09 91 00 Section "Painting" for field painting requirements.
- B. Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

#### 3.4. CONCRETE BASES

- A. Construct concrete equipment bases of dimensions indicated, but not less than 4 inches larger than supported unit in both directions. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi, 28-day compressive strength concrete and reinforcement as specified in Section 03 39 00 "Cast-in-Place Concrete."

### 3.5. ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1 "Structural Welding Code--Steel."

### 3.6. ERECTION OF WOOD SUPPORTS AND ANCHORAGE

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

### 3.7. DEMOLITION

- A. Disconnect, demolish, and remove work specified under Division 22, 23, and as indicated.
- B. Where pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.
- D. Abandoned Work: Cut and remove buried pipe abandoned in place, 2 inches beyond the face of adjacent construction. Cap and patch surface to match existing finish.
- E. Removal: Remove indicated equipment from the Project site.
- F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

### 3.8. CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of the trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

### 3.9. PROTECTION OF PENETRATION

- A. All penetrations of fire or smoke barriers shall be sealed, sleeves (if any), insulation (if any), and vibration isolation (if any) that maintain the fire or smoke resistance of the barrier in accordance with the latest edition of NFPA 101 Life Safety Code.
- B. Contractor shall verify locations and type of all partitions penetrations from the drawings. Sealing material and methods shall be per UL recommendations. The Contractor shall fire stop all penetrations through fire and smoke rated barriers as required by code. Refer to Division 7 for fire stopping material information.

### 3.10. GROUTING

- A. Install nonmetallic nonshrink grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's printed instructions.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms for placement of grout, as required.
- D. Avoid air entrapment when placing grout.
- E. Place grout to completely fill equipment bases.
- F. Place grout on concrete bases to provide a smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout according to manufacturer's printed instructions.

END OF SECTION 22 05 00

## **SECTION 22 05 29 – SUPPORTS AND ANCHORS**

### **PART 1 – GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Pipe and equipment hangers and supports.
- B. Equipment bases and supports.
- C. Sleeves and seals.
- D. Flashing and sealing equipment and pipe stacks.

#### **1.2. RELATED SECTIONS**

- A. Section 03 30 00 – Cast-In-Place Concrete: Equipment bases.
- B. Section 07 84 00 – Firestopping: Joint seals for piping and duct penetration of fire rated assemblies.
- C. Section 09 91 00 – Painting.
- D. Section 22 07 19 - Piping Insulation.
- E. Section 22 11 16 - Plumbing Piping.

#### **1.3. REFERENCES**

- A. ASME B31.9 – Building Services Piping
- B. ASTM F708 – Design and Installation of Rigid Pipe Hangers.
- C. MSS SP58 – Pipe Hangers and Supports – Materials, Design and Manufacturer.
- D. MSS SP69 – Pipe Hangers and Supports – Selection and Application.
- E. MSS SP89 – Pipe Hangers and Supports – Fabrication and Installation Practices.

#### **1.4. SUBMITTALS**

- A. Submit under provisions of Sections 01 33 00 and 22 00 00.

- B. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.
- C. Product Data: Provide manufacturers catalog data including load capacity.
- D. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- E. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

## 1.5. REGULATORY REQUIREMENTS

- A. Conform to applicable code for support of plumbing piping.

## PART 2 – PRODUCTS

### 2.1. PIPE HANGERS AND SUPPORTS

- A. Plumbing Piping – DWV:
  - 1. Conform to ASME B31.9, ASTM F708, MSS SP58, MSS SP69, and MSS SP89.
  - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
  - 3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
  - 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
  - 6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
  - 7. Vertical Support: Steel riser clamp.
  - 8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

### 2.2. ACCESSORIES

- A. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

### 2.3. INSERTS

- A. Inserts: Malleable iron case or galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

## 2.4. SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage galvanized steel.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage galvanized steel.
- C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.
- D. Sleeves for Round Ductwork: Galvanized steel.
- E. Sleeves for Rectangular Ductwork: Galvanized steel or wood.
- F. Stuffing or Firestopping Insulation: Glass fiber type, non-combustible; refer to Section 07 84 00.
- G. Sealant: Acrylic; refer to Section 07 92 00.

## PART 3 – EXECUTION

### 3.1. INSTALLATION

- A. Install in accordance with manufacturer's instructions.

### 3.2. INSERTS

- A. Provide inserts for placement in concrete formwork.
- B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

### 3.3. PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as scheduled.

- B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- C. Place hangers within 12 inches of each horizontal elbow.
- D. Use hangers with 1-1/2 inch minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Design hangers for pipe movement without disengagement of supported pipe.
- J. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

### 3.4. FLASHING

- A. Provide flexible flashing and metal counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and calk, metal counter flash, and seal.
- C. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with manufacturer's instructions for sound control.
- D. Adjust storm collars tight to pipe with bolts; calk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

### 3.5. SLEEVES

- A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

- B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- C. Extend sleeves through floors one inch above finished floor level. Calk sleeves.
- D. Where piping penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and calk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

3.6. SCHEDULES

HANGER ROD		
PIPE SIZE DIAMETER <u>Inches</u>	MAX. HANGER <u>Feet</u>	SPACING <u>Inches</u>
1/2 to 1-1/4	6.5	3/8
1-1/2 to 2	10	3/8
2-1/2 to 3	10	1/2
4 to 6	10	5/8
8 to 12	14	7/8
14 and Over	20	1
PVC (All Sizes)	6	3/8
C.I. Bell and Spigot(or No Hub) and at Joints	5	3/8

END OF SECTION 22 05 29

## SECTION 22 11 16 – PLUMBING PIPING

### PART 1 – GENERAL

#### 1.1. SECTION INCLUDES

- A. Pipe and pipe fittings.
- B. Sanitary sewer piping system.

#### 1.2. RELATED SECTIONS

- A. Division 7 – Fire Stopping
- B. Section 09 91 00 - Painting.
- C. Section 22 05 29 - Supports and Anchors.
- D. Section 22 11 19 - Plumbing Specialties.
- E. Section 22 40 00 - Plumbing Fixtures.
- F. Section 22 30 00 - Plumbing Equipment.
- G. Section 23 05 53 - Mechanical Identification.

#### 1.3. REFERENCES

- A. ANSI B31.9 - Building Service Piping.
- B. ASME - Boiler and Pressure Vessel Code.
- C. ASME Sec. 9 - Welding and Brazing Qualifications.
- D. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.
- E. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- F. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- G. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- H. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
- I. ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

- J. ASTM D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
  - K. ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
  - L. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
  - M. ASTM D3033 - Type PSP Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
  - N. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
  - O. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
  - P. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.
  - Q. ASTM B75 - Seamless Copper Tube.
  - R. AWS A5.8 – Brazing Filler Metal.
- 1.1. SUBMITTALS
    - A. Submit under provisions of Section 01 33 00 and 22 00 00.
    - B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
  - 1.2. PROJECT RECORD DOCUMENTS
    - A. Submit under provisions of Sections 01 78 39 and 22 00 00.
    - B. Record actual locations of valves.
  - 1.3. OPERATION AND MAINTENANCE DATA
    - A. Submit under provisions of Sections 01 78 23 and 22 00 00.
    - B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
  - 1.4. QUALITY ASSURANCE
    - A. Valves: Manufacturer's name and pressure rating marked on valve body.
  - 1.5. QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing the work of this section with minimum three years documented experience and approved by the manufacturer.

#### 1.6. REGULATORY REQUIREMENTS

- A. Perform Work in accordance with State of Texas and City of El Paso plumbing code.
- B. All items shall be lead free per the Reduction of Lead in Drinking Water Act 2014.

#### 1.7. DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Sections 01 60 00 and 22 00 00.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

#### 1.8. ENVIRONMENTAL REQUIREMENTS

- A. Do not install underground piping when bedding is wet or frozen.

#### 1.9. EXTRA MATERIALS

- A. Furnish under provisions of Sections 01 78 46 and 22 00 00.
- B. Provide two repacking kits for each size valve.

### PART 2 – PRODUCTS

#### 2.1. SANITARY SEWER PIPING, BURIED EXTERIOR TO BUILDING WALL.

- A. Cast Iron Pipe: ASTM A74, service weight, as indicated on drawings.
  - 1. Fittings: Cast iron.

2. Joints: ASTM C564, neoprene gasket system and the item shall be lead free.

## 2.2. SANITARY SEWER PIPING, BURIED INSIDE BUILDING

### A. PVC Pipe: ASTM D 1785.

1. Fittings: PVC.
2. Joints: ASTM F477, elastomeric gaskets. The item shall be lead free.

### B. PVC Pipe: ASTM D-1785.

1. Fittings: PVC.
2. Joints: ASTM D22665, hub and spigot solvent weld with ASTM D2564 solvent cement. The item shall be lead free.

## 2.3. SANITARY SEWER PIPING, ABOVE GRADE INSIDE BUILDING

### A. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.
2. Joints: Neoprene gaskets and 4 strap stainless steel heavy duty clamp-and-shield assemblies.

## 2.4. VENT PIPING, BURIED OUTSIDE BUILDING AND BURIED INSIDE BUILDING

### A. Cast Iron Pipe: ASTM A74, service weight, as indicated on drawings.

1. Fittings: Cast iron.
2. Joints: ASTM C564, neoprene gasket system and the item shall be lead free.

## 2.5. VENT PIPING, ABOVE GRADE INSIDE BUILDING

### A. PVC Pipe: ASTM D-1785.

1. Fittings: PVC.
2. Joints: ASTM D22665, hub and spigot solvent weld with ASTM D2564 solvent cement. The item shall be lead free.

## 2.6. TRAP PRIMER WATER PIPING, ABOVE GRADE

### A. Copper Tube: ASTM B306, DWV.

1. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
2. Joints: ASTM B32, solder, Grade 50B. The item shall be lead free.

## 2.7. BALL VALVES

A. Manufacturers:

1. NIBCO.
2. Milwaukee.
3. Grinnell Corp.
4. Refer to Sections 22 05 00 – Basic Mechanical Material and Methods and 22 00 00 – General Mechanical Requirements: For Product options and substitutions.

B. Over 2 Inches: Cast steel body, chrome plated full ported steel ball, teflon seat and stuffing box seals, lever handle, flanged. The valve assembly shall be lead free.

2.8. SPRING LOADED CHECK VALVES

A. Manufacturers:

1. NIBCO.
2. Milwaukee.
3. Grinnell Corp.
4. Red-White Valve Corp.
5. Refer to Sections 22 05 00 – Basic Mechanical Material and Methods and 22 00 00 – General Mechanical Requirements: For Product options and substitutions.

B. Iron body, bronze trim, stainless steel spring, renewable composition disc, screwed, wafer, or flanged ends. The valve assembly shall be lead free.

PART 3 – EXECUTION

3.1. EXAMINATION

A. Verify excavations under provisions of Division 22.

B. Verify that excavations are to required grade, dry, and not over-excavated.

C. The drawings indicate the locations, type and sizes of various utilities within the site where known. These utilities are indicated as accurately as possible. If the Contractor encounters any utilities or differing conditions during construction, which are not shown on the drawings, they shall request in writing for written instructions from the Engineer

D. Contractor shall verify location, size, elevation, pressure and any other pertinent data of the existing utilities. The Contractor shall provide a written report with drawings indicating this existing utilities information, such as utility locations and sewer invert information.

### 3.2. 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.

### 3.3. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient.
- D. Install piping to conserve building space and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Establish elevations of buried piping outside the building to ensure not less than 3 ft of cover.
- H. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- I. Prepare, clean, and prime pipe, fittings, supports, and accessories not pre-finished and ready for finish painting. Refer to Section 09 90 00.
- J. Install bell and spigot pipe with bell end upstream.
- K. Install valves with stems upright or horizontal, not inverted.
- L. Piping shall be supported at 6 feet on center and at both sides of changes in direction with factory fabricated roof supports. Flash supports into roof per roofing manufacturer recommendations.

### 3.4. PROTECTION OF PENETRATION

- A. All penetrations of fire or smoke barriers shall be sealed, sleeves (if any), insulation (if any), and vibration isolation (if any) that maintain the fire or smoke resistance of the barrier in accordance with the latest edition of NFPA 101 Life Safety Code.

- B. Contractor shall verify locations and type of all partitions penetrations from the drawings. Sealing material and methods shall be per UL recommendations. The Contractor shall fire stop all penetrations through fire and smoke rated barriers as required by code. Refer to Division 7 for fire stopping material information.

### 3.5. APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- C. Provide spring loaded check valves on discharge of pumps.

### 3.6. ERECTION TOLERANCES

- A. Establish invert elevations, slopes for drainage to 1/8 inch per foot per code requirements. Maintain gradients.
- B. Slope water piping and arrange to drain at low points.

### 3.7. PREPARATION OF SEWER LINE FOR USAGE

- A. The Contractor shall clean out all underground sewer lines with either high-pressure water or with sewer snake.
- B. The Contractor shall verify that all underground sewer lines are clean and clear of foreign material.
- C. The Contractor shall provide DOCUMENTATION THAT THIS SEWER LINE CLEANING HAS BEEN ACCOMPLISHED AND SHALL INCLUDE SUCH INFORMATION IN THE OWNER's Manuals.

### 3.8. SERVICE CONNECTIONS

- A. Connect into existing sanitary sewer services as indicated on the drawings. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

END OF SECTION 22 11 16

## **SECTION 22 11 19 – PLUMBING SPECIALTIES**

### **PART 1 – GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Floor drains.
- B. Cleanouts.

#### **1.2. RELATED SECTIONS**

- A. Section 22 11 16 – Plumbing Piping.
- B. Section 22 30 00 – Plumbing Equipment.

#### **1.3. REFERENCES**

- A. ASME A112.21.1 – Floor Drains.

#### **1.4. SUBMITTALS FOR REVIEW**

- A. Section 01 33 00 – Submittals: Procedures for submittals.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

#### **1.5. SUBMITTALS FOR INFORMATION**

- A. Section 01 33 00 – Submittals: Procedures for submittals.
- B. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

#### **1.6. SUBMITTALS AT PROJECT CLOSEOUT**

- A. Section 01 70 00 – Contract Closeout and Section 22 00 00 General Mechanical Requirements: Procedures for submittals.
- B. Project Record Documents: Record actual locations of equipment and cleanouts.
- C. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

## 1.7. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing the work of this section with minimum three years documented experience and approved by the manufacturer.
- C. All items shall be listed and approved by NSF for their intended usage. All items shall be lead free per the Reduction of Lead in Drinking Water Act 2014.

## 1.8. DELIVERY, STORAGE, AND PROTECTION

- A. Section 22 05 00 – Basic Mechanical Material and Methods: Transport, handle, store, and protect products.
- B. Accept specialties on site in original factory packaging. Inspect for damage.

## 1.9. MAINTENANCE PRODUCTS

- A. Section 01 70 00 – Contract Closeout and Section 22 00 00 General Mechanical Requirements.

## 1.10. EXTRA MATERIALS

- A. Section 01 70 00 – Contract Closeout and Section 22 00 00 General Mechanical Requirements

## PART 2 – PRODUCTS

### 2.1. FLOOR DRAINS

- A. Floor Drain:
  - 1. Manufacturer:
    - a). Zurn.
    - b). Watts.
    - c). JR Smith.
    - d). Josam.
    - e). Substitutions: Refer to Section 22 05 00 – Basic Mechanical Material and Methods and Section 22 00 00 – General Mechanical Requirements.
  - 2. ANSI A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable round nickel-bronze strainer with removable perforated sediment bucket and trap primer assembly.

## 2.2. CLEANOUTS

### A. Exterior Surfaced Areas:

1. Manufacturer:
  - a). Zurn.
  - b). Watts.
  - c). JR Smith.
  - d). Josam.
  - e). Substitutions: Refer to Section 22 05 00 – Basic Mechanical Material and Methods and Section 22 00 00 – General Mechanical Requirements.
2. Round cast nickel bronze access frame and non-skid cover.

