



Contract Documents for the Construction of
 Sacramento Regional Wastewater
 Treatment Plant

BOARD OF DIRECTORS

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DIGESTERS AND GMS
 (GAS MANAGEMENT SYSTEM)
 ELECTRICAL UPGRADES PROJECT
 RFB 8218

VOLUME 1 OF 2

PART A - SPECIFICATIONS

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SECTION 00 01 10

TABLE OF CONTENTS

PART A - SPECIFICATIONS

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

00 01 10 TABLE OF CONTENTS

DIVISION 01 – GENERAL REQUIREMENTS

01 33 00 SUBMITTAL PROCEDURES
01 65 00 PRODUCT DELIVERY REQUIREMENTS
01 78 39 PROJECT RECORD DOCUMENTS

DIVISION 03 - CONCRETE

03 11 00 CONCRETE FORMING
03 15 20 ANCHORAGE IN CONCRETE AND MASONRY
03 60 00 GROUTING

DIVISION 09 - FINISHES

09 06 90 SCHEDULES FOR PAINTING AND COATING
09 90 00 PAINTING AND COATING

DIVISION 26 - ELECTRICAL

26 05 00 COMMON WORK RESULTS FOR ELECTRICAL
26 05 21 ELECTRICAL POWER CONDUCTORS AND CABLES
26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 05 34 RACEWAYS, FITTINGS, AND BOXES FOR ELECTRICAL
 SYSTEMS
26 06 20.16 ELECTRICAL PANELBOARD SCHEDULE
26 06 20.21 ELECTRICAL RACEWAY SCHEDULE
26 06 20.25 ELECTRICAL CABLE SCHEDULE
26 06 50.16 LIGHTING FIXTURE SCHEDULE.
26 08 10 ACCEPTANCE TESTING OF ELECTRICAL SYSTEMS
26 24 16 PANELBOARDS
26 27 26 WIRING DEVICES
26 50 00 LIGHTING

PART B – DRAWINGS

****END OF SECTION****

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

- A. Submittals include, but are not limited to, product data, shop drawings, test procedures, test results, annotated PLC program listings, AutoCAD® generated drawings, samples, requests for substitutions, descriptive data, certificates, methods, schedules, marked contract drawings and specifications, manufacturer's installation and other instructions, and miscellaneous work related items. Submittals also include all other information as may reasonably be required, in the opinion of the District Representative, to demonstrate fully that the materials and equipment to be furnished and the methods of work comply with the provisions and intent of the contract documents. Additional submittal requirements are specified in each individual section of the specifications. Items to be submitted are specified in these individual technical specification sections.
- B. Minimum size lettering height on all submittals shall be 12 point font for text documents, 1/16 inch height for 8-1/2 by 11 inch and 11 by 17 inch documents and 1/8-inch height for documents larger than 11 by 17.
- C. The review of the Contractor's drawings or other descriptive material shall not relieve the Contractor of responsibility for any error or of any obligation for accuracy of dimensions and details, for agreement and conformity with the contract drawings and specifications, or responsibility to fulfill the contract. If errors or omissions exist in the Contractor's submittals which are not noted by the District during the District's review, it shall be the Contractor's responsibility, at no additional cost to the District, to correct the errors and omissions, to correct field conditions, and to repair any damage inflicted to new or existing equipment and other improvements as a result of the errors or omissions.
- D. Where specified, the Contractor shall furnish submittals to the District Representative for information only. An electronic version and two hard copies these submittals shall be transmitted to the District Representative. Designation "For Information Only" does not preclude the District Representative from reviewing or commenting on the submittal contents as specified in this section.
- E. All other submittals shall be submitted by the Contractor to the District Representative for review and comment. An electronic version and two hard copies of these submittals shall be transmitted to the District Representative.
- F. All submittal data including shop drawings will become part of the project records furnished under the PROJECT RECORD DOCUMENTS Section (01 78 39). All

changes or modifications during construction to original equipment submittals must be recorded and become part of the project record.

1.02 DEFINITIONS

A. GENERAL:

1. The definitions of types of drawings, diagrams and other forms of submittal documents shall include the terms used in the following paragraphs. Whenever the following terms for drawings or other forms of submittal documents are used in submittal requirements, the definitions in the following paragraphs shall apply. The following set of definitions is not comprehensive. They are included to help clarify the meanings of certain terms applicable to mechanical, electrical, instrumentation and control system documents.

B. SINGLE-LINE DIAGRAMS:

1. A single-line diagram shall show by means of single lines and graphical symbols the course of an electrical circuit or system of circuits and components, devices, or parts used therein. Physical relationships are represented schematically.

C. ELEMENTARY OR SCHEMATIC DIAGRAM:

1. An elementary or schematic diagram shall show all circuits and devices of a system, equipment item, or assembly, or any defined functional portion thereof. A system is defined as any assembly of electrical, electronic, mechanical, hydraulic, pneumatic, and other various types of components and devices and/or materials which are combined, connected, and integrated as necessary to perform some specific function. Such a diagram emphasizes the functional arrangement of system components and devices as opposed to their physical arrangement, and is intended to provide a functional understanding the operation of the system or circuit. "Elementary" and "schematic" are equivalent terms unless additional definitions or requirements are stated. However, the term "elementary" as used herein for electrical drawings generally refers to those drawings and diagrams which show the connection and control of electrical devices, whereas the term "schematic" generally refers to those drawings or diagrams which show the connection and application of electronic devices. (Note: Most elementary diagrams provided in the contract drawings are located on "X" drawings titled "Control and Logic Diagrams.")

D. LOOP DIAGRAM (NOT USED)

E. CONNECTION DIAGRAM:

1. Connection diagrams shall show the physical placement and wiring of devices and terminals in a panel, cabinet, console, assembly or system. Devices and terminals

are shown arranged in the physical layout (not necessarily to scale) as they would appear to a person who is servicing the equipment.

- F. INTERCONNECTION DIAGRAM (NOT USED)
- G. PANEL FABRICATION DRAWINGS (NOT USED)
- H. ELECTRONIC ASSEMBLY DRAWINGS (NOT USED)
- I. INSTRUMENT INSTALLATION DRAWINGS (NOT USED)
- J. BILL OF MATERIALS:

- 1. Materials identified on the drawing and listed by item number, a brief description, manufacturer, model number (and/or page number), serial number (if available), and quantity used. Associated equipment numbers must be shown. The items must match the field installation and the drawing.

1.03 STANDARD COMPLIANCE

- A. When materials or equipment are required to conform to the standards of organizations such as the American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA) and Underwriter's Laboratories (UL), documents showing or proving conformance shall be submitted.
- B. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified in the individual sections. In lieu of the label or listing, the Contractor shall submit a certificate from an independent testing organization which is competent to perform acceptable tests and is approved by the District's Representative. The certificate shall state that the item has been tested and found to be in conformance with the specified organization's standard. For materials and equipment whose compliance with organizational standards or specifications is not regulated by an organization using its own listing or label as proof of compliance, a certificate of compliance from the manufacturer shall be submitted for approval. The certificate shall identify the manufacturer, the product and the referenced standard and shall state that the manufacturer certifies that the product conforms to all requirements of the project specification and of the referenced standards listed.