### B. Interior Horizontal Cleanouts:

1. Manufacturers:
  - a). Zurn.
  - b). Watts.
  - c). JR Smith.
  - d). Josam.
  - e). Substitutions: Refer to Section 22 05 00 – Basic Mechanical Material and Methods and Section 22 00 00 – General Mechanical Requirements.
2. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

## PART 3 – EXECUTION

### 3.1. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Cleanouts to have lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install floor drains where shown and coordinate slop of floor to drain. Install trap primer in nearest water closet cold water supply and connect to floor drain with type L soft copper tubing.

END OF SECTION 22 11 19

## SECTION 22 30 00 – PLUMBING EQUIPMENT

### PART 1 – GENERAL

#### 1.1. SECTION INCLUDES

- A. Interior Lift station with duplex submersible pump equipment for all collection system lift stations.
- B. Exterior Lift station with duplex submersible pump equipment for all collection system lift stations.
- C. Grease Interceptor with cleanouts, access manways, and baffles.
- D. Lint Interceptor with cleanouts, access manways, and baffles.

#### 1.2. RELATED SECTIONS

- A. Section 26 05 03 – Equipment Wiring Systems: Electrical characteristics and wiring connections.

#### 1.3. REFERENCES

- A. ASHRAE 90A – Energy Conservation in New Building Design.
- B. NFPA 70 – National Electrical Code.
- C. Hydraulic Institute Standards

#### 1.4. SUBMITTALS FOR REVIEW

- A. Section 01 33 00 – Submittals: Procedures for submittals and Section 22 00 00 – General Mechanical Requirements.
- B. Product Data:
  - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
  - 2. Indicate pump type, capacity, and power requirements.
  - 3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
  - 4. Provide electrical characteristics and connection requirements.
- C. Shop Drawings:
  - 1. Indicate heat exchanger dimensions, size of tapings, and performance data.

2. Indicate dimensions of sump tanks, pumps, anchors, attachments, lifting points, tappings, and drains.

#### 1.5. SUBMITTALS FOR INFORMATION

- A. Section 01 33 00 – Submittals: Procedures for submittals.
- B. Provide Manufacturer's Instructions for installation.

#### 1.6. SUBMITTALS AT PROJECT CLOSEOUT

- A. Section 01 70 00 – Contract Closeout and 22 00 00 – General Mechanical Requirements: Procedures for submittals.
- B. Project Record Documents: Record actual locations of components.
- C. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

#### 1.7. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing the work of this section with minimum three years documented experience and approved by the manufacturer.
- C. Provide pumps with manufacturer's name, model number, and rating/capacity identified.
- D. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
  1. National Sanitation Foundation (NSF).
  2. National Electrical Manufacturers' Association (NEMA).
  3. Underwriters Laboratories (UL).
- E. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation; operate within 25 percent of midpoint of published maximum efficiency curve.

#### 1.8. REGULATORY REQUIREMENTS

- A. All items shall be lead free per the Reduction of Lead in Drinking Water Act 2014.

#### 1.9. DELIVERY, STORAGE, AND PROTECTION

- A. Section 22 00 00 – Basic Mechanical Material and Methods: Transport, handle, store, and protect products.
- B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

#### 1.10. WARRANTY

- A. Section 01 70 00 – Contract Closeout, 01 78 36 – Warranties, and 22 00 00 – General Mechanical Requirements.
- B. Provide five year manufacturer warranty for lift station sewage ejectors pumps.
- C. Manufacturer shall certify repair facilities. Manufacturer’s authorized repair station shall have \$100,000 minimum inventory of repair parts including O-rings, bearings, mechanical seals, motor stator, power cable, grommets, and fittings of the pumps to be supplied under this job.
- D. The aluminum access frames and covers shall carry a guarantee of 10 years against defects in material and/or workmanship.

#### 1.1. MAINTENANCE PRODUCTS

- A. Section 01 70 00 – Contract Closeout, 01 78 23 – Operation and Maintenance Data and 22 00 00 – General Mechanical Requirements.

#### 1.2. EXTRA MATERIALS

- A. Section 01 78 46 – Contract Closeout, 01 78 23 – Operation and Maintenance Data and 22 00 00 – General Mechanical Requirements.
- B. Provide two of pump seals.

### PART 2 – PRODUCTS

#### 2.1. ACCEPTABLE MANUFACTURERS

- A. Flygt.
- B. Vaughn
- C. Substitutions: Refer to Section 22 05 00 – Basic Mechanical Material and Methods

and Section 22 00 00 – General Mechanical Requirements

- D. All pumps specified in this section by same manufacturer.
- E. Motor and pump are designed and manufactured by the same source.

## 2.2. INTERIOR LIFT STATION

### A. PUMP MATERIALS

1. Volute, Impeller, Motor Housing, Discharge Elbow, and Other: Gray cast iron ASTM A-48 Class 35B, with smooth surfaces devoid of blow holes or other irregularities.
2. Shaft:
  - a). ANSI 431 stainless steel up to 100 HP
  - b). ASTM A572, Grade 50 Carbon steel above 100 HP
  - c). Stainless steel sleeves covering shafting constructed of lesser materials are not acceptable.
3. Motor:
  - a). Rotor bars and short circuit rings: Aluminum
  - b). Stator winding and lead insulation: Class H monomer free polyester resin.
4. Mechanical Seal: Tandem seals with all seal faces to be solid sintered tungsten carbide featuring a nickel binder to cement tungsten-carbide particles together during sintering.
5. Wear Ring: Required if C impeller scheduled
  - a). Case wear ring: Nitrile rubber molded with steel ring insert.
  - b). Impeller wear ring on 20 HP and larger pumps: ANSI 304 SS
6. Cutters:
  - a). Stationary Cutters – Hardened 316 “L” Stainless Steel
  - b). Rotary Cutter – Chrome alloyed cast iron
7. Exposed Nuts and Bolts: 304 stainless steel or brass and protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish.

### B. PUMP CONSTRUCTION

1. Water Tight Seatings: Nitrile rubber O-rings against machined surfaces
2. Sealing of the pumping unit to the discharge connection, guided by two guide bars extending from the top of the station to the discharge connection.
3. Cable Entry Design:
  - a). Seal: Torque-free mechanical compression type with strain relief (epoxies, silicones or other secondary sealing not acceptable), single grommet type tp 100 HP and double grommet above 100 HP.
  - b). Junction chamber to be sealed from motor by a non-hydroscopic,

- feed through type terminal board and elastomer compression seal.
4. Pump Motor:
    - a). Air filled, squirrel cage rotor, induction type, shell type design, housed in air-filled watertight chamber
    - b). Stator to be insulated by trickle impregnation to achieve a minimum 95% winding fill factor using monomer free, moisture resistant, polyester Class H resin rated for 180 C( 356 F)and heat shrink fitted into the stator housing (designs requiring use of bolts, pins, or other fastening devices requiring penetration of stator housing are not allowed).
    - c). FM rated explosion proof if required by specified Area Classification
    - d). Sensors:
      - 1). Equipment with winding over-temperature switches in each phase. Set to open at a maximum of 140 C.
      - 2). Thermal switches set to open at 125C (260F) are embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches are used in conjunction with and supplemental to external motor overload protection, and will be connected to the control panel. At 125C (260F) the thermal switches shall open, stop the motor and activate an alarm.
    - e). Combined service factor of 1.15 and rated for operation at 40C AMB.
    - f). Pump Motor: Connections between cable conductors and stator leads to be made with threaded compression type binding posts permanently affixed to terminal board. Connections via wire nuts or crimping devices are not allowed by this specification.
    - g). NEMA B design:
    - h). The motor is inverter duty rated in accordance with NEMA MG1, Part 31.
    - i). The motor has a voltage tolerance of plus or minus 10%.
  5. Motor Cooling System:
    - a). For pumps up to 10.5 HP: Provide thermal radiators integrally cast into stator housing.
    - b). For pumps larger than 10.5 HP: Provide cooling jacket to allow circulation of pumped media or propylene glycol around motor housing.
  6. Pump Shaft:
    - a). Rotate in two permanently lubricated ball bearings for pump sizes up to 100 HP.
    - b). Upper bearing to be single row deep groove ball bearing up to 100 HP.
    - c). Lower bearing to be a two-row angular contact ball bearing up to 100 HP.
    - d). Completely isolated from pumped liquid.
    - e). Lower bearing shall contain a temperature sensor for monitoring on

- units larger than 100 HP.
- f). Pump and motor shaft is the same unit. The pump shaft is an extension of the motor shaft. Couplings are not acceptable and are not used.
7. Minimum ABMA L10 Bearing Life: 50,000 hours at any point on head-capacity curve.
8. Mechanical Seals: tandem mechanical shaft seal system consisting of two seal assemblies. The seals operate in a lubricant reservoir using FDA approved, non-toxic paraffin oil, which hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, contains one stationary and one positively driven rotating ceramic ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, contains one stationary carbon seal ring and one positively driven rotating ceramic seal ring. Each seal interface is held in contact by its own spring system. The seals require neither maintenance nor adjustment, nor depend on direction of rotation for sealing. The position of both mechanical seals depends on the shaft. Mounting of the lower mechanical seal on the impeller hub is not an acceptable method. The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating members, conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. No system requiring a pressure differential to offset pressure and to effect sealing will be used. Each pump is provided with a lubricant chamber for the shaft sealing system. The lubricant chamber is designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal, will be easily accessible from the outside. The seal system does not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load.
9. Impeller: – As Scheduled:
- a). N-impeller: Dynamically balanced, semi-open, multi-vane, back-swept, non-clog with vanes of screw shaped leading edges, RC45 hardness, self-cleaning by shearing action from grooves in the volute.
- b). C-impeller: Double shrouded, non-clogging design with long throughlets without acute turns.
- c). Grinder impeller: single shrouded design having a long throughlet without acute turns. The impellers shall be capable of handling fine slurry from the special cutters. Pump shall include special cutters to reduce sewage to a fine slurry - The stationary cutter shall consist of hardened 316 “L” stainless steel and the rotary cutter shall consist of chrome alloyed cast iron
- d). Coating: Acrylic dispersion zinc phosphate primer or Alkyd resin primer.

- e). Impellers will be capable of handling fine slurry from the special cutters and are taper collet fitted and retained with an Allen head bolt.
10. Volute- As Scheduled:
    - a). N-impeller: Volute bottom design to be of sharp, spiral shaped grooves integrally cast into the suction side of the volute to provide shearing action from the movement of the leading edges of the impeller vanes. Clearances shall be adjustable for wear.
    - b). C-impeller: Volute to be of non-concentric design with smooth passage ways large enough to pass any solids entering the impeller.
    - c). Volutes shall be constructed from a single-piece gray cast iron, Class 35B.
  11. Each pump to be equipped with submersible pump (power) cable:
    - a). Pump cable sized according to NEC and ICEA Standards.
    - b). Pump cable meets P-MSHA Approval
    - c). Pump cable shall have at least 3 power leads, a ground lead, and a ground check lead.
    - d). Pump cable to have oil-resistant, chloroprene rubber jacket.
    - e). Pump cable to be sufficient length to reach the junction box without the need of any splices.
  12. Sliding guide bar bracket to be integral part of pump unit to guide on at least two rails. No portion of the pump or guidance system shall bear on sump floor.
  13. Discharge pump/elbow connection seal to be metal to metal, diaphragm or O-ring type seals are not acceptable. Critical mating surfaces where watertight sealing is required are machined and fitted with Nitrile rubber O-rings. Fittings are the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides, without the requirement of a specific torque limit. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. Secondary sealing compounds, elliptical O-rings, grease or other devices are not used.
  14. Bearings – The pump shaft rotates on two bearings. Motor bearings are permanently grease lubricated. Sleeve or single row lower bearings are not acceptable and are not used.

### C. PUMP MOTOR PERFORMANCE

1. Non-overloading throughout pump curve.
2. Capable of fifteen evenly spaced starts per hour.
3. Capable of running dry indefinitely without damage.
4. Capable of continuous operation unsubmerged and continuous submergence without loss of watertight integrity to a depth of 65 feet.
5. Motors for use in NEC/500/501, hazardous areas: FM, UL, or CSA listed for use in the area specified.

6. Designed for continuous duty handling pumped media of 40C (104F).
7. Motor horsepower is adequate so that each pump is non-overloading throughout the entire pump performance curve, from shut-off through run-out.
8. Power cable is capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.

#### D. PROTECTION COATING

1. Pump Exterior: Acrylic dispersion zinc phosphate primer with polyester resin paint finish.
2. Impeller: acrylic dispersion zinc phosphate primer.

#### E. ACCESSORIES

1. Pump installation accessories required for proper installation and/or recommended by manufacturer to be supplied by pump manufacturer:
  - a). 304 SS Upper and intermediate guide bar brackets.
  - b). 304 SS Safety chain hook.
  - c). 304 SS Cable holder.
  - d). 304 SS Cable support grips for motor cables.
  - e). Grip eye lifting system.
  - f). 304 SS Lifting chain with required shackles.
  - g). Guide bars shall be of 304 SS pipe, size 2 inch Schedule 40. The guide bars shall not support any portion of the weight of the pump.
  - h). Wet well access cover with Safe Hatch fall through protection, if specified in schedule.
  - i). Valve vault / meter vault access cover, if specified in schedule.
  - j). Pump hoist support mount.
  - k). Hydraulic Mix Flush valve mounted on pump volute, if specified in schedule.
  - l). Discharge Magnetic Flow meter, if specified in schedule.
2. Wet Well Access Cover:
  - a). Materials: Structural aluminum cover and frame, unless otherwise scheduled.
  - b). Hardware:
    - 1). Stainless Steel.
    - 2). Provide for a padlock.
  - c). Nut rail incorporated in frame.
  - d). 300 or as specified pounds per square foot rated, unless otherwise scheduled.
  - e). Size: Actual clear openings as recommended by pump manufacturer for the pumps being installed in wet well or as shown on Drawings.
  - f). Acceptable manufacturers:
    - 1). Flygt Safe-Hatch

- 2). Flygt
  - 3). Halliday
  - 4). USF Fabrication, Inc, Hialeah, FL
  - 5). Or Engineer approved equivalent
3. The access cover's frame shall be securely placed, mounted above the pumps. Doors constructed of skid proof design, provided with stainless steel hinges and stainless steel fasteners. The doors open to 90 degrees and lock automatically in that position with a stainless steel positive locking arm and stainless steel release handle.
  4. Doors are provided with a stainless steel lifting handle and stainless steel locking bar. The access covers for pumps are furnished with an attached nut rail for the upper guide bar brackets.
  5. The wet well access cover shall include the Flygt Safe Hatch feature. The Safe Hatch shall be designed to combine covering of the hole per OSHA 1910.23 standard and shall include fall through protection and controlled confined space entry. Aluminum grating shall be designed to withstand a minimum live load of 300 pounds per square foot, and deflection shall not exceed 1/150<sup>th</sup> of the span. Aluminum safety grate openings shall be 5" x 5", which will allow for visual inspection of the pit and float adjustment, once the access hatch is open.
  6. The safety grate opening arm will also be equipped with a controlled confined space entry locking device (lock provided by others). This locking device will prevent unauthorized entry to the confined space. Welding shall be in accordance with ANSI/AWS D1.290 Structural Welding Code for aluminum.
  7. Design of the system must assure fall through protection is in place after the door has been closed, thereby protecting the next operator.
  8. Wet well access cover shall be Flygt model FLEC-6 AOSH, 30 inch x 48 inch actual opening with Flygt Safe Hatch safety grating for OSHA fall through protection
  9. Grip Eye Lifting System: Each submersible pump shall be furnished with a pump lifting-chain positive recovery system consisting of the following components.
    - a). Minimum of 30 feet of stainless steel wire, of diameter to provide tensile strength capacity to support length of chain sling, connected to a short length (approximately ten links long) of high tensile strength proof-tested stainless steel chain sling of required capacity, connected to the lifting eye or lifting bail of the submersible pump.
    - b). A forged "grip-eye" of wrought alloy steel, provided separately to connect to the end of the lifting cable or chain of the pump lifting device.
    - c). Pumps are designed to automatically and firmly connect to the discharge connection, guided by two guide bars extending from the top of the station to the discharge connection with no need for personnel to enter the wet-well.

- d). Acceptable manufacturer: Flygt Grip-Eye System or Engineer approved equivalent.
- 10. Ball Check Valves: Furnish and install non-clog Flygt HDL Ball Check Valves as listed on the plans. The valve consists of just three components: body, cover, and ball- one moving part. The design of the valve is such that it keeps solids, stringy material, grit, rags, etc., moving without the need for back flushing. The ball clears the water way providing "full flow" equal to the nominal size. There shall be no outside levers, weights, springs, dash pots, or other accessories required for a swing (clapper) type check valve. The ball shall be hollow steel with an exterior of nitrile rubber, it shall be resistant to grease, petroleum products, animal and vegetable fats, diluted concentrations of acids and alkaline (pH 4 –10), tearing and abrasion. The body and cover shall be of gray cast iron, Class 35. Flange drilling shall be according to ANSI B16.1, Class 125.
- 11. Mix-flush system – Flygt Model 4901 Mix flush valve installed on volute of one (1) pump. Field Adjustable flushing cycle, 20 - 50 seconds. Materials will be: valve body- cast iron, ball: ball bearing steel, membranes: nitrile rubber. Mix-flush system shall be manufactured by the pump supplier and hydraulically operated.
- 12. Plug valves: Milliken or DeZurik PEC eccentric plug valves with manual lever actuator or approved equal.
  - a). Furnish portable and adjustable pump hoist.
  - b). Stainless steel construction.
  - c). Lifting capacity: as scheduled.
  - d). Provide stainless steel embed socket at installation points identified on plans.
  - e). Minimum of 30 feet of stainless steel cable and safety hook.
  - f). Reach: as scheduled.
  - g). Hoist shall consist of ¼" minimum diameter 304 stainless steel cable, painted lifting hook, and 304 stainless steel snap hook.
  - h). Furnish stainless steel embed socket assemblies as scheduled. Each socket assembly shall include 340 stainless steel adhesive anchors for anchoring the platform socket to the lift station wall.
  - i). Dutton-Lainson hand winch assembly.

## F. CONTROLS

- 1. Supplied by pump manufacturer or pump supplier.
- 2. General:
  - a). The pump control system shall be capable of operating two (2) pumps in a constant speed mode in order to convey sewage to the next gravity discharge point without causing a sewage over-flow wherever possible regardless of system demands.
- 3. Duplex pump control equipment:
  - a). NEMA 3R enclosure, painted galvanized steel enclosure.

- b). Panel equipped with internal logic for staggered pump start to prevent overload.
- c). Integral face main disconnect for entire unit.
- d). Two – Motor Circuit Protectors sized per NEC motor FLA.
- e). Two – Solid State starters w/ overload elements sized per NEMA recommendations.
- f). Red beacon light on top of enclosure to activate on high level alarm status.
- g). Include lead/ lag alternator.
- h). Timer for delay on restart after power failure.
- i). Low voltage monitor.
- j). Output contacts for future remote monitoring (EMS) of power failure, individual pump failure, float system operation, and high level alarm.
- a). Four (4) Flygt Model ENM-10 floats for level control to be :
  - 1). All Pumps OFF
  - 2). Lead Pump ON
  - 3). Lag Pump ON
  - 4). High level Alarm
- k). One - duplex logic chassis (24V power to float switches and an anodized aluminum sub-assembly) with Logic Panel including:
  - 1). Two – Hand-off-auto selector switches.
  - 2). Two – Run pilot lights.
  - 3). 24V Power On pilot light.
  - 4). Level Alarm pilot light.
  - 5). Alarm Silence push-button.
  - 6). Duplex Alternator.
  - 7). Lead Pump selector switch (1.2-Alt-2.1).
  - 8). Provision for normally closed motor over-temperature contact connections from each pump motor.
  - 9). LED status indication pilot lights for each relay function.
- 4. Lightning arrestor and power supply located inside of the panel enclosure.
- 5. Anti-condensation heater with thermostat inside of panel, 100 watt.
- 6. Panel mounted 15 amp, 120V GFI convenience outlet.
- 7. Top mounted red flashing high water level alarm beacon.
- 8. Pump run status lights for each pump.
- 9. H-O-A switches for each pump.
- 10. Run time meters for each pump.
- 11. Terminal strip for power and control I/O.
- 12. Control Panel Enclosure:
  - a). As specified on the drawings, provide a control panel security enclosure for each control panel.
  - b). Security enclosures designed to prevent unauthorized personnel from accessing panel controls. Provide solid front panel doors.
  - c). Painted galvanized Steel construction, conforming to NEMA 3R requirements with stainless steel hardware and padlock.
  - d). Hasp and staple provided for padlocking.

- e). Install level and plumb.
  - f). Back panel: Fabricated from #12 gauge cold rolled steel, finished with backed on white enamel.
  - g). Inner door: Fabricated from .080 aluminum with three (3) ¼ turn fasteners.
  - h). Control circuit wiring inside the panel shall be (16) gauge minimum, type MTW or THW, rated for 300 volts. All power wiring shall be rated for 600 volts. Conductors shall be color coded in the same colors throughout the entire panel. Components having numerical or alphabetical references shall have all wiring similarly coded using a standard decal, which shall be placed on the insulation materials within the confines of the enclosure. The decals shall be placed at all wiring terminations for ease of wire identification.
13. Comply with Division 26.

#### G. FIBERGLASS PUMP STATION CONSTRUCTION

1. The station cylinder shall be affixed to the station bottom such that the assembled components are structurally integrated, resulting in a watertight vessel which is capable of withstanding the full hydrostatic head from the exterior of the station while the station is completely empty.
2. The cylinder shall be made of FRP using the filament winding process. A safety factor of two (2) on the minimum ultimate tensile strength of the laminate bottom shall be used in designing the basin and cylinder wall thicknesses for the station, taking into account all normally imposed loads arising from flotation, soil pressures, normal backfill, handling loads, operating loads and static loads imposed by equipment used in hoisting the pumps in and out of the station.
3. The cylinder is a filament wound laminate constructed by saturating continuous strand glass roving in a controlled pattern over a corrosion resistant liner that is to be 110 mils minimum thickness. The roving's shall be applied uniformly throughout the entire length of the cylinder as required to provide adequate thickness for the mechanical loads of each application. The winding pattern shall be a combination of helical and hoop wraps and shall produce a dense laminate without non-reinforced resin pockets or air bridging between the rovings. The glass content of the structural laminate shall be 60% to 70% by weight.
4. All inside surfaces shall be smooth and free of cracks and crazing. The inside surface will be pigmented or gel coated to a bright white finish. All surfaces other than those made in contact with the mold surface shall be coated with air-inhibited resin or gel coat; this includes any cut edges of laminate.
5. The station shall be provided with one (1) anti-flotation flange located near the bottom of the station. This anti-flotation flange is an integral part of the station and is sufficient in design to withstand the forces acting upon the station due to the subsoil water pressure. Once the station is inserted into

the hole, concrete ballast may be required depending on the station depth, please refer to the recommendations for concrete ballast as recommended in the specified manufacturer. The combination of the flange and the loading of backfill material over the concrete shall provide adequate ballast against buoyancy under full hydrostatic head conditions.

6. STATION COVER:

- a). The station cover shall be of ¼-inch thick Type-5086 aluminum diamond plate with an integral Safe-Hatch access cover. All bars, angles and shapes shall be type 6061-T6 aluminum. The access cover frame shall be a minimum of 4-inches deep and shall be adequately sized to allow for easy passage of the submersible pumps. The Safe-Hatch access cover shall be designed to support the weight of the pump unit plus pedestrian traffic. The access door(s) shall be equipped with a hold-open arm, held open in the 90-degree position. Cover door hinges shall be heavy-duty design and be cast 1/4-inch thick Type 316 stainless steel with 3/8-inch diameter stainless steel hinge pins. All fasteners shall be type-316 stainless steel. Each hatch shall be supplied with a type-316 stainless steel slam lock, having a key-way protected by a threaded plug. The plug shall be flush with the diamond plate cover. The hatch shall be equipped with an aluminum lift handle that shall be flush to the top of the diamond plate cover.
- b). The station lid shall have an integral four-inch diameter stub-pipe connection for the purpose of venting the pump station. The inverted J-shaped vent pipe shall be schedule 40 PVC pipe and shall end at a point at least 3-foot above the elevation of the station cover. There shall also be an option for a second vent to accommodate positive ventilation of the wet well.
- c). The access cover unit shall be equipped with a Safe-Hatch hinged safety grate to provide protection against fall-through and to control access into the confined space. Grate openings shall be sized to allow for routine maintenance inspection without having to open the safety grate. The closed safety grate shall be designed to support the weight of one pump to facilitate site pump wash-down and inspection. The hatch opening will have a 4" elevated toe board to prevent tools from being kicked into the wet well (per OSHA 1926.502 (j)).

2.3. EXTERIOR LIFT STATION

A. PUMP MATERIALS

1. Volute, Impeller, Motor Housing, Discharge Elbow, and Other: Gray cast iron ASTM A-48 Class 35B, with smooth surfaces devoid of blow holes or other irregularities.
2. Shaft:

- a). ANSI 431 stainless steel up to 100 HP.
  - b). ASTM A572, Grade 50 Carbon steel above 100 HP.
  - c). Stainless steel sleeves covering shafting constructed of lesser materials are not acceptable.
3. Motor:
- a). Rotor bars and short circuit rings: Aluminum.
  - b). Stator winding and lead insulation: Class H monomer free polyester resin.
4. Mechanical Seal: Tandem seals with all seal faces to be solid sintered tungsten carbide featuring a nickel binder to cement tungsten-carbide particles together during sintering.
5. Wear Ring: Required if C impeller scheduled
- a). Case wear ring: Nitrile rubber molded with steel ring insert.
  - b). Impeller wear ring on 20 HP and larger pumps: ANSI 304 SS.
6. Cutters:
- a). Stationary Cutters – Hardened 316 “L” Stainless Steel.
  - b). Rotary Cutter – Chrome alloyed cast iron.
7. Exposed Nuts and Bolts: 304 stainless steel or brass and protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish.

#### D. PUMP CONSTRUCTION

1. Water Tight Seatings: Nitrile rubber O-rings against machined surfaces.
2. Sealing of the pumping unit to the discharge connection, guided by two guide bars extending from the top of the station to the discharge connection.
3. Cable Entry Design:
  - a). Seal: Torque-free mechanical compression type with strain relief (epoxies, silicones or other secondary sealing not acceptable), single grommet type up to 100 HP and double grommet above 100 HP.
  - b). Junction chamber to be sealed from motor by a non-hydroscopic, feed through type terminal board and elastomer compression seal.
4. Pump Motor:
  - a). Air filled, squirrel cage rotor, induction type, shell type design, housed in air-filled watertight chamber.
  - b). Stator to be insulated by trickle impregnation to achieve a minimum 95% winding fill factor using monomer free, moisture resistant, polyester Class H resin rated for 180 C( 356 F)and heat shrink fitted into the stator housing (designs requiring use of bolts, pins, or other fastening devices requiring penetration of stator housing are not allowed).
  - c). FM rated explosion proof if required by specified Area Classification.
  - d). Sensors:

- 1). Equipment with winding over-temperature switch in each phase. Set to open at a maximum of 140 C.
- 2). Thermal switches set to open at 125C (260F) are embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches are used in conjunction with and supplemental to external motor overload protection, and will be connected to the control panel. At 125C (260F) the thermal switches shall open, stop the motor and activate an alarm.
- e). Combined service factor of 1.15 and rated for operation at 40C AMB.
- f). Pump Motor: Connections between cable conductors and stator leads to be made with threaded compression type binding posts permanently affixed to terminal board. Connections via wire nuts or crimping devices are not allowed by this specification.
- g). NEMA B design:
- h). The motor is inverter duty rated in accordance with NEMA MG1, Part 31.
- i). The motor has a voltage tolerance of plus or minus 10%.
5. Motor Cooling System:
  - a). For pumps up to 10.5 HP: Provide thermal radiators integrally cast into stator housing.
  - b). For pumps larger than 10.5 HP: Provide cooling jacket to allow circulation of pumped media or propylene glycol around motor housing.
6. Pump Shaft:
  - a). Rotate in two permanently lubricated ball bearings for pump sizes up to 100 HP.
  - b). Upper bearing to be single row deep groove ball bearing up to 100 HP.
  - c). Lower bearing to be a two-row angular contact ball bearing up to 100 HP.
  - d). Completely isolated from pumped liquid.
  - e). Lower bearing shall contain a temperature sensor for monitoring on units larger than 100 HP.
  - f). Pump and motor shaft are the same unit. The pump shaft is an extension of the motor shaft. Couplings are not acceptable and are not used.
7. Minimum ABMA L10 Bearing Life: 50,000 hours at any point on head-capacity curve.
8. Mechanical Seals: Tandem mechanical shaft seal system consisting of two seal assemblies. The seals operate in a lubricant reservoir using FDA approved; non-toxic paraffin oil that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, contains one stationary and one positively driven rotating ceramic ring. The upper, secondary seal

unit, located between the lubricant chamber and the motor housing, contains one stationary carbon seal ring and one positively driven rotating ceramic seal ring. Each seal interface is held in contact by its own spring system. The seals require neither maintenance nor adjustment, nor depend on direction of rotation for sealing. The position of both mechanical seals depends on the shaft. Mounting of the lower mechanical seal on the impeller hub is not an acceptable method. The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating members, conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. No system requiring a pressure differential to offset pressure and to effect sealing will be used. Each pump is provided with a lubricant chamber for the shaft sealing system. The lubricant chamber is designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal, will be easily accessible from the outside. The seal system does not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load.

9. Impeller: – As Scheduled:
  - a). N-impeller: Dynamically balanced, semi-open, multi-vane, back-swept, non-clog with vanes of screw shaped leading edges, RC45 hardness, self-cleaning by shearing action from grooves in the volute.
  - b). C-impeller: Double shrouded, non-clogging design with long throughlets without acute turns.
  - c). Grinder impeller: single shrouded design having a long throughlet without acute turns. The impellers shall be capable of handling fine slurry from the special cutters. Pump shall include special cutters to reduce sewage to fine slurry – The stationary cutter shall consist of hardened 316 “L” stainless steel and the rotary cutter shall consist of chrome alloyed cast iron.
  - d). Coating: Acrylic dispersion zinc phosphate primer or Alkyd resin primer.
  - e). Impellers will be capable of handling fine slurry from the special cutters and are taper collet fitted and retained with an Allen head bolt.
10. Volute – As Scheduled:
  - a). N-impeller: Volute bottom design to be of sharp, spiral shaped grooves integrally cast into the suction side of the volute to provide shearing action from the movement of the leading edges of the impeller vanes. Clearances shall be adjustable for wear.
  - b). C-impeller: Volute to be of non-concentric design with smooth passage ways large enough to pass any solids entering the impeller.

- c). Volute shall be constructed from a single-piece gray cast iron, Class 35B.
- 11. Each pump to be equipped with submersible pump (power) cable:
  - a). Pump cable sized according to NEC and ICEA Standards.
  - b). Pump cable meets P-MSHA Approval.
  - c). Pump cable shall have at least 3 power leads, a ground lead, and a ground check lead.
  - d). Pump cable to have oil-resistant, chloroprene rubber jacket.
  - e). Pump cable to be sufficient length to reach the junction box without the need of any splices.
- 12. Sliding guide bar bracket to be integral part of pump unit to guide on at least two rails. No portion of the pump or guidance system shall bear on sump floor.
- 13. Discharge pump/elbow connection seal to be metal to metal, diaphragm or O-ring type seals are not acceptable. Critical mating surfaces where watertight sealing is required are machined and fitted with Nitrile rubber O-rings. Fittings are the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides, without the requirement of a specific torque limit. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. Secondary sealing compounds, elliptical O-rings, grease or other devices are not used.
- 14. Bearings- The pump shaft rotates on two bearings. Motor bearings are permanently grease lubricated. Sleeve or single row lower bearings are not acceptable and are not used.