1.04 SUBMITTAL REVIEW

- A. When review and comment is required of any drawing or information regarding materials and equipment, the District Representative will return the submittal documents indicating one of the following four actions by item number:

1. If review and comment indicates no exceptions, copies will be returned marked "NO EXCEPTIONS TAKEN". Work may begin immediately on incorporating the material and equipment covered by the submittal into the work.
 2. If review and comment indicates limited corrections are required, copies will be returned marked "MAKE CORRECTIONS NOTED". Work may begin immediately on incorporating the material and equipment covered by the submittal document into the work.
 3. If review and comment indicates insufficient or incorrect data has been submitted, copies will be returned marked "AMEND AND RESUBMIT." The Contractor is not authorized to begin incorporating the material and equipment covered by this submittal document into the work until the submittal document is revised, resubmitted and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".
 4. If review and comment indicates the material and equipment submittal is unacceptable, copies will be returned marked "REJECTED - SEE REMARKS". The Contractor is not authorized to begin incorporating the material and equipment covered by this submittal into the work until a new submittal is made, resubmitted, and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".
- B. When submittal documents are referred to in these specifications as "approved," "reviewed" or "accepted," this means that they are stamped as in case 1 or 2 above.
- C. Designation of submittal documents "for information only," does not preclude the District's Representative from reviewing or commenting on the submittal contents. Information only submittals returned to the Contractor marked "AMEND AND RESUBMIT" or "REJECTED - SEE REMARKS" shall be revised and resubmitted by the Contractor.

PART 2 -- PRODUCTS

2.01 SHOP DRAWINGS (NOT USED)

2.02 MANUFACTURER'S PRODUCT DATA

- A. Product data shall include data of all forms which define design, performance and function of manufactured products or materials. This includes all preprinted literature, performance specifications, drawings, instruction manuals, and data which are available from the original equipment manufacturer and/or supplier. Product data shall be submitted for all manufactured products and material as specified in this section and in the Technical Specifications, Divisions 03 through 26.

2.03 TEST PROCEDURES AND RESULTS

- A. Refer to the individual technical specifications for the submittal requirements of test procedures and results.

2.04 SAMPLES (NOT USED)

2.05 MISCELLANEOUS SUBMITTALS

- A. These include, but are not limited to, warranties, guarantees, certifications, maintenance agreements, quality testing reports and similar information, devices and materials.

2.06 PROJECT RECORD DRAWINGS AND DATA

- A. Refer to the PROJECT RECORD DOCUMENTS Section (01 78 39) for the submittal requirements of as-built drawings and data.

2.07 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

2.08 BURIED UTILITIES (NOT USED)

2.09 SCHEDULE (NOT USED)

PART 3 -- EXECUTION

3.01 SUBMITTAL REQUIREMENTS

A. GENERAL:

- 1. Submittals shall be reviewed and coordinated by the Contractor before transmittal to the District Representative. Submittals shall be complete and fully identified by the Contractor.

B. PREPARATION

- 1. Each submittal shall contain documents which are related to only one material, product or system. Normally, a separate submittal shall be used for each specific item or class of material, equipment or system. Exceptions may be allowed only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates checking or review of the group or "package" as a whole. The Contractor shall mark each submittal document with the submittal number, letter suffix and item number.

- 2. (Not Used)

C. TRANSMITTAL FORM (NOT USED)

D. DOCUMENT IDENTIFICATION (NOT USED)

E. RESUBMITTALS:

1. Revise returned submittal documents as indicated and as required. Resubmit using the same submittal procedure as for an initial submittal. All resubmittals shall use the previous submittal number with a letter suffix and shall refer to the previous item number.
2. Resubmittals shall address all comments from the District Representative. Partial re-submittals may be returned "REJECTED." The Contractor will be responsible for the District Representative's review costs for each re-submittal in excess of the first resubmittal. These costs will be back charged to the Contractor and will be deducted from progress payments.
3. Time extensions will not be granted for delays resulting from the necessity for the Contractor to provide resubmittals due to inaccurate, incomplete or rejected submittals.

F. COORDINATION AND SEQUENCING:

1. Review priority will be based on the schedule unless otherwise requested in writing by the Contractor.
2. The Contractor shall coordinate submittals with the work so that work will not be delayed. Submittals shall be coordinated and scheduled into different categories, so that one will not be delayed for lack of coordination with another. No extension of time will be allowed because of failure to properly schedule submittals. The Contractor shall not proceed with work related to a submittal until the submittal process is complete and the submittal document has been returned to the Contractor stamped "No Exceptions Taken" or "Make Corrections Noted."
3. All submittals, including shop drawings, shall be submitted in sufficient time to allow the District Representative not less than 21 days for review of such submittals.
4. These review periods do not include any time that the District Representative cannot proceed further with the review because of having to wait for further information of clarification from the Contractor.
5. Normally, initial submittals will be returned to the Contractor within 21 days, and resubmittals will be returned within 14 days, exclusive of any time awaiting clarification or further information, and exclusive of "major submittals" as described above. However, the time for return will necessarily vary and may exceed the time described above depending upon the complexity of the submittal, the number of submittals, and the express needs of the Contractor.

6. Submittals for material or equipment which are not specified by name, and which are being submitted as an "or equal" to that specified and submittals for material or equipment with arrangements or requirements that are different than that shown in the contract documents, will normally require 30 days for the review process.

G. CONTRACTOR'S RESPONSIBILITIES:

1. The Contractor shall review submittals before they are transmitted to the District Representative to ensure that there are no conflicts with other submittals. The Contractor shall coordinate submittals from subcontractors and suppliers to ensure that they are complete and that there are no conflicts.
2. The Contractor is responsible for errors and omissions in submittals even though the District's Representative reviews the submittal.
3. The District Representative shall be notified in writing at the time the submittal is transmitted of deviations from the requirements of the contract documents. The Contractor is responsible for correcting deviations from the contract documents even though the District Representative has reviewed the submittal, unless the deviations are clearly described in writing in the submittal transmittal form.
4. The Contractor shall be responsible for distributing submittals which have been returned with the District's Representative's action to subcontractors and suppliers. Installation shall not be started until the submittal data with the "No Exceptions Taken" or "Make Corrections Noted" stamp is in the possession of the installer.
5. No changes shall be made by the Contractor in any submittal after it has been approved. The equipment or materials provided shall not deviate from the submittal documents which are stamped with the "No Exceptions Taken" or "Make Corrections Noted" stamp in any way except with written approval by the District Representative.
6. The Contractor shall certify on each submittal document that the submittal has been reviewed, field conditions have been verified and contract documents have been complied with.
7. The Contractor may authorize a material or equipment supplier to deal directly with the District Representative with regard to such submittals; however, ultimate responsibility for the accuracy and completeness of the information contained in the submittal shall remain with the Contractor.

H. REQUESTS FOR SUBSTITUTION:

1. The Contractor may offer to substitute material or equipment if permitted by the technical specifications. The District will consider offers for substitution only from the Contractor unless the substitution/or equal submission is made pre-bid. Post-bid

the District will not acknowledge or consider such offers from suppliers, distributors, manufacturers, or subcontractors.

2. The Contractor's offers of substitution shall be made in writing to the District Representative in ample time to permit review without delaying the work. Until and unless such substitutions are approved by the District Representative, no deviations from the specifications shall be allowed. Time extensions will not be granted for requests for substitution which are subsequently denied by the District Representative. Time extensions will not be granted for substitutions which are not submitted in a timely manner. Any request for substitutions shall include sufficient data to enable the District Representative to assess the acceptability of the material or equipment for the particular application and requirements.
3. The Contractor shall submit a brief description of the proposed substitution prior to preparing a detailed submittal. The brief description shall be submitted on a Request for Substitution/Construction Incentive Change Proposal (CICP) form. Within 15 working days, the District Representative will review the proposal in concept and respond. If the District Representative accepts the concept of the substitution, the Contractor may prepare a detailed submittal conforming to the requirements of this section.
4. Any cost differential associated with a request for substitution must be negotiated with the District Representative. These costs or savings must be covered by a change order which modifies the contract documents.

I. DRAWINGS FOR MODIFIED PANELS AND OTHER CONTROL SYSTEM COMPONENTS (NOT USED)

3.02 PROPRIETARY INFORMATION (NOT USED)

3.03 MANAGEMENT OF THE SUBMITTAL PROCESS (NOT USED)

****END OF SECTION****

SECTION 01 65 00

PRODUCT DELIVERY REQUIREMENTS

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

- A. Equipment, products and materials shall be shipped, handled, stored, maintained and installed in ways which will prevent damage to the items. Damaged items will not be permitted as part of the work except in cases of minor damage that have been satisfactorily repaired and are acceptable to the District Representative.
- B. Failure of Contractor to properly store and maintain equipment and materials will result in rejection of the equipment or material or a withholding from the progress payment.
- C. Deliveries to the SRWTP must include the contract number and name of the project on all delivery manifests.