#### E. PUMP MOTOR PERFORMANCE

- 1. Non-overloading throughout pump curve.
- 2. Capable of fifteen evenly spaced starts per hour.
- 3. Capable of running dry indefinitely without damage.
- 4. Capable of continuous operation unsubmerged and continuous submergence without loss of watertight integrity to a depth of 65 feet.
- 5. Motors for use in NEC/500/501, hazardous areas: FM, UL, or CSA listed for use in the area specified.
- 6. Designed for continuous duty handling pumped media of 40C (104F).
- 7. Motor horsepower is adequate so that each pump is non-overloading throughout the entire pump performance curve, from shut-off through run-out.
- 8. Power cable is capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.

#### H. PROTECTION COATING

- 1. Pump Exterior: Acrylic dispersion zinc phosphate primer with polyester resin paint finish.

2. Impeller: acrylic dispersion zinc phosphate primer.

## I. ACCESSORIES

1. Pump installation accessories required for proper installation and/or recommended by manufacturer to be supplied by pump manufacturer:
  - a). 304 SS Upper and intermediate guide bar brackets.
  - b). 304 SS Safety chain hook.
  - c). 304 SS Cable holder.
  - d). 304 SS Cable support grips for motor cables.
  - e). Grip eye lifting system.
  - f). 304 SS Lifting chain with required shackles.
  - g). Guide bars shall be of 304 SS pipe, size 2 inch Schedule 40. The guide bars shall not support any portion of the weight of the pump.
  - h). Wet well access cover with Safe Hatch fall through protection, if specified in schedule.
  - i). Valve vault / meter vault access cover, if specified in schedule.
  - j). Pump hoist support mount.
  - k). Hydraulic Mix Flush valve mounted on pump volute, if specified in schedule.
  - l). Discharge Magnetic Flow meter, if specified in schedule.
2. Wet Well Access Cover:
  - a). Materials: Structural aluminum cover and frame, unless otherwise scheduled.
  - b). Hardware:
    - 1). Stainless Steel.
    - 2). Provide for a padlock.
  - c). Nut rail incorporated in frame.
  - d). 300 or as specified pounds per square foot rated, unless otherwise scheduled.
  - e). Size: Actual clear openings as recommended by pump manufacturer for the pumps being installed in wet well or as shown on Drawings.
  - f). Acceptable manufacturers:
    - 1). Flygt Safe-Hatch.
    - 2). Flygt.
    - 3). Halliday.
    - 4). USF Fabrication, Inc, Hialeah, FL.
    - 5). Or Engineer approved equivalent.
3. The access cover's frame shall be securely placed, mounted above the pumps. Doors constructed of skid proof design, provided with stainless steel hinges and stainless steel fasteners. The doors open to 90 degrees and lock automatically in that position with a stainless steel positive locking arm and stainless steel release handle.

4. Doors are provided with a stainless steel lifting handle and stainless steel locking bar. The access covers for pumps are furnished with an attached nut rail for the upper guide bar brackets.
5. The wet well access cover shall include the Flygt Safe Hatch feature. The Safe Hatch shall be designed to combine covering of the hole per OSHA 1910.23 standard and shall include fall through protection and controlled confined space entry. Aluminum grating shall be designed to withstand a minimum live load of 300 pounds per square foot, and deflection shall not exceed 1/150<sup>th</sup> of the span. Aluminum safety grate openings shall be 5" x 5", which will allow for visual inspection of the pit and float adjustment, once the access hatch is open.
6. The safety grate opening arm will also be equipped with a controlled confined space entry locking device (lock provided by others). This locking device will prevent unauthorized entry to the confined space. Welding shall be in accordance with ANSI/AWS D1.290 Structural Welding Code for aluminum.
7. Design of the system must assure fall through protection is in place after the door has been closed, thereby protecting the next operator.
8. Wet well access cover shall be Flygt model FLEC-6 AOSH, 30 inch x 48 inch actual opening with Flygt Safe Hatch safety grating for OSHA fall through protection
9. Grip Eye Lifting System: Each submersible pump shall be furnished with a pump lifting-chain positive recovery system consisting of the following components.
  - a). Minimum of 30 feet of stainless steel wire, of diameter to provide tensile strength capacity to support length of chain sling, connected to a short length (approximately ten links long) of high tensile strength proof-tested stainless steel chain sling of required capacity, connected to the lifting eye or lifting bail of the submersible pump.
  - b). A forged "grip-eye" of wrought alloy steel, provided separately to connect to the end of the lifting cable or chain of the pump lifting device.
  - c). Pumps are designed to automatically and firmly connect to the discharge connection, guided by two guide bars extending from the top of the station to the discharge connection with no need for personnel to enter the wet-well.
  - d). Acceptable manufacturer: Flygt Grip-Eye System or Engineer approved equivalent.
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  - a). Furnish portable and adjustable pump hoist.
  - b). Stainless steel construction.
  - c). Lifting capacity: as scheduled.
  - d). Provide stainless steel embed socket at installation points identified on plans.
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  - f). Reach: as scheduled.
  - g). Hoist shall consist of ¼" minimum diameter 304 stainless steel cable, painted lifting hook, and 304 stainless steel snap hook.
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## J. CONTROLS

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adequately sized to allow for easy passage of the submersible pumps. The Safe-Hatch access cover shall be designed to support the weight of the pump unit plus pedestrian traffic. The access door(s) shall be equipped with a hold-open arm, held open in the 90-degree position. Cover door hinges shall be heavy-duty design and be cast 1/4-inch thick Type 316 stainless steel with 3/8-inch diameter stainless steel hinge pins. All fasteners shall be type-316 stainless steel. Each hatch shall be supplied with a type-316 stainless steel slam lock, having a key-way protected by a threaded plug. The plug shall be flush with the diamond plate cover. The hatch shall be equipped with an aluminum lift handle that shall be flush to the top of the diamond plate cover.

- b). The station lid shall have an integral four-inch diameter stub-pipe connection for the purpose of venting the pump station. The inverted J-shaped vent pipe shall be schedule 40 PVC pipe and shall end at a point at least 3-foot above the elevation of the station cover. There shall also be an option for a second vent to accommodate positive ventilation of the wet well.
- c). The access cover unit shall be equipped with a Safe-Hatch hinged safety grate to provide protection against fall-through and to control access into the confined space. Grate openings shall be sized to allow for routine maintenance inspection without having to open the safety grate. The closed safety grate shall be designed to support the weight of one pump to facilitate site pump wash-down and inspection. The hatch opening will have a 4" elevated toe board to prevent tools from being kicked into the wet well (per OSHA 1926.502 (j)).

## 2.4. GREASE INTERCEPTORS

### A. ACCEPTABLE MANUFACTURERS

- 1. Green Turtle Zurn; Proceptor Model GMC and Retroceptor series Grease Interceptors.
- 2. Substitutions: Refer to Section 22 05 00 – Basic Mechanical Material and Methods and Section 22 00 00 – General Mechanical Requirements.

### B. Grease Interceptors: Fiberglass (FRP) complying with IAPMO/ANSI Z1001-2003 or PDI G-101 and the latest editions on the Uniform Plumbing Code and International Plumbing Code.

### C. Structural Design Loads:

- 1. Heavy-Traffic Load: Comply with ASTM C 890, A-16 (ASSHTO HS20-44).

### D. Grade Rings: fiberglass (FRP), 24- to 36-inch diameter, to match diameter of manhole frame and cover, and reach from top of interceptor to top of grade.

- E. Manhole Frames and Covers: Ferrous; 24-inch diameter cover, H-20 traffic load. Ductile Iron: ASTM A 536, Grade 60-40-18, unless otherwise indicated.
- F. Include indented top design with lettering cast into cover, using wording equivalent to "**GREASE INTERCEPTOR.**"
- G. Capacities and Characteristics:
  - 1. Number of Compartments: Two
  - 2. Number of tanks: Two.
  - 3. Retention Capacity: See Schedule on the drawings.
  - 4. Inlet and Outlet Pipe Size: See Schedule on the drawings.
  - 5. Centerline of Inlet to Floor: See Schedule and schematic on the drawings
  - 6. Centerline of Outlet to Floor: See Schedule and schematic on the drawings
- H. Installation Position: Underground with manhole riser to grade, buried in Traffic Load Area.

## 2.5. LINT INTERCEPTOR

### A. ACCEPTABLE MANUFACTURERS

- 1. Zurn.
- 2. Watts.
- 3. JR Smith.
- 4. Josam.
- 5. Substitutions: Refer to Section 22 05 13 – Basic Mechanical Material and Methods and Section 22 05 00 – General Mechanical Requirements.

B. Acid Resistant Coated interior and exterior fabricated steel lint interceptor, non-skid secured cover with removable lift handle, removable aluminum lint intercepting secondary screen assembly, and permanent primary straining baffle with 3/8 diameter perforated holes. Regularly furnished with high inlet and low outlet. Note: size #3 and #7 covers are not furnished with a lift handle. Coated interior and exterior fabricated steel extension section as required.

C. Unit Rating: Refer to Schedule on drawings for information.

## PART 3 – EXECUTION

### 3.1. INSTALLATION

A. Manufacturer's recommendations.

B. Level, plumb, accurate alignment, leak-proof pump connection, easily removed without entering wet well as appropriate.

C. No splices allowed in cable.

### 3.2. FLOATS

A. Suspend as shown on the Drawings.

B. No splices allowed in cables.

C. Set to levels shown on the Drawings.

### 3.3. GREASE INTERCEPTOR

A. Install interceptors according to Manufacturer instructions and Authority Having Jurisdiction (AHJ).

B. Install manhole risers from top of underground interceptors to manholes and gratings at finished grade.

C. For buried applications, use only manufacturer approved backfill materials.

D. Set tops of manhole frames and covers flush with finished surface in pavements.

E. Set tops of grating frames and grates flush with finished surface.

F. Set Fiberglass (FRP) interceptors level and plumb.

G. Set tops of metal interceptor covers flush with finished surface in pavements.

### H. CONNECTIONS

1. Piping installation requirements are specified in Section 221316 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

2. Make piping connections between interceptors and piping systems.

### 3.4. START-UP SERVICES

A. Qualified Field Service Representative is required.

B. Present to check installation and operation.

C. Provide 8 hours of training to Owner's personnel on operation and

maintenance.

- D. Provide services of qualified personnel to inspect the completed installation, and furnish written report to Engineer certifying that equipment is properly installed, fully functional, ready for use, and is operating correctly.
- E. Assist contractor with start-up.

### 3.5. SCHEDULES

- A. Interior Lift Station as per schedule on drawings.
- B. Exterior Lift Station as per schedule on drawings.
- C. Grease Interceptor as per schedule on drawings.
- D. Lint Interceptor as per schedule on drawings.

END OF SECTION 22 30 00

## **SECTION 23 05 53 – MECHANICAL IDENTIFICATION**

### **PART 1 – GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Tags
- B. Pipe Markers.

#### **1.2. REFERENCES**

- A. Section 01 45 00 – Quality Control and Section 22 00 00 – General Mechanical Requirements: Requirements for references and standards.
- B. ASME A13.1 – Scheme for the Identification of Piping Systems.

#### **1.3. SUBMITTALS FOR REVIEW**

- A. Section 01 33 00 – Submittals: Procedures for submittals.
- B. Section 22 00 00 – General Mechanical Requirements for submittals.
- C. Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- D. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- E. Product Data: Provide manufacturers catalog literature for each product required.

#### **1.4. SUBMITTALS FOR INFORMATION**

- A. Section 01 33 00 – Submittals Procedures and Section 22 00 00 – General Mechanical Requirements: Procedures for submittals.
- B. Manufacturer's Instructions: Indicate installation instructions, special procedures, and installation.

#### **1.5. SUBMITTALS AT PROJECT CLOSEOUT**

- A. Section 01 70 00 – Contract Closeout and Section 22 00 00 – General Mechanical Requirements: Procedures for submittals.
- B. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers and provide a Valve Tag Chart.

## SECTION 26 05 00 – ELECTRICAL GENERAL PROVISIONS

### PART 1 – GENERAL

#### 1.1. RELATED DOCUMENTS

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

#### 1.2. DESCRIPTION OF WORK:

- A. Drawings: Refer to the E-series drawings for graphic representations, schedules and notations showing electrical work.
- B. Specifications: Refer to the Division 26 sections for the primary technical specifications of electrical work.
- C. This work includes furnishing and installing all electrical material, accessories, supports, conduit, wire, connections, grounding, excavating and all other labor and materials indicated on the drawings or specified herein and required by codes. This includes all electrical materials and connections required for operation of all items of equipment furnished under other sections of these specifications. For clarity some items may be noted as "BY ELECTRICAL CONTRACTOR" or "IN THIS CONTRACT".

#### D. Work Included:

The work under this section is not limited to, but shall include:

1. Any fees or assessments required by local authorities are a part of the electrical contract.
2. New circuit breakers in existing switchboard and/or panelboard, and feeders for a complete power distribution system.
3. Outlet boxes, conduit, wire, wiring devices, control components, and accessories.
4. Conduit, wiring and connections for all line voltage electrical equipment furnished and installed by others (see Mechanical Drawings).
5. Conduit and wire for low voltage controls. Final connections by electrical contractor.
6. Trenching, excavating and backfilling for electrical work. (If applicable.)
7. Starters and disconnects for all motors.

#### E. Equipment provided under other sections, but connected under this section:

1. Mechanical.

### 1.3. BIDDING

- A. All electrical equipment shall be new unless specified otherwise in the specifications or on the drawings.
- B. All bids must be based only on the equipment and materials as scheduled on the drawings and as specified or on equivalent equipment and materials from a pre-approved alternative manufacturer. No bid may be based on a substituted or other alternative without specific written prior approval from the Engineer. Any Contractor who assumes equivalence of products and who bases his bid on that assumption does so at his own risk.
- C. A listing of approved alternative manufacturers does not mean that all products of a particular alternative manufacturer are acceptable alternative to the scheduled items; it merely means that for bidding prior approval is not required. All fixtures and devices must still be submitted according to the prescribed procedures. In addition, some items that have an important visual affect, e.g. electric water coolers, may be required to receive Owner's approval also.

### 1.4. COORDINATION OF ELECTRICAL WORK:

- A. General: Refer to the Division 1 sections for general coordination requirements applicable to the entire work. It is recognized that the contract documents are diagrammatic in showing certain physical relationships, which must be established within the electrical work, and in its interface with other work including utilities and mechanical work, and that such establishment is the exclusive responsibility of the Electrical Subcontractor.
- B. Arrange electrical work in a neat, well organized manner with conduit and similar services running parallel with primary lines of the building construction, and with a minimum of 8'-0" overhead clearance where possible.
- C. The electrical plans are diagrammatic, but shall be followed as closely as actual construction and the work of the other trades will allow. Such minor changes as are necessary to make the electrical work conform to the work of other trades and to the building shall be made without cost to the Owner.
- D. The maximum number of circuits combined in one raceway shall be three; however, no circuit shall be combined without prior approval of the Engineer or unless specifically shown on the drawings.
- E. The Electrical Subcontractor shall not combine circuits not shown to be combined. Furthermore, this electrical subcontractor shall not extend circuits, shown on the drawings as routed in the floor, overhead or extend circuits, shown on the drawings as routed overhead, in the floor, without first obtaining approval from the Engineer. This electrical subcontractor shall not prepare

and/or use electrical subcontractor prepared rough-in drawings without first obtaining approval from the Engineer.

- F. Where unauthorized design changes are found, the work shall be disapproved and the contractor shall remove the work and extend it as shown on the Drawings.
- G. The Electrical Contractor shall coordinate the installation of electrical conduits with any cable tray to maintain required clearances.

1.5. QUALITY ASSURANCE AND STANDARDS:

- A. General: Refer to Division 1 for general administrative/procedural requirements related to compliance with codes and standards. Specifically, for the electrical work (in addition to standards specified in individual work sections), the following standards are imposed, as applicable to the work in each instance:
  - 1. ANSI C 2, National Electrical Safety Code.
  - 2. NECA standards for installation.
  - 3. NEMA standards for materials and products.

1.6. LAWS, CODES AND ORDINANCES:

- A. All work and material shall conform to the requirements of OSHA and all national and state Laws and ordinances having jurisdiction at the job site. The (NEC) National Electrical Code, 2008 Edition, or latest edition being enforced, shall be strictly adhered to. NEC requirements are considered "minimum requirements". Where requirements of the contract documents exceed NEC, the contract documents govern.
- B. Secure permits and pay permit and inspection fee as required by local authorities.
- C. Upon completion of the work, furnish to the Owner a certificate of final inspection and approval from the electrical inspection bureau having jurisdiction.
- D. All electrical systems shall be grounded in strict accordance with the requirements of the National Electrical Code.

1.7. INDUSTRY PUBLICATION STANDARDS:

- A. The publications and standards of the latest issue at the time of bid, of the following organizations, where referenced in these specifications or on the drawings, shall apply:

1. ANSI-American National Standards Institute.
2. ASTM-American Society of Testing and Materials.
3. CBM-Certified Ballast Manufacturers Association.
4. IEEE-Institute of Electrical and Electronic Engineers.
5. IPCEA-Insulated Power Cable Engineers Association.
6. NEC-National Electrical Code.
7. NECA-National Electrical Contractors Association.
8. NEMA-National Electrical Manufacturers Association.
9. NESC-National Electrical Safety Code.
10. NFPA-National Fire Protection Association.
11. UL-Underwriters Laboratory.
12. IESNA-Illuminating Engineering Society of North America.

#### 1.8. EXISTING UTILITIES

- A. The drawings indicate the locations, type and sizes of various utilities within the site where known. These utilities are indicated as accurately as possible. If the Contractor encounters any utilities or differing conditions during construction, which are not shown on the drawings, they shall request in writing for written instructions from the Engineer. Any relocation or remodeling required will then be directed by a change order. This Contractor shall assume all responsibility for protection of all utilities, shown or not, and for repair required by this construction.
- B. Contractor shall verify location, size, elevation, and any other pertinent data of the existing utilities. The Contractor shall provide a written report with drawings indicating this existing utilities information, such as utility locations information. Additional costs incurred due to failure to verify such data and to coordinate associated work with respective utility providers shall not be the Owner's responsibility but shall be borne by the Contractor.
- C. All costs associated with providing utilities including, but not limited to, connection fees, meters, boring under roads, etc., shall be included in the Contractor's bid price whether such costs are incurred by Contractor or charged by the utility company.
- D. Submission of a bid by the Contractor shall be considered an acknowledgment by the contractor of his compliance with this section.
- E. The Contractor shall coordinate with Owner and this Engineer's office any work that has the potential to hinder electrical services to areas outside this contract. All shut downs or tie-ins relating to these systems shall be scheduled and submitted in writing to be approved by the Owner and this Engineer's office. Contractor shall submit in writing a schedule of construction phasing that indicates areas of first priority during each phase and anticipated completion times. Schedules shall be submitted a minimum of 7 days prior to commencing

work. Owner and this Engineer's office shall review these schedules and notify the contractor of acceptance prior to commencement of work.

#### 1.9. SUBMITTALS:

- A. General: Refer to Division 1 for general requirements concerning work related and administrative submittals. All descriptive and technical data and shop drawings shall bear signed certification by the Electrical Subcontractor to the effect that they have been carefully examined and found to be correct with respect to dimension, space available, non-interference with other trades and that the equipment complies with all the requirements of these specifications. Submittals will be rejected if signed certification is not included. Where catalog data are submitted, the proposed items shall be clearly "flagged" or otherwise identified, so that no confusion exists. Site lighting substitutions shall meet performance specifications indicated on lighting plan. Substitute interior specialty lighting fixtures shall be approved by the engineer and owner 10 days prior to bid date.

#### 1.10. DRAWING AND DRAWING CONFLICTS

- A. Contract drawings are diagrammatic only and are not intended to be scaled for dimensions. All dimensions shall be taken from certified equipment drawings and from the structure itself before fabricating and work. All space requirements shall be verified, coordinated with other trades, as it is the various Contractors' responsibility to install the systems complete in the space provided without extra charges to the Owner.
- B. It is intended that anything, including labor and materials, which is usually furnished as part of any equipment specified and which is necessary for operation shall be furnished as part of the Contract without additional cost, whether or not shown or described.
- C. All piping in finished areas of the building shall be concealed except where otherwise noted on the drawings.
- D. All equipment shall be installed in accordance with manufacturer's recommendations, unless approval is given in writing by the Consulting Electrical Engineer for deviation prior to commencement of work.
- E. In the event of a conflict or inconsistency between items indicated on the drawings and in the specifications or conflicts with code requirements applying to the same item, that drawing indication, note, specification or code which prescribes and establishes the higher standard, provides for a better grade of material or provides a more complete job shall take precedence. The Contractor shall notify Engineer to obtain a clarification.

- F. All materials not approved by Engineer and all material not properly installed, shall be promptly removed from the premises by the Contractor, whether or not it has been incorporated into the work. The Contractor shall then promptly replace and reconnect all work in accordance with the drawings and specifications, at his own expense, and shall also bear the expense of restoring all work of other trades damaged or dislocated by such removal or replacement.
- G. Should the Contractor refuse to remove and replace unsatisfactory materials and installation, and restore work of other trades after having been notified by Engineer, then Engineer and Owner shall have the right to enter upon the work and procure such materials and labor required to remove and replace all unsatisfactory work and restore work of other trades, in order to complete the project. All costs incurred by Owner/Engineer for such corrective work shall be borne by the Contractor.
- H. Submittals shall indicate minimum access and service clearances for the submitted equipment.

#### 1.11. STRUCTURAL CONDITIONS - SPECIAL NOTE

- A. Where conduits, sleeves, inserts, supports, cabinets, fixtures and other material are to be attached to, pass through, or interfere with, any structural member, or where notching, boring or cutting of any structural member is necessary, or where special openings are required through floors, footings, foundations, walls, roofs, or other structural elements to accommodate the electrical work, this Contractor shall obtain the approval of Owner/Engineer and shall coordinate all such work with the General Contractor, and other trades. The Electrical Contractor shall perform all such work and shall patch and repaint all members and surfaces damaged or soiled in performing the electrical installation, unless specifically instructed otherwise.
- B. Where conduits pass through walls or foundations, seal around conduits to make the work watertight. Where conduits pass through roofs, provide galvanized metal flashing and seal with a suitable compound, intended for the purpose to make the work watertight.
- C. See schematics and plans for conduits through roof on M/E/P drawings.

#### 1.12. WARRANTY

- A. All materials and equipment shall be new unless otherwise specified.
- B. Guarantee all workmanship, material and equipment and replace any found defective without cost to the Owner, for ONE year after final acceptance, as defined in General Conditions.

- C. Each warranty for longer than one year as described above (that comes with equipment used on the job) shall be passed into the Owner in the Operation and Maintenance Manual, along with the dates of start and end of warranty.
- D. Refer to General Conditions for additional information regarding specific warranty requirements.

#### 1.13. PROJECT RECORD DOCUMENTS

- A. Before final payment, provide the Engineer with one clean set of drawings and specifications corrected up-to-date as job progress. These documents shall reflect the As-Built conditions. Refer to General Conditions for additional information.

#### 1.14. SUBMITTALS

- A. The intent of this section is to give general submittal information, refer to specific submittal information in the subsequent electrical sections.
- B. Within 10 days after award of the contract, and before orders are placed, Contractor shall submit specific information on list of equipment and principal materials specified. Contractor shall indicate and/or provide names of manufacturers, catalog and model numbers, cut sheets, and such other supplementary information as necessary for evaluation. Minimum of six (6) copies, or as directed by the Engineer, of each shall be submitted and shall include all items mentioned by model number and/or manufacturer's name in the specifications or in schedules on the drawings.
- C. Requirements for each submittal:
  - 1. Bear a dated stamp or specific written indication that the Contractor has reviewed and approved all submittal prior to submission to Engineer,
  - 2. Have all information deleted by Contractor that pertains to the means and methods of construction or to fabrication, assembly, installation, or erection (approval by Engineer shall not extend to these areas unless specifically noted by Engineer),
  - 3. **BE CLEARLY AND SPECIFICALLY** marked as to which specific piece of equipment is being submitted, by use of a permanent marker, stamp, etc., so as to distinguish it from other pieces of equipment that may occur on the same page,
  - 4. **BE CLEARLY AND SPECIFICALLY** marked as to which available options are being submitted that are associated with a piece of equipment, and
  - 5. Be complete with respect to quantities, dimensions, specific performance, materials, and similar data to enable the Engineer to review the proposed equipment.

6. Omission by Contractor of any of the above requirements or submittals will subject submittal to automatic rejection without review.
7. Any submittals received by Engineer that were not requested shall be returned without review of any kind.

- D. Installation Instructions – For certain products or systems as identified in subsequent specifications sections or on the drawings, the Contractor shall be required to provide copies of manufacturer’s installation instructions with the submittal. When required as such, the installation instructions are considered part of the submittal and their omission may result in automatic rejection of the submittal. Where more than one identical device are scheduled, only one set of installation instructions needs to be submitted, e.g. if seven 200A panels are scheduled; only electrical panel installation instruction needs to be submitted. Similarly, if one set of installation instructions is identified by the manufacturer and on the instructions to be applicable to more than one type or size of devices, e.g. if one set of panel instructions is good for 100A, 150A,200A, electrical panels, then only one instruction set is required for these devices.
- E. This Engineer will review the submittals for approval twice. Any additional reviews that are required by the engineer for whatever reason after the initial two reviews will result in additional compensation for the Engineer’s time by the submitting Contractor at the Engineer’s rate.

#### 1.15. SUBSTITUTED PRODUCTS

- A. Material or equipment specified by Manufacturer’s name is being used as a basis of standard. No substitution is allowable without Engineer’s written approval **TEN (10) DAYS PRIOR TO BID DUE DATE** unless the manufacturer is listed on the drawings or in the specification as being a preapproved alternative manufacturer. Any submittal received without such written approval or prior approval is subject to unqualified rejection.
- B. It shall be the Contractor’s responsibility to verify that submitted substitute equipment will fit in space available. The contractor’s submittal for acceptance of the substitute shall include a written statement of whether or not such acceptance would require any subsequent or associated changes to the drawings or specifications. Any such changes shall be described in writing, briefly but complete.
- C. The Contractor shall be responsible for the costs of any such modifications due to substitution of materials or equipment for that which was specified or scheduled. The cost shall be complete, that is, it shall include the cost affect of any and all other trades.
- D. The Engineer may request detailed shop drawing or plan layouts of electrical rooms or systems of the substituted equipment.

#### 1.16. SAFETY

- A. General – Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work, and Contractor shall comply with all laws governing safety, specifically the “Occupational Safety and Health Standards” and the “Safety and Health Regulations for Construction”, state and federal.
- B. According to OSHA, a hazardous chemical is any chemical, which is a physical hazard or a health hazard. This may include items such as paints, solvents, adhesives, sealants, cleaners, etc. If a contractor produces, uses, or stores hazardous chemicals at the workplace, then contractor shall develop, implement, and maintain a hazard communication program in compliance with the latest OSHA requirements. In projects with multiple tenants in which the building is partially occupied during all or part of the project, Contractor shall inform the building manager or Owner, according to OSHA guidelines, of any hazardous chemicals being produced, stored, or used in the building so that other tenants may be notified. Contractor shall employ required methods of training, information, handling, ventilation, labeling, storing, disposal, and removal of hazardous chemicals.

#### 1.17. LABELING

- A. Each device for which an independent testing authority has established a standard shall have affixed a label indicating its compliance and listing. Refer to General Conditions for list of such independent testing authorities.

#### 1.18. SITE VISIT REPORTS

- A. During the course of the job, the Engineer will make site visits to observe work in progress and will subsequently prepare a written site visit report, which will be sent to the Contractor and to whomever else the Engineer desires. The Contractor shall prepare a written and typed response within seven (7) calendar days of his receiving the site visit report. The General Contractor shall include in his response the following information.
  - 1. Date of site visit by the Engineer,
  - 2. Date of receipt of the site visit report,
  - 3. Name and title of the preparer of the response,
  - 4. An item number referenced to the site report,
  - 5. A brief three or four word description of the item,
  - 6. The Contractor or Subcontractor affected,
  - 7. The proposed course of action, and
  - 8. An expected time of completion of the action.

#### 1.19. CUTTING AND PATCHING

- A. No joists, beams, girders, columns, slabs, or other structural elements shall be cut, drilled, or altered in any way by the Contractor without first obtaining written permission and instructions from the Engineer.
- B. Where it is necessary to cut through any non-structural elements of walls, floors, or ceilings to permit the installation of any work under this contract, or to repair any defects that may appear up to expiration of the guarantee, such cutting shall be done by the Contractor with as little damage as reasonably possible to the element being cut or to adjacent elements.
- C. After the necessary work has been completed, the damage shall be repaired by the respective Contractor, who shall pay all costs of such cutting, repairs and patching. All patching or sealing of cuts and penetrations, including final appearance of same, shall be done to the approval of the Engineer.

#### 1.20. INSURANCE

- A. The Contractor shall have required insurance. Required insurance shall be provided by this Contractor for protection against public liability and property damage for the duration of work.

#### 1.21. CONFLICTS AND CORRECTION OF WORK

- A. Promptly correct work rejected or failing to conform to the requirements of the Contract, whether observed before or after substantial completion and whether or not fabricated, installed or completed. The Contractor shall bear cost of correcting such rejected and nonconforming work including additional testing and inspections and including compensation for observing mechanical and electrical engineering firm's services and expenses made necessary thereby.
- B. If a conflict occurs on the bid documents, the Contractor shall contact the Engineer's offices with a written request for clarification. If the conflict is unresolvable at the time of bid, the most expensive interpretation of the conflict shall be bid so the conflict can be resolved in a deductive manner at a later time if necessary.
- C. If a conflict is discovered during construction, the Contractor shall stop work and that portion of the project and contact the appropriate party for clarification. The request for clarification shall be in written form. The Contractor shall bare the burden of replacing work that has been installed incorrectly as a result of a conflict on the drawings where he has not sought the Engineer's guidance for clarification.

#### 1.22. COMMISSIONING

- A. Coordinate all work with the commissioning agent and the commissioning specifications.

### 1.23. COORDINATION

- A. In a timely manner, and coordinated with all work involved, prepare and submit a trade composite work plan to be integrated into the Commissioning Plan for the following areas:
  - 1. Where new work of three or more trades or subcontractors is installed.
  - 2. Where lead times are critical to the project schedule.
  - 3. Provide construction grade drawing as needed to acquire approval of work plan.
  - 4. Access or service spaces required for Electrical equipment.
- B. Provide final coordination plan to be integrated into the Commissioning Plan to account for:
  - 1. Matching the work to the final selection of equipment; incorporating manufacturer's published instructions into the design;
  - 2. Changes in equipment arrangement, and associated changes in equipment piping, ducting, and electrical work different from what is shown or specified;
  - 3. Changes by manufacturer between date of design and date of delivery of equipment;
  - 4. Relocations resulting from more than one trade being shown or specified in these drawings and specifications in the same location;
  - 5. Addition of minor structural, mechanical, and electrical work for a complete system;
  - 6. And similar circumstances as described above;
- C. Work shall not be installed prior to written reply acknowledging that coordination drawing submittals have accomplished the specified intent of coordination. Relocations of work installed prior to coordination drawing acknowledgment, if subsequently required to avoid interference, shall be made.