1.02 MATERIALS

- A. Materials shall be handled, stored, and installed as recommended by the manufacturer. Pipes with paint, tape coatings, linings or the like shall be stored to protect the coating or lining from physical damage or other deterioration.

1.03 EQUIPMENT

A. PACKAGE AND MARKING:

- 1. All equipment shall be protected against damage from moisture, dust, handling, or other cause during transport from manufacturer's premises to site. Each item or package shall be marked with the number unique to the specification reference covering the item.
- 2. (Not Used)

B. IDENTIFICATION:

- 1. Each item of equipment shall have permanently affixed to it a label or tag with its equipment number designated in this contract. Label or tag shall be of stainless steel. Location of label will be easily visible.

C. SHIPPING (NOT USED)

D. FACTORY APPLIED COATINGS:

1. Unless otherwise specified, each item of equipment shall be shipped to the site of the work with the manufacturer's shop applied prime coating which is compatible with the field applied coating as specified in the PAINTING AND COATING Section (09 90 00). The prime coating shall be applied over clean dry surfaces in accordance with the coating manufacturer's recommendations. The prime coating will serve as a base for field-applied finish coats. Electrical equipment and materials shall be painted by manufacturer as specified in the PAINTING AND COATING Section (09 90 00).

E. STORAGE:

1. During the interval between the delivery of equipment to the site and installation, all equipment, unless otherwise specified, shall be stored in an enclosed space affording protection from weather, dust and mechanical damage and providing favorable temperature, humidity and ventilation conditions to ensure against equipment deterioration. Manufacturer's recommendations shall be adhered to in addition to these requirements.
2. Equipment and materials to be located outdoors may be stored outdoors if protected against moisture condensation. Equipment shall be stored at least 6 inches above ground. Temporary power shall be provided to energize space heaters or other heat sources for control of moisture condensation. Space heaters or other heat sources shall be energized without disturbing the sealed enclosure.

F. PROTECTION OF EQUIPMENT AFTER INSTALLATION:

1. After installation, all equipment shall be protected from damage from, including but not limited to, dust, abrasive particles, debris and dirt generated by the placement, chipping, sandblasting, cutting, finishing and grinding of new or existing concrete, terrazzo and metal; and from the fumes, particulate matter, and splatter from welding, brazing and painting of new or existing piping and equipment. As a minimum, vacuum cleaning, blowers with filters, protective shieldings, and other dust suppression methods will be required at all times to adequately protect all equipment. The protection of equipment shall also apply to disassembled equipment. During concreting, including finishing, all equipment that may be affected by cement dust must be completely covered. During painting operations, all equipment nameplates, grease fittings, and similar openings shall be covered to prevent the entry of paint.

G. PREVENTIVE MAINTENANCE (NOT USED)

1.04 SUBMITTALS

- A. Prior to equipment delivery, Contractor shall submit pre and post installation preventive maintenance (PM) instructions recommended by the manufacturers for Major Equipment. Contractor shall conduct an ongoing monthly PM program during construction on all Major Equipment and any minor equipment requiring PM per the manufacturer's recommendations. The PM program shall be witnessed by the District Representative. Contractor shall monthly submit information in accordance with the SUBMITTAL PROCEDURES Section (01 33 00) on the status of all equipment in the PM program. Failure of Contractor to properly maintain the equipment shall result in rejection of the equipment or a withholding from the progress payment.

****END OF SECTION****

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

- A. Project record documents (commonly known as “as-builts”) shall show the actual as-constructed conditions of installed or modified systems, equipment and material at the time of field acceptance of the related portions of work. The purpose of as-built documents is to provide accurate information for the future modification, expansion, operation and maintenance of the plant.
- B. The project record documents are especially important for recording field conditions of embedded or concealed material and equipment. These embedded or concealed items shall include, but are not limited to, buried structures, thrust restraints, backfill material, piping, cables and raceways.
- C. Work related to Field Instructions (FI), Contract Change Orders (CCO), Clarifications or other agreements between Contractor and the District Representative shall be considered part of the project record process. Contractor shall record conditions and/or changes relating to this work on the project record documents.
- D. (Not Used)
- E. Divisions 1 through 50 may contain additional project record document requirements which shall be met in accordance with the requirements of this section.

1.02 VALUES (NOT USED)

PART 2 -- PRODUCTS

2.01 DISTRICT-SUPPLIED DRAWINGS AND CONTRACT DOCUMENTS

- A. The following District-supplied drawings, contract documents, and AutoCAD files are to be submitted in as-built condition for review by the District Representative:
 - 1. Contract drawings and specification schedules.
 - 2. Contract supplemental drawings, existing plant drawings, schedules affected by the work of this contract. These drawings and documents cover electrical distribution systems and electrical control panels.

3. Drawings, agreements, tabulations, and schedules supplied by District as a result of Requests for Information (RFIs), Field Instructions (FIs), and Change Orders (COs).

2.02 CONTRACTOR-SUPPLIED DRAWINGS AND OTHER DOCUMENTS

- A. The following Contractor supplied drawings, other contract documents, and AutoCAD files shall be submitted in project record condition for review by the District Representative:
 1. Shop drawings generated by Contractor, sub-contractors, vendors or suppliers as defined in the SUBMITTAL PROCEDURES Section (01 33 00).
 2. (Not Used)
 3. Operation and maintenance manual documents, drawings, and schedules supplied by Contractor, subcontractors, vendors, or suppliers.

PART 3 -- EXECUTION

3.01 GENERAL

- A. Contractor immediately upon setting up the job site field office shall set up a designated area for project record keeping. An accurate neatly marked complete set of full-size contract drawings, documents and shop drawings (including specifications and schedules) shall be designated as the as-built record set.
- B. Contractor shall immediately start recording project record information upon doing any work.
- C. Contractor shall keep those documents current with changes reflecting as-built status as construction proceeds.
- D. Although some drawings are considered diagrammatic with respect to placement of conduit, piping, etc., Contractor must closely follow the routing shown. If there are deviations, Contractor must show the as-built conditions as work progresses and provide all changes to the project record documents with dimensions as outlined below:
 1. Buried or embedded items within buildings, tunnels and other structures including but not limited to, piping, thrust restraints, electrical raceways, cables, duct banks, or other related appurtenances, in or under concrete, asphalt or soil, which are not placed as shown on the drawings, shall show as-built dimensions horizontally and vertically from a wall, formed footing, finish floor, ceiling or finish top of curb. Items placed in the center of concrete slabs do not need to have vertical dimensions.

2. All buried or embedded items as described above which are outside of buildings shall be tied to the plant survey grid system both horizontally and vertically with proper stationing, invert elevations and/or top of buried item. Survey data shall show all transition points (changes in direction, change in elevation, etc.). All items which are installed by horizontal or vertical curves shall show as-built curve data.

3.02 PROJECT RECORD KEEPING

- A. All project record documents shall be marked-up copies, with erasable colored pencils using the following color coding:
 1. Red - Additions including notes and dimensions.
 2. Green - Deletions (By hash marks or appropriate lines through the deletion.)
 3. Graphite - General comments and notes used by Contractor or District's Representative and not required on the as-built.
 4. Yellow - Work completed as shown and used by District's Representative in field review of the as-built, during the submittal phase.
 5. Blue - District's Representative's office verification and notes required to be added and noted by District's Representative in review of the as-built, during submittal phase.
- B. All work shall be neatly organized and legible using the same standards and symbols as the original drawing.

3.03 MAINTAINING PROJECT RECORD DOCUMENTS

- A. Contractor shall maintain a neatly marked full size set of project record documents. All District-supplied documents shall have shop drawing references clearly marked with clouds around the areas which are detailed on the shop drawing. Shop drawings referenced to other associated shop drawings shall have drawing references clearly marked with clouds around the area representing the shop drawing.
- B. Abbreviation of the drawing Originator (Contractor, subcontractors, vendors or suppliers) referenced on the contract documents is unacceptable.
- C. In areas where detail does not permit showing as-built conditions clearly on contract drawings but a shop drawing depicts actual as-built condition of the area, a cloud with shop drawing reference may be accepted at the District Representative's discretion. Otherwise all as-built conditions shall be shown on the contract drawings.
- D. The project record documents and one copy of all approved shop drawings and one copy of the approved O&M instructions shall be kept in a central location on the job

site providing access for all associated with the contract, for updating of as-built information and for review during normal business hours.

- E. The project record documents shall be kept current using the mark-up procedures described herein. These documents shall be available for inspection by the District Representative at all times.
- F. (Not Used)

3.04 PROJECT RECORD SUBMITTAL PROCESS

A. GENERAL:

1. All project record documents shall be submitted electronically in accordance with the SUBMITTAL PROCEDURES Section (01 33 00).
2. Project record documents shall be completed and submitted prior to Substantial completion of each area or subsystem. Contractor shall compare all as-built documents with the actual field conditions and show the actual field conditions on the as-built documents before submitting them for review.
3. Project record submittals shall be rejected without any part being reviewed for any of the following reasons:
 - a. Work has not been completed, including work related to Field Instructions, Change Orders, clarifications, or other agreements pending.
 - b. Not all components and equipment have been properly labeled on the drawings. All equipment numbers (device and equipment number labeling codes) shall be shown on all drawings depicting the equipment. Equipment numbers must be coordinated with the plans and drawings and shown on all District-supplied and all contractor supplied drawings that depict equipment.
 - c. Actual field conditions are not substantially shown on the documents.
 - d. Drawing cross references are incomplete. District supplied drawings must be cross referenced to Contractor-supplied drawings and Contractor-supplied drawings must be cross referenced back to the District-supplied drawings.

B. PROJECT RECORD GROUPS AND SYSTEMS (NOT USED)

C. PRELIMINARY REVIEW PROCESS (NOT USED)

D. PROJECT RECORD SUBMITTALS FOR REVIEW AND COMMENTS

1. Contractor shall submit the original full size markups, one (1) set of full size copies of all District-supplied documents and two (2) sets of Contractor-supplied as-built

record documents for each submittal or re-submittal as outlined in this section. One (1) set of Contractor supplied as-built documents shall be returned after each submittal review.

2. Contractor shall correct the original hard copy drawings and AutoCAD drawings once the District Representative has returned the marked up Contractor supplied documents "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED". Contractor shall then supply the mark-ups, and the AutoCAD drawing files electronically as part of the resubmittal package, along with a hard copy of the drawing files.

E. DOCUMENT IDENTIFICATION:

1. Each separately bound document within a submittal shall have the following information shown on it:
 - a. Submittal number
 - b. Document item number within this submittal
 - c. Identification of product or material
 - d. Manufacturer's name

F. COORDINATION AND SEQUENCE:

1. Contractor shall coordinate the submittals with the work as outlined in this section. No extension of time will be allowed because of failure to properly schedule as-built submittals as outlined in this section. The submittal will be returned to Contractor within twenty-one (21) working days of receipt by the District Representative, exclusive of any time waiting for clarification or further information from Contractor. The time for return will vary and may exceed 21 days depending on the complexity of the submittal and the number of submittals.

G. PROJECT RECORD RE-SUBMITTALS:

1. Returned project record submittal documents shall be revised as indicated by the District Representative's comments as required. Re-submittal shall be done by using the same submittal number with an alpha suffix after the submittal number. Reference to the previous submittal number and item number is required when resubmitting. Re-submittals shall address all comments from the District Representative. Partial re-submittals will not be reviewed and will be returned in their entirety REJECTED. Contractor will be responsible for the District Representative's review cost for each re-submittal in excess of the first re-submittal. These costs will be back-charged to Contractor and will be deducted from the progress payment.

H. SUBMITTAL REVIEW:

1. GENERAL: The following are the four (4) possible Review Codes each document item can receive:
 - a. "A" - NO EXCEPTIONS TAKEN: the as-built document is approved as is.
 - b. "B" - MAKE CORRECTIONS NOTED: limited corrections are required. Copies will be returned with remarks as to corrections required.
 - c. "C" - AMEND AND RESUBMIT: insufficient or incorrect data has been submitted or data is missing to complete the review. Copies will be returned with remarks requiring re-submittal with deficiencies corrected.
 - d. "D" - REJECTED: Submittal is unacceptable and does not meet the requirements of these specifications, the document will be returned with remarks. A complete submittal may be REJECTED for excessive errors.
2. The Review Status and approval of District supplied drawings and documents shall be as follows:
 - a. As-built drawings and documents which receive an "A" Review Status are approved as as-built. District's Representative will stamp the document As-Built, sign and date it. The document will not be returned to Contractor unless it is a partial or tied to a related document which has not received an "A" status in the submittal.
 - b. As-built drawings and documents which receive a "B," "C" or "D" Review Status will be returned with comments indicating corrections needed.
 - c. Submittals of as-built AutoCAD drawings shall be subject to the same submittal requirements as other as-built documents.
3. The Review Status and approval of Contractor supplied drawings and documents shall be as follows:
 - a. As-built drawings and documents receiving an "A" Review Status are approved as as-built. District's Representative will stamp the document As-built, sign and date it. This document will be returned for AutoCAD update, as required.
 - b. As-built drawings and documents receiving an "B", "C", or "D" will be returned with comments directed at corrections needed.
 - c. Submittals of as-built AutoCAD drawings shall be subject to the same submittal requirements as other as-built documents.

3.05 PAYMENT (NOT USED)

****END OF SECTION****

SECTION 03 11 00

CONCRETE FORMING

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. Forms shall be designed, constructed, and maintained so as to insure that after removal of forms the finished concrete will have true surfaces free of offset, waviness or bulges and will conform accurately to the indicated shapes, dimensions, lines, elevations, and positions. Provide opening in forms for the embedded work of other sections. Provide all form accessories and form stripping after concrete has cured.
2. Design for formwork and falsework is the Contractor's responsibility. The Contractor shall obtain the services of a civil or structural engineer registered in the State of California to review and stamp formwork and falsework design. The design Engineer shall have a minimum of 3 years of experience in this type of design work.
3. Preinspection of the falsework or vertical shoring prior to placement of concrete is the Contractor's responsibility. An engineer who is registered as a civil or structural engineer in the State of California shall supervise the preinspection of the falsework or vertical shoring system for conformity with the working drawings.

1.02 REFERENCES

- A. REFERENCE STANDARDS: The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of referenced publications in effect at the time of the bid shall govern except where a specific date or edition is given below. In case of conflict between requirements of this section and the listed standards, the requirements of this section shall prevail.