## PART 2 – PRODUCTS

### 2.1. MATERIALS AND EQUIPMENT:

- A. General: Refer to Division 1 sections for general requirements on products, materials and equipment. The following provisions expand or modify the requirements as applicable to electrical work:

- B. **Materials List:** Within 15 days after award of contract, the Electrical Subcontractor shall submit to the Engineer a list, seven (7) copies, of all equipment, fixtures, materials, etc. to be furnished. Where such equipment will be furnished "as specified", a listing of the specific equipment manufacturer to be used on this project is sufficient. Where substitutions are proposed, complete data must be furnished showing performance, quality and dimensions. Written approval of the Engineer must be obtained before purchasing any substitute equipment.
- C. All materials shall be new and shall bear the label of the Underwriter's Laboratories, Inc., or be listed under reexamination service. All materials shall be of the best grade and latest pattern of manufacturer as specified.
- D. All work shall be performed in a neat, workmanlike manner and shall present a neat electrical appearance when completed.
- E. All similar materials and equipment shall be the product of the same manufacturer.
- F. Where no specific material, apparatus or appliance is mentioned, any first-class product made by a reputable manufacturer may be used, providing it conforms to the contract requirements and meets the approval of the Engineer.
- G. Materials and equipment shall be the standard products of manufacturers regularly engaged in the production of such material and shall be the manufacturer's current and standard design.
- H. **Altitude:** Equipment affected by altitude shall perform satisfactorily for the function intended at the altitude of the project site.
- I. **Compatibility:** Provide products, which are compatible with other products of the electrical work and with other work requiring interface with the electrical work, including electrical connections and control devices. For exposed electrical work, coordinate colors and finishes with other work.
- J. **Substitution:** Manufacturer's catalog numbers are specified for the purpose of establishing a standard. All proposed substitutions on specific materials (lighting fixtures but not limited to) shall be submitted in duplicate ten (10) days prior to bid openings. This request shall be accompanied by complete descriptions of the substitutes offered, including catalog cut sheets, performance, quality and dimensions. The entire burden of proof of equality shall be placed on the Electrical Subcontractor and the decision of the Engineer shall be final. All other electrical equipment, devices, etc. may have substitutions only if equal in quality and function to, or better than, the specified item. Complete descriptive and technical data shall be submitted on all proposed substitute items, together with the same data on the specified items. Material samples of the proposed

substitute item, together with samples of the specified items, shall be submitted for comparison and test when requested by the Engineer.

- K. **Work Quality:** Fabrication, erection and installation of the complete electrical system shall be done in a first class workmanlike manner by qualified personnel experienced in such work and shall proceed in an orderly manner so as not to hold up the progress of the project. The Electrical Subcontractor shall check all areas and surfaces where electrical equipment material is to be installed, removed or relocated and report any unsatisfactory conditions to the Engineer before starting work. Commencement of work signifies this Electrical Subcontractor's acceptance of existing conditions. In the acceptance or rejection of the finished installation, no allowance will be made for lack of skill on the part of the workmen.

2.2. ELECTRICAL EQUIPMENT AND WIRING FOR MECHANICAL DIVISION:

A. Responsibility

1. Unless otherwise indicated, all motors, conduit, wiring, and controls (including temperature) shall be furnished, set in place, and wired in accordance with the following schedule. (MD is Mechanical Division and ED is Electrical Division)

<b>MECHANICAL-ELECTRICAL COORDINATION</b>			
<b>TABLE 1</b>			
ITEM	FURNISHED UNDER	SET IN PLACE OR MOUNTED UNDER	WIRED AND CONNECTED UNDER
1. Equipment Motors and Thermal Overloads	MD	MD	ED
2. Motor Controllers: magnetic starters, reduced voltage starters and overload relays	MD (1)	ED (1)	ED
3. Disconnect switches, fused or unfused, manual operating switches	ED (1)	ED (1)	ED
4. Pushbutton stations, pilot lights, multi-speed switches, variable speed switches, float switches, control relays, time clocks, control transformer, control panels, motor valves, damper motors, EP and PE switches and interlocks	MD	MD (2)	MD (2)
5. Contactors, 120V control circuit outlets for control panels and for boiler controls and fire protection	ED	ED	ED

control and fire/smoke detectors			
6. Plumbing Fixture Electrical Power: electric or gas water heaters, instantaneous water heater, electronic sensor systems, circulation pumps, sump pumps and lift stations.	MD	ED (1 & 3)	ED (3)
<p>Notes:</p> <ol style="list-style-type: none"> <li>1. If furnished as part of factory wired equipment, wiring, conduit, and connection only be ED</li> <li>2. If float switches, line voltage thermostats, PE switches, time switches etc., carry the FULL LOAD CURRENT of any motor, they shall be furnished by the Mechanical Division, but shall be set in place, wired and connected by the Electrical Division, except that where such items are and integral part of the mechanical equipment, or directly attached to ducts, piping, etc., they shall be set in place under the Mechanical Division and wired and connected by the Electrical Division. If they do not carry the FULL LOAD CURRENT to any motor they shall be furnished, set in place and wired under the Mechanical Division.</li> <li>3. Wiring and conduit from alarm contacts to alarm system and conduit for control functions by ED; all control function wiring by MD.</li> <li>4. Mechanical Contractor to set in place and make mechanical connections and Electrical Contractor to make electrical connections.</li> </ol>			

B. Connections

1. Connection to all control directly attached to ducts, piping and mechanical equipment shall be made with flexible connections not to exceed 3 linear feet.

2.3. PROTECTION OF PENETRATION

- A. All penetrations of fire or smoke barriers shall be sealed, sleeves (if any), insulation (if any), and vibration isolation (if any) that maintain the fire or smoke resistance of the barrier in accordance with the latest edition of NFPA 101 Life Safety Code.
- B. Contractor shall verify locations and type of all partitions penetrations from the drawings. Sealing material and methods shall be per UL recommendations. The Contractor shall fire stop all penetrations through fire and smoke rated barriers as required by code. Refer to Division 7 for fire stopping material information.

PART 3 – EXECUTION

3.1. GENERAL REQUIREMENTS:

- A. Comply with manufacturer's recommended installation procedures for electrical equipment. Refer to specific Division 26 specification sections for specific equipment installation requirements.

### 3.2. ELECTRICAL INSTALLATION

- A. Install all work to permit removal (without damage to other parts) of breakers and all other parts, which might require periodic replacement or maintenance. Arrange conduit and equipment to permit ready access to panels and to clear opens of doors and of access panels.
- B. Electrical Contractor shall coordinate with other trade with regards to equipment going under mechanical equipment.
- C. Electrical Contractor shall install electrical equipment in a manner to provide the manufacturer's recommended service clearance and access space. The Electrical Contractor shall be responsible for maintaining these clearances, coordinating them with the other trades and have installed work modified to maintain these clearances at no additional charge to the project or the Owner.

### 3.3. PROTECTION OF PENETRATION

- A. All penetrations of fire or smoke barriers shall be sealed, sleeves (if any), insulation (if any), and vibration isolation (if any) that maintain the fire or smoke resistance of the barrier in accordance with the latest edition of NFPA 101 Life Safety Code.
- B. Contractor shall verify locations and type of all partitions penetrations from the drawings. Sealing material and methods shall be per UL recommendations. The Contractor shall fire stop all penetrations through fire and smoke rated barriers as required by code. Refer to Division 7 for fire stopping material information.

### 3.4. ELECTRICAL WORK CLOSEOUT:

- A. General: Refer to the Division 1 sections for general closeout requirements. Upon completion of the work, the various systems operated under load conditions shall be tested for short circuits and grounds in accordance with the method and resistance values outlined in the National Electrical Code and for load balance on feeders and branch circuits.
- B. The complete system shall operate satisfactorily in every respect. Make any repairs or adjustments necessary to this end to the satisfaction of the Engineer.
- C. Furnish all instruments and labor for testing.

3.5. GUARANTEE:

- A. The work to be performed shall be guaranteed for a period of one year after final acceptance against faulty workmanship and/or materials, and any failure or trouble due to such causes within the period of guarantee shall be made good upon demand of the Owner and without cost to the Owner.

3.6. MISCELLANEOUS ITEMS:

- A. Miscellaneous items not covered in these specifications shall be as indicated on the drawings, installed and connected by the proper method and as recommended by the manufacturer.
- B. Coordinate the thickness of the wall to accommodate the concealed conduits and its associated hangers, if required. I.E. 4-inch conduit requires a 6-inch thick wall.

3.7. PRODUCT HANDLING:

- A. Use all means necessary to protect electrical materials and equipment before, during and after installation and to protect the installed work of other trades. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no extra cost to him.

3.8. AS-BUILT DRAWINGS:

- A. During progress of the Work, maintain an accurate record of the installation of the system. Upon completion of the installation, transfer all record data to blue line prints of the original drawings and furnish to the Engineer.

END OF SECTION 26 05 00

## **SECTION 26 05 11 – MINOR ELECTRICAL DEMOLITION**

### **PART 1 – GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Electrical demolition.

### **PART 2 – PRODUCTS**

#### **2.1. MATERIALS AND EQUIPMENT**

- A. Materials and equipment for patching and extending work: As specified in individual Sections.

### **PART 3 – EXECUTION**

#### **3.1. EXAMINATION**

- A. Verify field measurements and circuiting arrangements are as shown on Drawings.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Engineer before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.

#### **3.2. PREPARATION**

- A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
- B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits use personnel experienced in such operations.
- C. Existing Electrical, Communications and Fire Alarm Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area where feasible.

### 3.3. DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Demolish and extend existing electrical work under provisions of this Section.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
- F. Disconnect and remove abandoned panelboards and distribution equipment.
- G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- H. Repair adjacent construction and finishes damaged during demolition and extension work.
- I. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
- J. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

### 3.4. CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment which remain or are to be reused.
- B. 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.

END OF SECTION 26 05 11

## SECTION 26 05 19 – BUILDING WIRE AND CABLE

### PART 1 – GENERAL

#### 1.1. SUMMARY

- A. Section includes building wire and cable and wiring connectors and connections.

#### 1.2. REFERENCES

- A. NECA (National Electrical Contractors Association) – Standard of Installation.
- B. NETA ATS (International Electrical Testing Association) – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

#### 1.3. WIRING METHODS AND PRODUCTS REQUIREMENTS

- A. Product Requirements: Use products as indicated and as follows:
  - 1. Use solid conductor for feeders and branch circuits 12 AWG and smaller.
  - 2. Use conductor not smaller than 12 AWG for power and lighting circuits.
  - 3. Use conductors for 80% of branch circuit's circuit breaker size to provide no more than 3% voltage drop on branch circuits and no more than 5% voltage drop total from service entrance point to the load.
- B. Wiring Methods: Use wiring methods indicated and as follows:
- C. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN, in raceway.
- D. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN insulation in raceway.
- E. Above Accessible Ceilings: Use only building wire, Type THHN/THWN insulation in raceway.

#### 1.4. FIELD MEASUREMENTS

- A. Verify field measurements are as indicated

#### 1.5. COORDINATION

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

## PART 2 – PRODUCTS

### 2.1. BUILDING WIRE

- A. Manufacturers:
  - 1. Houston Wire and Cable
  - 2. Southwire
  - 3. Substitutions: Section 01 60 00 – Product Requirements – Permitted
- B. Product Description: Single conductor insulated wire.
- C. Conductor: Copper.
- D. Insulation Voltage Rating: 600 volts.
- E. Insulation: Thermoplastic material rated 75 degrees C.

### 2.2. WIRING CONNECTORS

- A. Split Bolt Connectors, Solderless Pressure Connectors, Spring Wire Connectors, Compression Connectors:
  - 1. IlSCO
  - 2. Substitutions: Section 01 60 00 – Product Requirements – Permitted.

## PART 3 – EXECUTION

### 3.1. EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.
- B. Verify that mechanical work likely to damage wire and cable has been completed.

### 3.2. 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 if wire and cable servicing them is abandoned and removed. Provide blank cover for abandoned boxes that are not removed.

- C. Ensure access to existing wiring connections which remain active and which require access. Modify installation or provide access panel as appropriate.
- D. Extend existing circuits using materials and methods compatible with existing electrical installations or as specified.

### 3.3. INSTALLATION

- A. Route wire and cable as required meeting Project conditions.
- B. Install wire and cable in accordance with the NECA "Standard of Installation."
- C. Neatly train and lace wiring inside boxes, equipment and panelboards.

### 3.4. FIELD QUALITY CONTROL:

- A. Section 01 40 00 – Quality Requirements: Testing and inspection services.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspection and tests listed in NETA ATS, Section 7.3.1

END OF SECTION 26 05 19

## **SECTION 26 05 26 – GROUNDING AND BONDING**

### **PART 1 – GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Equipment grounding conductors.
- B. Bonding.

#### **1.2. REFERENCES**

- A. Section 01 45 00 – Quality Control: Requirements for references and standards.
- B. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association).
- C. NFPA 70 – National Electrical Code.

#### **1.3. REGULATORY REQUIREMENTS**

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.
- C. Conforms to requirements of NFPA 99.

### **PART 2 – PRODUCTS**

#### **2.1. EQUIPMENT GROUNDING CONDUCTOR**

- A. Material: Stranded copper.
- B. Size to meet NFPA 70 requirements.

### **PART 3 – EXECUTION**

#### **3.1. EXAMINATION**

- A. Section 01 31 00 – Coordination and Meetings: Verification of existing conditions prior to beginning work.

#### **3.2. INSTALLATION**

- A. Section 01 45 00 – Quality Control: Manufacturer's instructions.
- B. Provide bonding to meet Regulatory Requirements.
- C. Bond together each metallic raceway, pipe, duct and other metal objects.
- D. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

### 3.3. FIELD QUALITY CONTROL

- A. Section 01 43 00 – Quality Assurance: Field inspection, 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 7.13.

END OF SECTION 26 05 26

## SECTION 26 05 29 – SUPPORTING DEVICES

### PART 1 – GENERAL

#### 1.1. SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

#### 1.2. REFERENCES

- A. Section 01 45 00 – Quality Control: Requirements for references and standards.
- B. NECA Standard of Installation (National Electrical Contractors Association).
- C. NFPA 70 – National Electrical Code.

#### 1.3. SUBMITTALS FOR REVIEW

- A. Section 01 33 00 – Submittals: Procedures for submittals.
- B. Product Data: Provide manufacturers catalog data for fastening systems.

#### 1.4. REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

### PART 2 – PRODUCTS

#### 2.1. PRODUCT REQUIREMENTS

- A. Materials and Finishes: Corrosion resistant.
- B. Select materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit, including weight of wire in conduit.
- C. Anchors and Fasteners:
  - 1. Concrete Structural Elements: Use pre-cast inserts, expansion anchors and preset inserts.
  - 2. Steel Structural Elements: Use beam clamps and welded fasteners.

3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts.
5. Solid Masonry Walls: Use expansion anchors.
6. Sheet Metal: Use sheet metal screws.

## 2.2. FORMED STEEL CHANNEL

### A. Manufacturers:

1. B-line.
2. Unistrut.
3. Substitutions: Refer to Section 01 60 00 – Product Requirements.

### B. Description: Galvanized or Painted steel.

## PART 3 – EXECUTION

### 3.1. INSTALLATION

- A. Locate and install anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
  1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
  2. Do not drill or cut structural members.
- B. Fabricate supports from structural steel or formed steel members. Rigidly weld members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- C. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- D. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch (25 mm) off wall.
- E. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION 26 05 29

## SECTION 26 05 33 – CONDUIT

### PART 1 – GENERAL

#### 1.1. SECTION INCLUDES

- A. Metal conduit.
- B. Flexible metal conduit.
- C. Liquid tight flexible metal conduit.
- D. Electrical metallic tubing.
- E. Nonmetal conduit.
- F. Fittings and conduit bodies.

#### 1.2. RELATED SECTIONS

- A. Section 07 84 00 - Fire Stopping.
- B. Section 26 05 34 - Boxes.
- C. Section 26 05 26 - Grounding and Bonding.
- D. Section 26 05 29 - Supporting Devices.
- E. Section 26 05 53 - Electrical Identification.

#### 1.3. REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
- B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
- C. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- D. ANSI/NFPA 70 - National Electrical Code.
- E. NECA "Standard of Installation."
- F. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

- G. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
  - H. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.
- 1.4. DESIGN REQUIREMENTS
- A. Conduit Size: ANSI/NFPA 70.
- 1.5. SUBMITTALS
- A. Submit under provisions of Section 01 33 00.
  - B. Product Data: Provide for metallic conduit, flexible metal conduit, liquid tight flexible metal conduit, metallic tubing, nonmetallic conduit and conduit bodies.
- 1.6. PROJECT RECORD DOCUMENTS
- A. Submit under provisions of Section 01 78 39.
- 1.7. REGULATORY REQUIREMENTS
- A. Conform to requirements of ANSI/NFPA 70.
  - B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.
- 1.8. DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect, and handle Products to site under provisions of Section 01 60 00.
  - B. Accept conduit on site. Inspect for damage.
  - C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
  - D. Protect PVC conduit from sunlight.
- 1.9. PROJECT CONDITIONS
- A. Verify that field measurements are as shown on Drawings.
  - B. Verify routing and termination locations of conduit prior to rough-in.