American Concrete Institute (ACI):

| <u>Reference</u> | <u>Title</u> |
|------------------|---|
| 117 | Specifications for Tolerances for Concrete Construction and Materials |
| 301 | Specifications for Structural Concrete for Buildings |
| 347R | Guide to Formwork for Concrete |
| 350 | Environmental Engineering Concrete Structures |
| SP4 | Formwork for Concrete |

National Institute of Standards:

| <u>Reference</u> | <u>Title</u> |
|------------------|-------------------------------------|
| PS 1 | Construction and Industrial Plywood |

B. DEFINITIONS: (Not Used)

1.03 SUBMITTALS

- A. The following information shall be submitted for review in accordance with SUBMITTAL PROCEDURES Section (01 33 00).
1. A copy of this specification section, with addenda updates, with each paragraph, check marked to show specification compliance or marked to show deviation.
 2. Shop drawings shall be prepared and stamped by a civil or structural engineer registered in the State of California.
 - a. Formwork and Falsework: Before starting concrete work, the contractor shall submit formwork or falsework drawings of all formwork and falsework showing form plywood patterns, formwork, ties, vertical limits of concrete placements, horizontal lifts, and construction joints.
 - b. Bracing, Shoring and reshoring drawings and calculations: If shoring the structure is required, submit drawings and structural calculations showing members, connections, and anchorage of the proposed shoring system.
 3. Formwork designer qualifications.
 4. Manufacturer's data:
 - a. Form System

- b. Form Material
 - c. Form Accessories
5. The Contractor shall submit for review and comment coordination (lift) drawings for all concrete placements prior to placing concrete. The drawings shall show as a minimum the following information:
- a. Construction.
 - b. All joint types and locations.
 - c. Waterstop.
 - d. All embedded material/items (architectural, mechanical, electrical, etc.).
 - e. All openings and penetrations.
 - f. These drawings shall show concrete type, concrete quantity, finish, and curing requirements. If more than one placement is shown, the placing shall be indicated.
 - g. Each concrete placement shall have a separate schedule activity. The CPM schedule activity for each concrete placement shall be shown on the coordination drawings.
 - h. The coordination drawings shall be certified for completeness and accuracy by the Quality Control manager prior to submittal.
 - i. The coordination drawings need not be prepared by a registered engineer.

PART 2 -- PRODUCTS

2.01 FORM SYSTEM

- A. Utilize a manufacturer's standard system or a custom designed system which shall include clamps, lugs, brackets, jacks, braces, aligners, ties, spreaders, and all other hardware necessary for a wood, aluminum, or steel form system. Manufactured form system shall be by the Burke Company, Symons Corporation, or equal.

2.02 FORM MATERIALS

- A. Plywood shall be new and unused exterior grade plywood panels manufactured in accordance with APA (American Plywood Association) and bearing the trademark of that group. Plywood shall be APA Douglas Fir B-B Plyform Class 1 Exterior 48-inches by 96-inches by 3/4-inch minimum thickness.
- B. When approved by the District Representative, plywood may be reused.

- C. Formboard shall be phenolic resin covered. Formboard shall be Douglas fir APA inspected, cross laminated with waterproof phenolic resins one side and sanded "B" Grade on the back. Resin coated plywood shall be Burke Concrete Accessories "Neotex Form Panels," or equal.
- D. Framing lumber shall be Douglas fir "Standard" or better grade, sizes to uniform width and depth.
- E. Sheathing shall be Douglas fir "Construction" grade boards and sheathing, 10-inch maximum board width.
- F. Aluminum and steel panels and components shall be part of a manufacturer's standard or engineered form system.

2.03 FORM TIES AND ACCESSORIES

- A. For liquid retaining structures, ties shall have a minimum 1-1/2-inch break-back and plastic cones 1-1/4-inch diameter with sharp taper, 1-1/2-inches long. The tie system shall be leakproof. Provide ties with a neoprene waterseal washer at the midpoint. Furnish Dayton-Superior A series with A-8 washer, Symons S series with water seal, or equal.
- B. Other formed concrete ties shall be adjustable type, arranged to leave no metal within 1-1/2-inch of surface. They shall have no lugs, cones, or other devices that will leave holes larger than 1-inch diameter in exposed concrete surfaces. Spreaders shall be either type designed for use with approved clamps of separate metal spreaders. Do not use wood spreaders or wire ties. Furnish Burke Pentaties series, Symons S series, or equal.
- C. Form coating shall be non-staining, and shall not inhibit the specified coating to be applied to the finished concrete. Furnish Burke QC release agent, or equal.
- D. Plywood form joint tape shall be Burke Vinyl foam tape, or equal.

PART 3 -- EXECUTION

3.01 GENERAL

- A. Design construction, erection, use and removal are the Contractor's responsibility and shall conform to ACI 301, 347R, 350, and SP-4 and as specified herein.
- B. Formwork shall be installed so that it will safely support all vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Vertical or lateral loads must be carried to the ground by the formwork and shoring system or by the in-place construction that has adequate capacity for that purpose. Formwork and falsework vertical and lateral loads shall also include live loads, wind loads, and construction loads together with appropriate safety factors and load

multipliers to conform with ACI 347R. All formwork shall be mortar tight. Tie systems shall provide for positive pressure at all joints to preclude grout leakage.

- C. Provide openings for mechanical and electrical work and work of other sections. Place items specified in the METAL SPECIALTIES Section (05 59 00) which are to be embedded in concrete and support on framework. Seal forms around openings to prevent concrete seepage.
- D. Exposed-to-view architectural concrete deflection of facing materials between studs, as well as deflection of studs and walers, shall be limited to a deflection of 1/32 of an inch or 0.0025 times the span length, whichever is the larger, at the midpoint between supports.
- E. Exposed-to-view concrete deflection of facing materials between studs, as well as deflection of studs and walers, shall be limited to 3/64 of an inch or 0.004 times the span length, whichever is the larger, at the midpoint between supports.
- F. Unless otherwise specified, exposed edges of concrete shall be chamfered or beveled at an angle of 45 degrees by using a chamfer strip with nailing leg, such bevel being 3/4-inch on a side. However, the Contractor shall provide square edges for any portion of the work if so directed by the District Representative.
- G. Tape and seal all reveal strips to prevent leakage and leave a smooth finish.

3.02 INSPECTION

- A. At least two (2) hours prior to a scheduled concrete placement, the Quality Control manager shall notify the District Representative in writing that forms, embeds, blockouts, penetrations, reinforcing steel, waterstops, etc. are installed in conformance with the accepted coordination drawings; the forms are properly constructed, aligned and braced; and that the forms have been cleaned of all debris and deleterious matter.
- B. After notification and prior to concrete placement, the District Representative and Contractor will review and certify that the concrete placement is ready for concrete.

3.03 CONSTRUCTION TOLERANCES

- A. Construct forms to provide concrete conforming to dimensions shown, and to tolerance limits listed in ACI 301. Construction tolerances for slide gates exceed ACI requirements as shown on the Drawings.

3.04 INSTALLATION

- A. Installation shall conform to ACI 301, 347R, 350, and SP4. Design forms for easy removal.

- B. Forms will not be used if there is any evidence of surface wear or tear which would impair the quality of the exposed-to-view concrete. Forms shall be thoroughly cleaned and relubricated before reuse. Forms for exposed-to-view concrete shall be observed continuously while concrete is being placed to see that there are no changes of elevation, plumbness, or camber. If, during construction, any weakness develops and the falsework shows any undue settlement or distortion, the work shall be stopped, the affected construction removed, if permanently damaged, and the falsework strengthened.

3.05 CONSTRUCTION AND SURFACE FINISH

- A. Forms shall be substantial, true to line, and level, sufficiently tight to prevent leakage and shall conform exactly to dimensions indicated on the Drawings. Provide cleanout holes at bottom of forms. Remove debris before concrete is placed. Construct forms for exposed surfaces so that joints in forms are either horizontal or vertical. External corners on all architectural concrete shall be formed with chamfer strips in corners of forms to form bevel at external angles. All form joints in forms for exposed-to-view concrete shall be sealed with specified form tape to prevent leakage. Camber soffits to accommodate anticipated deflections caused by wet concrete and construction loads. Provide positive means of adjustment for shores and struts. Take up settlement as concrete is placed.

3.06 REMOVAL AND REUSE

- A. Removal of forms shall conform to ACI 347R, 350, and as specified herein. Remove forms, shoring, and bracing carefully to avoid self-damage to fresh concrete, but not before concrete is capable of self-support and support of construction loads. Do not pry against face of concrete. Use wooden wedges only. In order that reused forms will not contain patches resulting from alterations, forms for concrete exposed-to-view shall be reused only on identical sections. When forms are removed during specified curing period, cure the concrete as specified in the CAST-IN-PLACE CONCRETE Section (03 30 00). Regardless of strengths attained by concrete, leave forms in place for the following periods when supporting:
 - 1. Vertical surfaces: 3 days minimum.
 - 2. Slabs: 7 days minimum, but do not remove vertical support until concrete has reached its specified 28-day strength.
 - 3. Beams and Girders: 15 days minimum, but do not remove vertical support until concrete has reached its specified 28-day strength.
- B. In hot, dry weather wood forms remaining in place which do not provide adequate curing shall be removed or loosened so that the concrete surfaces can be kept moist or coated with a curing membrane. In cold weather, removal of formwork shall be deferred or formwork shall be replaced with insulation blankets to avoid thermal shock and consequent crazing of the concrete surface.

- C. Before reuse of plywood forms, thoroughly clean, sand, and recoat with an effective bond breaking form coating in conformance with ACI 347R. Do not reuse plywood that has torn grain, patches, worn edges, damaged phenolic resin covered surfaces, or other defects which would impair texture of finished surface. Other wood forms shall be prepared for reuse by thorough cleaning and recoat with form coating. Repair damaged forms and replace loose or damaged boards.

3.07 FORM TIES

- A. Form tie assemblies shall permit tightening of the forms and be of such type as to leave no metal or other material within 1-1/2 inches of the surface. The assembly shall provide cone-shaped depressions in the forms at the surface at least 1 inch in diameter and 1-1/2 inches deep to allow filling and patching per the CAST-IN-PLACE CONCRETE Section (03 30 00). Ties shall be tight fitting, or tie holes in forms shall be sealed to prevent leakage where ties penetrate the form.
- B. When a portion of single rod ties are to remain in a liquid retaining structure, the portion that is to remain shall be provided with a tightly fitted washer at midpoint. Through ties that are to be entirely removed from the structure shall be tapered over the portion which passes through the concrete.

3.08 SHORING

- A. Plans for shoring and reshoring operations shall be approved in advance of construction and shall conform to ACI 347R. Live loading of new construction while reshoring is under way is not permitted. Do not over stress new construction by over tightening reshores. Leave reshores in place until concrete has reached its specified 28-day strength. Reshore floors that support shores under wet concrete, or leave original shores in place. Reshores shall have at least half the capacity of the shores above and be distributed in approximately the same pattern. Leave these reshores in place until freshly placed concrete has reached its specified 28-day strength.

3.09 MATERIAL APPLICATION

- A. Concrete exposed-to-view in completed structures:
 - 1. For smooth architectural concrete use specified phenolic resin covered form board.
 - 2. For all other exposed-to-view concrete, use "B-B" plyform plywood or the phenolic resin covered form board or aluminum and steel when part of a form system.
 - 3. For forms for concrete surfaces not visible in completed structure, use plywood, lumber, aluminum, or steel. Footings may be placed directly against earth banks where soil conditions are such that vertical banks will remain stable during placing operations. Earth forms at walls are not permitted.

4. A 3/4-inch chamfer strip shall be placed in exposed to view corners of forms to produce a 3/4-inch wide beveled edge. Chamfer strip to be made of douglas-fir of a grade that is free of knots.

3.10 TESTING (NOT USED)

3.11 TRAINING (NOT USED)

****END OF SECTION****

SECTION 03 15 20

ANCHORAGE IN CONCRETE AND MASONRY

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section specifies anchor bolts complete with washers and nuts. Unless otherwise specified, anchor bolts shall be hot-dip galvanized or type 304 or 316 stainless steel.

B. SPECIAL INSPECTION:

1. Special inspection of anchor bolts shall be performed by the Special Inspector under contract with the District and in accordance with the CBC Chapter 17.

1.02 REFERENCES

- A. REFERENCE STANDARDS:** The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of referenced publications in effect at the time of the bid shall govern. In case of conflict between the requirements of this section and the listed references, the requirements of this section shall prevail.

| <u>Reference</u> | <u>Title</u> |
|-------------------|---|
| CBC | California Building Code, 2010 Edition |
| ACI 318 | American Concrete Institute - Building Code Requirements for Structural Concrete, and Commentary |
| ACI 350 | American Concrete Institute - Code Requirements For Environmental Engineering Concrete Structures, and Commentary |
| ASTM A36 | Structural Steel |
| ASTM A123 / A123M | Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products |
| ASTM A 193/A | Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service |
| ASTM A 194/A | Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both |
| ASTM A320 | Alloy Steel Bolting Materials for Low-Temperature Service |
| ASTM A325 | Standard Specification for Structural Bolts, Steel, Heat |

| <u>Reference</u> | <u>Title</u> |
|------------------|--|
| | Treated, 120/105 ksi Minimum Tensile Strength |
| ASTM A354 | Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners |
| ASTM A449 | Quenched and Tempered Steel Bolts and Studs |
| ASTM A490 | Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength |
| ASTM A 563 | Standard Specification for Carbon and Alloy Steel Nuts |
| ASTM A572 | Standard Specification for High Strength Low Alloy Columbium Vanadium Structural Steel |
| ASTM F593 | Stainless Steel Bolts, Hex Cap Screws and Studs |
| ASTM F594 | Stainless Steel Nuts |
| ASTM F1554 | Anchor Bolts, Steel, 36, 55, 105-ksi Yield Strength |

B. DEFINITIONS: (Not Used)

1.03 SUBMITTALS

- A. The following information shall be submitted for review in accordance with SUBMITTALS PROCEDURES Section (01 33 00) for all bolt systems not cast-in-place:
1. A copy of this specification section, with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviations.
 2. Data indicating load capacities.
 3. Chemical resistance.
 4. Temperature limitations.
 5. Installation instructions.
 6. Manufacturer's data and catalogue numbers.
 7. All post installed anchors, adhesive and expansion type anchors shall be listed with at least one of the following agencies, ICC & ICC (ES). Submit ICC evaluation reports for adhesive and expansion type anchors as specified in paragraphs 3.02-B and 3.02-C of this specification section, respectively.
 8. Design calculation in accordance with paragraph 2.04 of this specification section.

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

PART 2 -- PRODUCTS

2.01 GENERAL

- A. Anchor bolt holes in equipment support frames shall not exceed the bolt diameters by more than 25 percent, up to a limiting maximum oversizing of 1/4 inch. Minimum anchor bolt diameter shall be 1/2 inch. Anchor bolts shall be furnished with leveling nuts, the faces of which shall be tightened against flat surfaces as shown to not less than 10 percent of the bolt's safe tensile stress.
- B. Tapered washers shall be provided where mating surface is not square with the nut.
- C. Expansion, wedge or adhesive anchors set in holes drilled in the concrete after the concrete is placed will not be permitted in substitution for anchor bolts except where otherwise specified. Upset threads shall not be acceptable.

2.02 MATERIALS

- A. Anchor bolt materials shall be as specified in Table A unless otherwise specified on the contract drawings.

2.03 ANTI-SEIZE COMPOUND

- A. All stainless steel embedded bolts, expansion anchors, and adhesive anchors shall be assembled with a stainless steel anti-seize compound such as molycote.

2.04 DESIGN

- A. Anchor bolts for equipment frames and foundations shall be designed in accordance with the CBC. The contractor designed anchor bolts are differed approval, and the "stamped" calculations and drawing shall be submitted to the engineer of record for review of general complaisance with design intent. Calculations and shop drawings shall be submitted with the equipment submittal in accordance with the SUBMITTAL PROCEDURES Section (01 33 00) for all anchorage details. All calculations must be made and signed by a civil or structural engineer currently registered in the State of California.
- B. All anchor bolts resisting seismic forces shall be design based on cracked concrete requirement in ACI 318 or ACI 350, Appendix D.