- C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

## PART 2 – PRODUCTS

### 2.1. CONDUIT REQUIREMENTS

- A. Minimum Size: 3/4 inch unless otherwise specified.
- B. Underground Installations:
  - 1. More than Five Feet from Foundation Wall: use rigid steel conduit or plastic coated conduit.
  - 2. Within Five Feet from Foundation Wall: Use rigid steel conduit.
  - 3. In- or Under- Slab on Grade: Use rigid steel conduit or plastic coated conduit.
  - 4. Minimum Size: 3/4 inch.
- C. Outdoor Locations, Above Grade: Use rigid steel conduit.
- D. In Slab Above Grade:
  - 1. Use rigid steel conduit or thickwall nonmetallic conduit.
  - 2. Maximum Size Conduit in Slab: 1/2 inch.
- E. Wet and Damp Locations: Use rigid steel conduit.
- F. Dry Locations:
  - 1. Concealed: Use rigid steel conduit and electrical metallic tubing.
  - 2. Exposed: Use rigid steel conduit and electrical metallic tubing.

### 2.2. METAL CONDUIT

- A. Manufacturers:
  - 1. Allied.
  - 2. Substitutions: Under provisions of Section 26 05 00.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Intermediate Metal Conduit (IMC): Rigid steel.
- D. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.

## 2.3. FLEXIBLE METAL CONDUIT

### A. Manufacturers:

1. Alflex.
2. Greenfield.
3. Substitutions: Under provisions of Section 26 05 00.

### B. Description: Interlocked steel construction.

### C. Fittings: ANSI/NEMA FB 1.

## 2.4. LIQUIDTIGHT FLEXIBLE METAL CONDUIT

### A. Manufacturers:

1. Ultratight.
2. Substitutions: Under provisions of Section 26 05 00.

### B. Description: Interlocked steel construction with PVC jacket.

### C. Fittings: ANSI/NEMA FB 1.

## 2.5. ELECTRICAL METALLIC TUBING (EMT)

### A. Manufacturers:

1. Allied.
2. Substitutions: Under provisions of Section 26 05 00.

### B. Description: ANSI C80.3; galvanized tubing.

### C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel, compression type.

## 2.6. NONMETALLIC CONDUIT

### A. Manufacturers:

1. Carlon.
2. Cantex.
3. Substitutions: Under provisions of Section 26 05 00.

### B. Description: NEMA TC 2; Schedule 40 and 80 PVC.

### C. Fittings and Conduit Bodies: NEMA TC 3.

## PART 3 – EXECUTION

### 3.1. INSTALLATION

- A. Install conduit in accordance with NECA "Standard of Installation."
- B. Install nonmetallic conduit in accordance with manufacturer's instructions.
- C. Arrange supports to prevent misalignment during wiring installation.
- D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- E. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- F. Fasten conduit supports to building structure and surfaces under provisions of Section 26 05 29.
- G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports
- H. Do not attach conduit to ceiling support wires.
- I. Arrange conduit to maintain headroom and present neat appearance.
- J. Route exposed conduit parallel and perpendicular to walls.
- K. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- L. Route conduit in and under slab from point-to-point.
- M. Do not cross conduits in slab.
- N. Maintain adequate clearance between conduit and piping.
- O. Maintain 12-inch (300 mm) clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).
- P. Cut conduit square using saw or pipe-cutter; de-burr cut ends.
- Q. Bring conduit to shoulder of fittings; fasten securely.
- R. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of

cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

- S. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
  - T. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2-inch (50 mm) size.
  - U. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
  - V. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control and expansion joints.
  - W. Provide suitable pull string in each empty conduit except sleeves and nipples.
  - X. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
  - Y. Ground and bond conduit under provisions of Section 26 05 26.
  - Z. Identify conduit under provisions of Section 26 05 53.
- 3.2. INTERFACE WITH OTHER PRODUCTS:
- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions of Division 7.
  - B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket.

END OF SECTION 26 05 33

## SECTION 26 05 34 – BOXES

### PART 1 – GENERAL

#### 1.1. SECTION INCLUDES

- A. Wall and ceiling outlet boxes.
- B. Pull and junction boxes.

#### 1.2. RELATED SECTIONS

- A. Section 07 84 00 - Firestopping.
- B. Section 08 31 13 - Access Doors.
- C. Section 26 27 26 - Wiring Devices: Wall plates in finished areas.
- D. Section 26 27 16 - Cabinets and Enclosures.

#### 1.3. REFERENCES

- A. NECA – Standard of Installation.
- B. NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- C. NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- E. NFPA 70 – National Electrical Code.

#### 1.4. SUBMITTALS FOR CLOSEOUT

- A. Section 01 70 00 – Contract Closeout: Submittals for Project closeout.
- B. Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

#### 1.5. REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Provide Products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

## PART 2 – PRODUCTS

### 2.1. OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
  - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch (13 mm) male fixture studs where required.
  - 2. Concrete Ceiling Boxes: Concrete type.
- B. Cast Boxes: NEMA FB 1, Type FD, cast ferrous alloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.
- C. Wall Plates for Finished Areas: As specified in Section 26 27 26.

### 2.2. PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Hinged Enclosures: As specified in Section 26 27 26.
- C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
  - 1. Material: Galvanized cast iron.
  - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- D. In-Ground Cast Metal Box: NEMA 250, Type 6, inside flanged, recessed cover box for flush mounting:
  - 1. Material: Galvanized cast iron.
  - 2. Cover: Smooth cover with neoprene gasket and stainless steel cover screws.
  - 3. Cover Legend: "ELECTRIC".

## PART 3 – EXECUTION

### 3.1. EXAMINATION

- A. Verify locations of outlets in offices and work areas prior to rough-in.

### 3.2. INSTALLATION

- A. Install boxes in accordance with NECA "Standard of Installation."
- B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- C. Set wall mounted boxes at elevations to accommodate mounting heights indicated.
- D. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Adjust box location up to 10 feet if required to accommodate intended purpose.
- E. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.
- F. Maintain headroom and present neat mechanical appearance.
- G. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- H. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches (150 mm) from ceiling access panel or from removable recessed luminaire.
- I. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 7.
- J. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
- K. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- L. Use flush mounting outlet box in finished areas.
- M. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- N. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches (150 mm) separation. Provide minimum 24 inches (600 mm) separation in acoustic rated walls.
- O. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- P. Use stamped steel bridges to fasten flush mounting outlet box between studs.

- Q. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- R. Use adjustable steel channel fasteners for hung ceiling outlet box.
- S. Do not fasten boxes to ceiling support wires.
- T. Support boxes independently of conduit.
- U. Use gang box where more than one device is mounted together. Do not use sectional box.
- V. Use gang box with plaster ring for single device outlets.
- W. Use cast outlet box in exterior locations and wet locations.
- X. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.
- Y. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

### 3.3. ADJUSTING

- A. Section 01 70 00 – Contract Closeout: Adjusting installed work.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused box openings.

### 3.4. CLEANING

- A. Section 01 70 00 – Contract Closeout: Cleaning installed work.
- B. Clean interior of boxes to remove dust, debris, and other material.
- C. Clean exposed surfaces and restore finish.

END OF SECTION 26 05 34

## **SECTION 26 05 53 – ELECTRICAL IDENTIFICATION**

### **PART 1 – GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.

#### **1.2. RELATED SECTIONS**

- A. Section 09 91 00 – Painting.

#### **1.3. REFERENCES**

- A. Section 01 45 00 – Quality Control: Requirements for references and standards.
- B. NFPA 70 – National Electrical Code.

#### **1.4. SUBMITTALS FOR REVIEW**

- A. Section 01 33 00 – Submittals: Procedures for submittals.
- B. Product Data: Provide catalog data for nameplates, labels, and markers.

#### **1.5. REGULATORY REQUIREMENTS**

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

### **PART 2 – PRODUCTS**

#### **2.1. NAMEPLATES AND LABELS**

- A. Nameplates: Engraved three-layer laminated plastic, white letters on black background.
- B. Locations:
  - 1. Each electrical distribution and control equipment enclosure.
  - 2. Communication cabinets.

C. Letter Size:

1. 1/8-inch letters for identifying individual equipment and loads.
2. 1/4-inch letters for identifying grouped equipment and loads.

D. Labels: Embossed adhesive tape, with 3/16-inch white letters on black background. Use only for identification of individual wall switches and receptacles and control device stations.

2.2. WIRE MARKERS

A. Manufacturers:

1. Brady
2. Panduit
3. Substitutions: Refer to Section 01 60 00 – Product Requirements.

2.3. UNDERGROUND WARNING TAPE

A. Description: 4-inch wide plastic tape, colored red with suitable warning legend describing buried electrical lines.

B. Location: Along length of each underground conduit.

PART 3 – EXECUTION

3.1. PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.2. INSTALLATION

A. Section 01 45 00 – Quality Control: Manufacturer's instructions.

B. Install nameplate and label parallel to equipment lines.

C. Secure nameplate to equipment front using rivets.

D. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

E. Identify underground conduits using one underground warning tape per trench at 3 inches (75 mm) below finished grade.

END OF SECTION 26 05 53

## **SECTION 26 05 63 – EQUIPMENT WIRING SYSTEMS**

### **PART 1 – GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Electrical connections to equipment specified under other sections.

#### **1.2. RELATED SECTIONS**

- A. Section 22 30 00 - Plumbing Equipment.
- B. Section 26 05 33 - Conduit.
- C. Section 26 05 19 - Building Wire and Cable.
- D. Section 26 05 34 - Boxes.

#### **1.3. REFERENCES**

- A. NEMA WD 1 - General Purpose Wiring Devices.
- B. NEMA WD 6 - Wiring Device Configurations.
- C. ANSI/NFPA 70 - National Electrical Code.

#### **1.4. SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

#### **1.5. REGULATORY REQUIREMENTS**

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.

#### **1.6. COORDINATION**

- A. Coordinate work under provisions of Section 01 31 00.
- B. Obtain and review shop drawings, product data, 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 schedule for equipment.
- E. Sequence electrical connections to coordinate with start-up schedule for equipment.

## PART 2 – PRODUCTS

### 2.1. CORDS AND CAPS

- A. Attachment Plug Construction: Conform to NEMA WD 1.
- B. Configuration: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
- C. Cord Construction: ANSI/NFPA 70, Type SO or SJO 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 over current protection.

## PART 3 – EXECUTION

### 3.1. EXAMINATION

- A. Verify conditions under provisions of Section 26 05 00.
- B. Verify that equipment is ready for electrical connection, wiring, and energization.

### 3.2. ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquid tight flexible conduit with watertight connectors in damp or wet locations.

- C. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.
- D. Provide suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- E. Install disconnect switches, controllers, control stations, and control devices as indicated.
- F. Modify equipment control wiring with terminal block jumpers as indicated.
- G. Provide interconnecting conduit and wiring between devices and equipment where indicated.

END OF SECTION 26 05 63

## **SECTION 26 27 16 – CABINETS AND ENCLOSURES**

### **PART 1 – GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Hinged cover enclosures.
- B. Cabinets.
- C. Terminal blocks.
- D. Accessories.

#### **1.2. RELATED SECTIONS**

- A. Section 26 05 29 – Supporting Devices.

#### **1.3. REFERENCES**

- A. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. NEMA ICS 4 – Terminal Blocks for Industrial Control Equipment and Systems.
- C. ANSI/NFPA 70 – National Electrical Code.

#### **1.4. SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide manufacturer's standard data for enclosures and cabinets.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

#### **1.5. REGULATORY REQUIREMENTS**

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

#### **1.6. EXTRA MATERIALS**

- A. Furnish under provisions of Section 01 70 00.
- B. Provide two of each cabinet key.

## PART 2 – PRODUCTS

### 2.1. HINGED COVER ENCLOSURES

- A. Construction: NEMA 250, Type 1 steel enclosure for interior dry locations, Type 3R for interior wet or exterior locations.
- B. Covers: Continuous hinge, held closed by hasp and staple for padlock.
- C. Provide interior plywood panel for mounting terminal blocks and electrical components; finish with white enamel.
- D. Enclosure Finish: Manufacturer's standard enamel.

### 2.2. CABINETS

- A. Boxes: Galvanized steel.
- B. Box Size: sized for project needs.
- C. Backboard: Provide 3/4 inch (19 mm) thick plywood backboard for mounting terminal blocks. Paint matte white.
- D. Fronts: Steel, surface type with screw cover front, concealed hinge, and flush lock keyed to match branch circuit panelboard. Finish with gray baked enamel.
- E. Provide metal barriers to separate compartments containing control wiring operating at less than 50 volts from power wiring.
- F. Provide accessory feet for free-standing equipment.

## PART 3 – EXECUTION

### 3.1. EXAMINATION

- A. Verify conditions under provisions of Section 26 05 00.
- B. Verify that surfaces are ready to receive Work.

### 3.2. INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner.
- C. Install cabinet fronts plumb.

END OF SECTION 26 27 16

## SECTION 26 27 26 – WIRING DEVICES

### PART 1 – GENERAL

#### 1.1. SUMMARY

##### A. Related Sections:

1. Section 26 05 34 – Boxes: Outlet boxes for wiring devices.

#### 1.2. REFERENCES

##### A. NECA (National Contractors Association) – Standard of Installation.

##### B. NEMA WD 1 (National Electrical Manufacturers Association) – General Requirements for Wiring Devices.

##### C. NEMA WD 6 (National Electrical Manufacturers Association) – Wiring Device – Dimensional Requirements.

### PART 2 – PRODUCTS

#### 2.1. WALL SWITCHES

##### A. Manufacturers:

1. Hubbell
2. Pass and Seymour

##### B. Single Pole Switch: Non Emergency

1. Hubbell 1221-I
2. Pass and Seymour 20AC1-I

##### C. Ratings: Match branch circuit and load characteristics.

#### 2.2. RECEPTACLES

##### A. Standard Duplex or Quad Receptacle: Heavy Duty Specification Grade

1. Hubbell 5362.
2. Pass and Seymour PS5262.

##### B. GFCI Duplex Receptacle: Heavy Duty Specification Grade

1. Hubbell IG20DR.

2. Pass and Seymour 2095

C. Ratings: Match branch circuit and load characteristics.

### 2.3. WALL PLATES

A. Manufacturers:

1. Pass and Seymour
2. Hubbell

B. Decorative Cover Plate: Match receptacle color. Color by Architect.

## PART 3 – EXECUTION

### 3.1. EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.
- B. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- C. Verify that branch circuit wiring installation is completed, tested and ready for connection to wiring devices.

### 3.2. PREPARATION

- A. Clean debris from outlet boxes.

### 3.3. EXISTING WORK

- A. Disconnect abandoned wiring devices and remove them.
- B. Ensure access to existing wiring devices which remain active. Modify installation as appropriate.
- C. Clean and repair existing wiring devices which remain or are to be reinstalled.

### 3.4. INSTALLATION

- A. Install in accordance with NECA “Standard of Installation.”

### 3.5. ADJUSTING

- A. Section 01 70 00 – Execution Requirements: Testing, Adjusting and Balancing.

B. Adjust devices and wall plates to be flush and level.

3.6. CLEANING

A. Section 01 45 00 – Execution Requirements: Final Cleaning.

B. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION 26 27 26

## SECTION 26 28 19 – ENCLOSED SWITCHES

### PART 1 – GENERAL

#### 1.1. SECTION INCLUDES

- A. Fusible switches.
- B. Nonfusible switches.
- C. Fuses.

#### 1.2. REFERENCES

- A. NEMA KS 1 – Enclosed Switches.
- B. NFPA 70 – National Electrical Code.
- C. UL 198C – High-Interrupting Capacity Fuses; Current Limiting Type.
- D. UL 198E – Class R Fuses.

#### 1.3. SUBMITTALS

- A. Submit under provisions of Section 01 33 00 and 26 05 00.
- B. Product Data: Provide switch ratings and enclosure dimensions.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

#### 1.4. QUALITY ASSURANCE

- A. Perform Work in accordance with NECA Standard of Installation.
- B. Maintain one copy of each document on site.