Table A – Anchor Bolt Materials

| Material | Specification |
|---|--|
| Stainless Steel Anchor Bolts | ASTM A193, Grade B8M Class 1, AISI 316 or ASTM A320, Grade B8M Class 1, AISI 316 |
| Stainless Steel Threaded Rods at Adhesive Anchors | ASTM F593 CW1 (1/4" to 5/8" Rod) ASTM F593 CW2 (3/4" to 1 1/2" Rod) |
| Stainless Steel Nuts and Washers | ASTM A194 Grade 8M, SS316 Nuts with Type 316 SS Washers (ASTM F594 Group 2 Type 316 SS Nuts at Adhesive Anchors) |
| Carbon Steel Anchor Bolts | ASTM F1554 (Grade 36) – Hot Dip Galvanized unless noted otherwise |
| High-Strength Carbon Steel Anchor Bolts | ASTM F1554 (Grade 55 Weldable per Supplementary Requirement S1) – Hot Dip Galvanized unless noted otherwise |
| Carbon Steel Nuts and Washers Concrete Expansion Anchors | ASTM A563 and ASTM F844 Stainless Steel HILTI "KWIK BOLT TZ", SIMPSON STRONG-TIE STRONG BOLT 2, or equal |
| Concrete Adhesive Anchoring System | HILTI HIT-RE 500-SD, SIMPSON STRONG-TIE SET-XP, or equal. |
| Masonry Expansion Anchors | Stainless Steel HILTI "KWIK BOLT 3", or equal |
| Masonry Adhesive Anchoring System | HILTI "HIT-HY 150 MAX", or equal |

PART 3 -- EXECUTION

3.01 GENERAL

- A. Fieldwork, including cutting and threading, shall not be permitted on galvanized items. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators. Grouting of anchor bolts with nonshrink or epoxy grouts, where specified, shall be in accordance with the GROUTING Section (03 60 00). All stainless steel anchor bolts and fasteners shall be assembled with stainless steel anti-seize compound.

3.02 INSTALLATION

A. CAST-IN-PLACE ANCHOR BOLTS:

1. Anchor bolts to be embedded in concrete shall be placed accurately and held in correct position while the concrete is placed. Only where specifically shown on the contract plans recesses or blockouts shall be formed in the concrete and the metalwork shall be grouted in place in accordance with the GROUTING Section (03 60 00) after strength is attained. The surfaces of metalwork in contact with concrete shall be thoroughly cleaned.
2. After anchor bolts have been embedded, their threads shall be protected by grease and the nuts run on.
3. For grouting of anchor bolts, use non-shrink, non-metallic grout as specified in the GROUTING Section (03 60 00).

B. ADHESIVE ANCHORS:

1. Use of adhesive or capsule anchors shall be as shown on the contract drawings and shall be subject to the following conditions:
 - a. Use shall be limited to locations where exposure, on an intermittent or continuous basis, to acid concentrations higher than 10 percent, to chlorine gas, or to machine or diesel oils, is extremely unlikely.
 - b. Use shall be limited to applications where exposure to fire or exposure to concrete or rod temperature above 120 degrees F is extremely unlikely. Overhead applications (such as pipe supports), because of the above concerns, shall be disallowed.
 - c. Approval from District Representative for specific application and from supplier of equipment to be anchored, if applicable.

- d. Anchor diameter and grade of steel shall be per contract documents or per equipment supplier specifications. Anchor shall be threaded or deformed full length of embedment and shall be free of rust, scale, grease, and oils.
 - e. Embedment depth shall be as specified on the drawings. Adhesive capsules of different diameters may be used to obtain proper volume for the embedment, but no more than two capsules per anchor may be used. When installing different diameter capsules in the same hole, the larger diameter capsule shall be installed first. Any extension or protrusion of the capsule from the hole is prohibited.
 - f. All installation recommendations by the anchor system manufacturer shall be followed carefully, including, but not limited to, maximum hole diameter, minimum embedment, and minimum edge distance.
 - g. Holes shall have rough surfaces, such as can be achieved using a rotary percussion drill.
 - h. Holes shall be blown clean with compressed air and be free of dust or standing water prior to installation.
 - i. Anchor shall be left undisturbed and unloaded for full adhesive curing period.
 - j. Concrete temperature (not air temperature) shall be compatible with curing requirements of adhesives per adhesive manufacturer. Anchors shall not be placed in concrete below 25 degrees F.
2. The Contractor shall supply the District Representative with the current ICC evaluation report from the ICC Evaluation Services for the particular brand of adhesive anchors to be used.

C. EXPANSION ANCHORS:

- 1. Use of expansion anchors shall be as shown on the contract drawings and shall be subject to Conditions c, d, e, f, g, and h specified in paragraph 3.02-B.1 of this specification section.

3.03 TESTING (NOT USED)

3.04 TRAINING (NOT USED)

****END OF SECTION****

SECTION 03 60 00

GROUTING

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section specifies grout for uses other than masonry.

1.02 REFERENCES

- A. REFERENCE STANDARDS: The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of referenced publications in effect at the time of the bid shall govern. In case of conflict between the requirements of this section and the listed references, the requirements of this section shall govern.

| <u>Reference</u> | <u>Title</u> |
|------------------|---|
| ASTM C33 | Concrete Aggregates |
| ASTM C40 | Test Method for Organic Impurities in Fine Aggregates for Concrete |
| ASTM C88 | Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate |
| ASTM C117 | Test Method for Materials Finer Than 75-Micrometer (No. 200) Sieve in Mineral Aggregates by Washing |
| ASTM C136 | Method for Sieve Analysis of Fine and Coarse Aggregates |
| ASTMC150 | Portland Cement |
| ASTMC289 | Test Method for Potential Reactivity of Aggregates (Chemical Method) |
| ASTMC494 | Chemical Admixtures for Concrete |
| ASTM C881 | Epoxy-Resin-Base Bonding Systems for Concrete |
| ASTM C1107 | Packaged Dry, Hydraulic-Cement Grout (Nonshrink) |
| ASTMD2419 | Test Method for Sand Equivalent Value of Soils And Fine Aggregate |
| ASTME329 | Practice for Use in the Evaluation of Testing and Inspection Agencies as Used in Construction |

B. DEFINITIONS: (Not Used)

1.03 SUBMITTALS

A. The following information shall be submitted for review in accordance with the SUBMITTAL PROCEDURES Section (01 33 00):

1. A copy of this specification section, with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviation.
2. MANUFACTURER'S DATA:
 - a. Dry pack grout
 - b. Cement grout
 - c. Nonshrink grout
 - d. Epoxy grout
 - e. Epoxy injection system and installer certification
 - f. Admixtures (if used)
 - g. Bonding compounds
 - h. Current ICC Evaluation Report for adhesives used for dowel and anchor setting.

B. LABORATORY TEST REPORTS:

1. Before delivery of materials, the reports of the tests specified herein shall be submitted. Test reports on previously tested materials shall be accompanied by the manufacturer's statement that the previously tested material is the same type, quality, manufacture, and make as that proposed for use in this project. Test reports are required for the following:
 - a. Cement
 - b. Aggregates
 - c. Admixtures
 - d. Bonding compounds
 - e. Epoxy Resin

2. To demonstrate conformance with the specified requirements for grout, the Contractor shall provide the services of an independent testing laboratory which complies with the requirements of ASTM E329. The testing laboratory shall sample and test grout materials as required in this section. Costs of testing laboratory services shall be borne by the Contractor.

C. EVIDENCE OF TESTING LABORATORY COMPETENCE:

1. The Contractor shall require that the laboratory provide directly to the District Representative evidence of the most recent inspection of its facilities by the Cement and Concrete Reference Laboratory of the National Bureau of Standards. The evidences shall show that deficiencies mentioned in the report of that inspection have been corrected. The evidence of inspection shall be submitted and approved prior to delivery of materials to the job site.

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

PART 2 -- PRODUCTS

2.01 MATERIALS

A. CEMENT:

1. Portland cement shall be ASTM C150, Type II or Type V, low alkali, containing less than 0.60 percent by weight of alkalies.