#### 1.5. QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years documented experience.

#### 1.6. REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by UL as suitable for purpose specified and shown.

#### 1.7. EXTRA MATERIALS

- A. Furnish under provisions of Section 01 70 00 and 26 05 00.
- B. Provide three of each size and type fuse installed.

### PART 2 – PRODUCTS

#### 2.1. MANUFACTURERS

- A. General Electric (GE).
- B. Square D.
- C. Siemens.
- D. Cuttler Hammer.
- E. Substitutions: Refer for product options and substitutions to Sections 01 60 00 – Product Requirements and 26 05 00 – General Electrical Requirements.

#### 2.2. ENCLOSED SWITCHES

- A. Fusible Switch Assemblies: NEMA KS 1, Type HD load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate fuses of appropriate Class for the application.
- B. Nonfusible Switch Assemblies: NEMA KS 1, Type HD load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- C. Enclosures: NEMA KS 1.
  - 1. Interior Dry Locations: Type 1.
  - 2. Exterior Locations: Type 3R.

#### 2.3. FUSES

- A. Manufacturers:

1. Bussman.
2. Little Fuse.
3. Gould Schmut.
4. Substitutions: Refer to Sections 01 60 00 – Product Requirements and 26 05 00 – General Electrical Requirements: For Product options and substitutions

B. Description: Per Drawings – rated for voltage of equipment.

C. Interrupting Rating: 200,000 rms amperes or as noted on Drawings.

### PART 3 – EXECUTION

#### 3.1. INSTALLATION

A. Install disconnect switches where indicated.

B. Install fuses in fusible disconnect switches.

C. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.

END OF SECTION 26 28 19

## SECTION 26 28 23 – ENCLOSED CIRCUIT BREAKERS

### PART 1 – GENERAL

#### 1.1. SECTION INCLUDES:

- A. Enclosed circuit breakers.

#### 1.2. RELATED WORK:

- A. Section 26 05 29 – Supporting Devices.
- B. Section 26 05 53 – Electrical Identification: Engraved nameplates.

#### 1.3. REFERENCES:

- A. NECA (National Electrical Contractors Association) "Standard of Installation."
- B. NEMA AB 1 – Molded Case Circuit Breakers
- C. NFPA 70 – National Electrical Code.

#### 1.4. SUBMITTALS:

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide catalog sheets showing ratings, trip units, time current curves, dimensions, and enclosure details.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

#### 1.5. QUALITY ASSURANCE:

- A. Perform Work in accordance with NECA Standard of Installation.
- B. Maintain one copy of each document on site.

#### 1.6. QUALIFICATIONS:

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

#### 1.7. REGULATORY REQUIREMENTS:

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

1.8. EXTRA MATERIALS:

- A. Furnish under provisions of Section 01 70 00.
- B. Provide three of each size and type of current limiter.

PART 2 – PRODUCTS

2.1. MANUFACTURERS:

- A. Match existing switchgear manufacturer.
- B. Permitted to use manufacturer other than existing switchgear manufacturer only if the retrofit kit is specifically designed for installation in this type of switchgear. Prior approval required.
- C. Substitutions: Under provisions of Section 01 60 00.

2.2. MOLDED CASE CIRCUIT BREAKER:

- A. Circuit Breaker: NEMA AB 1.
- B. Service Conditions:
  - 1. Temperature: per site conditions.
  - 2. Altitude: per site conditions.

2.3. TRIP UNITS:

- A. Field-Adjustable Trip Circuit Breaker: Provide circuit breakers with frame sizes 200 amperes and larger with mechanism for adjusting all settings for automatic operation.
- B. Field-Changeable Ampere Rating Circuit Breaker: Provide circuit breakers with frame sizes 200 amperes and larger with changeable trip units.
- C. Current Limiting Circuit Breaker: Provide circuit breaker with automatically-resetting current limiting elements in each pole. Let-through Current and Energy: Less than permitted for same size Class RK-5 fuse.

- D. Solid-State Circuit Breaker: Provide circuit breaker with electronic sensing, timing and tripping circuits for adjustable current settings; ground fault trip; instantaneous trip; and adjustable short time trip.

#### 2.4. CURRENT LIMITERS:

- A. Current Limiter: Designed for application with molded case circuit breaker.
- B. Coordinate limiter size with trip rating of circuit breaker to prevent nuisance tripping and to achieve interrupting current rating specified for circuit breaker.
- C. Provide interlocks to trip circuit breaker and to prevent closing circuit breaker when limiter compartment cover is removed or when one or more limiter is not in place or has operated.

#### 2.5. PRODUCT OPTIONS AND FEATURES:

- A. Provide accessories as scheduled, to NEMA AB 1.
- B. Handle Lock: Include provisions for padlocking.
- C. Provide mechanical trip device.
- D. Provide insulated grounding lug in each enclosure.

### PART 3 – EXECUTION

#### 3.1. INSTALLATION:

- A. Install enclosed circuit breakers where indicated, in accordance with manufacturer's instructions.
- B. Install enclosed circuit breakers plumb. Provide supports in accordance with Section 26 05 29.
- C. Height: 5 ft (1.6 M) to operating handle.
- D. Provide engraved plastic nameplates under the provisions of Section 26 05 53.

#### 3.2. FIELD QUALITY CONTROL:

- A. Field inspection and testing will be performed under provisions of Section 01 45 00.
- B. Inspect and test each circuit breaker to NEMA AB 1.

- C. Inspect each circuit breaker visually.
- D. Perform several mechanical ON-OFF operations on each circuit breaker.
- E. Verify circuit continuity on each pole in closed position.
- F. Determine that circuit breaker will trip on overcurrent condition, with tripping time to NEMA AB 1 requirements.
- G. Include description of testing and results in test report.

3.3. ADJUSTING:

- A. Adjust work under provisions of Section 01 70 00.
- B. Adjust trip settings so that circuit breakers coordinate with other overcurrent protective devices in circuit.
- C. Adjust trip settings to provide adequate protection from overcurrent and fault currents.

END OF SECTION 26 28 23

## SECTION 31 23 16 – TRENCHING

### PART 1 – GENERAL

#### 1.1. SCOPE

- A. The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to complete trenching for utilities and other work, as required in these specifications, on the drawings and as otherwise deemed necessary to complete the work

#### 1.2. RELATED WORK

- A. Applicable provisions of Division 1 shall govern all work under this section.

#### 1.3. SUBMITALS

- A. Provide copies of record drawings.
- B. Provide samples of each type of soil or aggregate proposed for use on the project. Samples shall consist of a minimum of 50 pounds of soil. The contractor shall be responsible for delivering soil samples to the testing agency as designated by the Engineer. Provide samples a minimum of 2 weeks prior to starting construction.
- C. Provide copies of material testing reports.

#### 1.4. RECORD DRAWINGS

- A. Maintain record drawings showing actual locations of utilities and other features encountered, modifications to proposed grades and site features, and other deviations from the original design.

#### 1.5. QUALITY ASSURANCE

- A. The Contractor shall complete quality assurance testing as outlined in Table 31 23 16.13-1:

Material	Test Required	Test/Sample Frequency
I.E. Granular Fill	<i>I.e. D2922-01 Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods</i>	<i>I.e. 1 test/500 lf trench</i>

Table 31 23 16.13-1

#### 1.6. PERMITS/FEES

- A. Contractor shall be solely responsible for obtaining all permits necessary to complete trenching work. The Contractor shall pay all fees associated with obtaining permits. These include, but are not limited to permits to work within right-of-way, utility connection permits, plumbing permits, electrical permits and other building permits.

- B. Contractor shall be responsible for transferring benchmarks, control points, lines and grades as necessary to complete his work.

#### 1.7. SUBMITTALS

- A. Section 22 05 00 Mechanical General Requirements: Requirements for submittals.
- B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of South Carolina.
- C. Dewatering Plan if required: Describe methods of dewatering and disposal of water.
- D. Product Data: Submit data for geotextile fabric indicating fabric and construction.
- E. Samples: Submit to testing laboratory, in air-tight containers, 10-pound sample of each type of fill.
- F. Materials Source: Submit name of imported fill material suppliers.
- G. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

#### 1.8. QUALITY ASSURANCE

- A. Perform Work in accordance with El Paso Water Utility Standard Specifications.
- B. Maintain one copy of document on site.

#### 1.9. FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

#### 1.10. COORDINATION

- A. Section 22 05 00 Mechanical General Requirements: Coordination and project conditions.
- B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

### PART 2 - MATERIALS

#### 2.1. UTILITY BEDDING AND COVER

- A. Class "B" stone chip bedding.

- B. Use bedding free from clumps, rocks, organic and frozen materials.
- C. Use crushed stone chips meeting the following for all direct buried utilities and utility tunnel:

<u>Gradation</u>	
<u>Sieve Size</u>	<u>% passing (by weight)</u>
1 inch	100
3/4 inch	90 to 100
1/2 inch	
3/8 inch	20 to 55
No. 4	0 to 10
No. 8	0 to 5
No. 100	

- D. Lifts not-to-exceed 18” see Table 31 23 16.13-2 for final compacted lift height.
- E. Each lift compacted to 90 percent of dry density in accordance with ASTM D1557

2.2. FREE DRAINING FILL

- A. Comply with ASTM C33 grading requirements. Washed gravel or crushed stone, 1/4 inch minimum, 3/4 inch maximum.

2.3. EARTH BACKFILL

- A. Sand/gravel non-cohesive non-expansive, free of vegetable matter, clay , rubbish, rock larger than 2 inches, boulders, concrete, paving, masonry debris, waste, frozen materials, other inorganic and deleterious materials. Existing material meeting these requirements can be reused.

2.4. CONTROLLED BACKFILL

- A. Sand or pit-run sand/gravel, meeting the following above all direct buried utility and utility tunnel:

<u>Gradation</u>	
<u>Sieve Size</u>	<u>% passing (by weight)</u>
2-1/2 inch	100
1 inch	90 to 100
3/4 inch	70 to 100
No. 4	60 to 100
No. 200	15 or less

2.5. FLOWABLE FILL

- A. Controlled low strength material (CLSM) or flowable slurry fill.
  - 1. Cement: Any Type, 100 lb/cu. yd & 50 lb. per cu. yd.
  - 2. Aggregate: None required for slurry fill, sand for utility support.
  - 3. Strength: 50 – 100 + psi @ 28 days.
  - 4. Slurry: As necessary.
  - 5. Fly Ash: Any class in quantity equal to cement.
- B. Thoroughly mix in a clean ready mix truck; run mixer at mixing speed for one minute just prior to placement to insure an even mixture.

2.6. CRUSHED STONE BEDDING

- A. Clean material meeting the requirements of “¾” Crushed Stone Chips” as defined in Section 6.43.2(a)2, regardless of pipe size, of Standard Specifications for Sewer and Water Construction.

2.7. CRUSHED STONE SCREENINGS

- A. Crushed stone free of organic material, concrete, asphalt and other debris. Material shall meet the requirements of “Crushed Stone Screenings” as defined in Section 6.43.2(b) of Standard Specifications for Sewer and Water Construction.

2.8. BEDDING SAND

- A. Sand meeting the requirements of “Bedding Sand” as defined in Section 6.43.2(c) of Standard Specifications for Sewer and Water Construction.

2.9. CEMENT SLURRY GROUT

- A. Portland cement based grout having a slump of 10”-12” and the following mix proportion (per CY):

Type 1 Portland Cement	100#
Class C Fly Ash	300#
Fine Aggregate	2700#
Water	400#
Air Entraining Admixture	35 oz

- B. Similar mix designs that are suitable for the intended use will be considered.

PART 3 - EXECUTION

3.1. PREPARATION

- A. General Contractor shall excavate and backfill the following utilities in accordance with this section:
  - 1. -Underground water pipe

2. -Manholes
3. -Sanitary piping.
4. -Lift station

- B. Remove excavated materials throughout day.
- C. No stockpiling of excavated materials on site.
- D. Review plans and prepare work plan and schedule. Coordinate any necessary interruptions in utility service with Engineer, in accordance with other specification sections.
- E. Layout work. Establish and transfer line and grade as necessary to complete the work.
- F. Remove topsoil from work area. Saw cut and remove pavement from the work area.

### 3.2. EXCAVATION

- A. Excavate to elevations and dimensions necessary to complete construction. Excavations shall be sufficiently deep to provide for bedding beneath pipes and structures, to provide steam tunnel water proofing and as otherwise required to complete the work as shown.
- B. For pipes less than 12" in diameter, maximum trench width at the top of the pipe shall be 3'. For pipes greater than 12" in diameter, the maximum trench width at the top of the pipe shall be no greater than the outside diameter of the pipe plus 2'.
- C. The trench width at the ground surface shall be minimized to the extent possible through the use of trench boxes, shields, or shoring, and as necessary to protect features and improvements that are shown to be protected on the drawings.
- D. The trench width at the ground surface shall not exceed the width of the trench at the top of the pipe by more than 2' without prior approval by the Engineer.
- E. Provide a minimum clearance of 6" from outside of pipe to the closest of either the sidewall of trench or inside wall of trench box, shield or shoring.
- F. Notify Engineer if trench subgrade consists of unstable soil, organic material, debris or other undesirable material.
- G. Segregate the various materials excavated. Reserve material meeting the requirements of backfill for the location. Excavated material that does not meet the requirements of backfill, and excess excavated material, shall be removed from the site and disposed by the contractor, unless directed otherwise by other specification sections or the Engineer.

- H. Locate bedding, backfill and spoil piles in accordance with OSHA requirements, and so that it does not interfere with public travel, adjacent landowners or other construction activities.
- I. Trench excavation shall be limited to that which can be excavated and backfilled within the same workday.
- J. Provide a dewatering sump with pump and emergency generator power in each excavation from the first day of excavation until the excavation is backfilled. Provide a sump with a pump and emergency generator power in each tunnel, new and existing steam pits from the first day of excavation until the excavation is backfilled and the permanent sump pumps are installed.
- K. Work necessary to expose existing underground facilities that are part of the Contractor's statutory obligation during the normal storm sewer, sanitary sewer, chilled water, steam, condensate and compressed air utilities, electrical conduit or water main installation shall be considered as incidental to those respective items.

3.3. SUPPORT OF EXISTING UTILITIES

- A. Contractor shall support all conduits, sewers, structures, piping, wiring and cables that are exposed due to trenching and excavations.

BACKFILL AND COMPACTION

- B. Backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed and the excavation cleaned of trash and debris.
- C. Backfill trenches from elevations 12" above utility cover material to subgrade below pavements, base course, and topsoil as required by the plans and other Contract Documents. Where final restoration will be delayed, backfill trench to existing grade to provide a safe, free-draining surface. Ramp around structures left above surface.

- 3.4. It is the responsibility of the Contractor to provide all necessary compaction equipment and other grading equipment that may be required to obtain the specified density. Vibratory plate or tamping type walk behind compactors will be required whenever backfill is placed adjacent to structures, pipes, utility lines and other features.

Location	Required Material	Maximum Compacted Lift Thickness	Minimum Proctor Compaction	Minimum Relative Density <sup>(a)</sup>
Bedding Beneath Footings, Slabs, Materials	Controlled Backfill	12"	95%	70%

Location	Required Material	Maximum Compacted Lift Thickness	Minimum Proctor Compaction	Minimum Relative Density <sup>(a)</sup>
for Structures	II		Modified	
Bedding Materials Beneath Utilities	Utility Bedding and Cover	12"	95% Modified	70%
Areas Between Top Soil and Utility Cover	Earth Backfill	12"	90% Modified	50%

1. Minimum relative density as determined by ASTM D-4253-00 for coarse-grained soils with less than 15% by mass passing the No. 200 sieve. Applicable only when minimum proctor compaction cannot be achieved.

Table 31 23 16.13-2

### 3.5. GRADING

- A. Grading shall include areas necessary to establish new grades as required, additional areas disturbed by construction activities, storage, equipment including all trenching, where excess fill is deposited and where cutting is required.

### 3.6. RESTORATION

- A. Restore trenches to proposed grades and surfaces as soon as practicable after backfilling.
- B. Remove excess bedding, backfill and spoil material from the site as soon as possible after backfilling is complete, but no later than 1 calendar dates after backfilling is complete.

END OF SECTION