B. AGGREGATE:

1. **GENERAL:** Aggregate shall be nonreactive and shall be washed before use.
 - a. When sources of aggregate are changed, test reports shall be provided for the new material. The tests specified shall be performed submitted and approved prior to commencing grout work.
2. **FINE AGGREGATE:** Fine aggregate shall be hard, dense, durable particles of either sand or crushed stone regularly graded from coarse to fine and shall conform to ASTM C33 as modified herein. When tested in accordance with ASTM C136, gradation shall be such that 100 percent by weight will pass a standard No. 8 mesh sieve and no less than 45 percent by weight will pass a standard No. 40 mesh sieve.
 - a. Variation from the specified gradations in individual tests will be acceptable if the average of three consecutive tests is within the specified limits and the variation is within the permissible variation listed below:

| U.S. standard sieve size | Permissible variation in individual test, percent |
|-------------------------------------|--|
| 30 or coarser | 2 |
| 50 or finer | 0.5 |

3. Other tests shall be in accordance with the following specifications:

| Test | Test Method | Requirements |
|---|--------------------|--------------------------------------|
| Organic Impurities | ASTM C40 | Color lighter than standard |
| Amount of Material Passing No. 200 Sieve | ASTM C117 | 3% maximum by weight |
| Soundness | ASTM C88 | 10% maximum loss with sodium sulfate |
| Reactivity | ASTM C289 | Innocuous aggregate |
| Sand Equivalent | ASTM D2419 | Minimum 80 |

C. ADMIXTURES:

- GENERAL:** Admixtures shall be compatible with the grout. Calcium chloride or admixtures containing calcium chloride are not acceptable. Admixtures shall be used in accordance with the manufacturer's recommendations and shall be added separately to the grout mix.
- WATER REDUCING RETARDER:** Water reducing retarder shall be ASTM C494, Type D and shall be BASF Pozzolith 322-N, Sika Corporation Plastocrete 161, or equal.
- LUBRICANT FOR CEMENT PRESSURE GROUTING:** Lubricant additive for cement pressure grouting shall be Spcrete Intrusion Aid, Sika Intraplast N, or equal.

D. WATER:

- Water for washing aggregate, for mixing and for curing shall be free from oil and deleterious amounts of acids, alkalies, and organic materials; shall not contain more than 1000 mg/l of chlorides as Cl, nor more than 1300 mg/l of sulfates as SO₄; and shall not contain an amount of impurities that may cause a change of more than 25 percent in the setting time of the cement nor a reduction of more than 5 percent in the compressive strength of the grout at 14 days when compared with the result obtained with distilled water. Additionally, water used for curing shall not contain an amount of impurities sufficient to discolor the grout.

2.02 GROUT

A. DRYPACK GROUT:

1. Drypack grout shall be a mixture of approximately one part cement, 1-1/2 to 2 parts sand, water reducing retarder, and sufficient water to make a stiff workable mix.

B. CEMENT GROUT:

1. Cement grout shall be a mixture of one part cement, two parts sand, proportioned by volume, admixtures for pressure grouting, and sufficient water to form a workable mix.

C. NONSHRINK NONMETALLIC GROUT:

1. Nonshrink grout shall be factory premixed requiring only water addition in the field. Nonmetallic aggregate grout shall be Five Star Products Inc. Five Star grout, Burke Company Non-Ferrous, Non-Shrink Grout, BASF Masterflow 928, or equal.
2. Metallic aggregate grout is not acceptable.

D. EPOXY GROUT FOR EQUIPMENT MOUNTING:

1. Epoxy grout shall be a three-component epoxy resin system, consisting of two liquid epoxy components and an optional inert aggregate component. Each component shall be in separate bags in the correct ratio for job site mixing.
2. Epoxy grout shall be Euclid Chemical Company E3-G, Sika Corporation Sikadur 42, or equal.

E. ADHESIVE FOR DOWEL AND ANCHOR SETTING:

1. Adhesive for setting dowels and anchoring connection/base plate bolts shall be an injectable two-component epoxy adhesive. Adhesive shall be approved for the intended use per the product ICC Report.

Adhesive shall be HIT-RE-500-SD by Hilti; SET-XP by Simpson Strong-Tie; or equal (equivalent product must have ICC approval for use in cracked concrete).

2.03 EPOXY INJECTION SYSTEM

- A. Epoxy for pressure grouting/crack injection shall be a two-component, moisture insensitive, high modulus, injection grade, 100 percent solids, blend of epoxy-resin compounds. The consistency shall be as required to achieve complete penetration in hairline cracks and larger. Material shall conform to ASTM C881, Type 1, Grade 1. Candidate manufacturers include Sika Corporation Sikadur 52, BASF SCB Concessive 1300 series, and Adhesive Technology Corporation SLV 300 series, or equal.

PART 3 -- EXECUTION

3.01 GENERAL

- A. Holes required for grouting shall be blown clean. Horizontal holes for grouting shall be drilled at a slight downward angle to facilitate holding the grout until setting is complete. Bolts or reinforcing steel installed in horizontal grout holes shall be bent slightly accordingly. Bonding compound for use with grout is specified in the CAST-IN-PLACE CONCRETE Section (03 30 00). Mechanically mix the grout materials with or without fillers in strict accordance with the manufacturer's instruction. All application of the mixed materials shall be performed within the working life or pot life of the grout system. Unused mixed materials which have reached the end of the working or pot life shall be removed from the job site.

3.02 INSTALLATION

A. DRYPACK GROUT:

- 1. Drypack grout shall be used for built-up surfaces, setting miscellaneous metal items and minor repairs.
 - a. Surfaces required to be built up with drypack grout shall be roughened by brushing, cleaned, and coated with the bonding compound specified in the CAST-IN-PLACE CONCRETE Section (03 30 00) before the application of the grout. The drypack grout shall be applied immediately following the application of the bonding compound in bands or strips to form a covering of the required thickness. The covering shall be smooth. Construction joints in the grout shall be sloped and shall be cleaned and wetted before application is resumed. Drypack grout shall be cured in accordance with the CAST-IN-PLACE CONCRETE Section (03 30 00).

B. CEMENT GROUT:

- 1. Cement grout shall be used for filling nonbearing portions of equipment pads.
- 2. Mixing and placing apparatus shall be similar to that normally used for cast-in-place concrete. Grout shall be mixed for a period of at least 1 minute. Diluted grout shall be agitated to keep ingredients mixed.

C. NONSHRINK NONMETALLIC GROUT:

- 1. Nonshrink nonmetallic aggregate grout shall be used for the bearing surfaces of machinery and equipment bases, column base plates and bearing plates and for built-up surfaces.

D. EPOXY ADHESIVE:

1. Epoxy Adhesive shall be used for setting anchor bolts and grouting reinforcing steel holes, and setting reinforcing dowels. Concrete shall be primed in accordance with the grout manufacturer's instructions.

E. EPOXY INJECTION SYSTEM:

1. Epoxy injection system shall be used for repairing cracks by pressure in structural concrete. Installer shall be certified by the system supplier. Prior to starting, cracks and holes to be injected shall be washed clean. Washing is not required for grouting soil voids outside pipe cylinders or casing pipes. Injection once commenced, shall be completed without stoppage. In case of breakdown of equipment, the Contractor shall wash out the epoxy system sufficiently to ensure fresh epoxy and adequate bond and penetration will occur upon restarting the injection operation. Pressure shall be maintained until grout has set.
2. Pressure grouting equipment shall include a mixer and holdover agitator tanks and shall be designed to place grout at pressures up to 50 psi. Gages shall be provided to indicate pressure used. The mixer shall be provided with a meter capable of indicating to one-tenth of a cubic foot the volume of grout used.

F. WEATHER LIMITATIONS:

1. Work shall not proceed when weather conditions detrimentally affect the quality of patching or bonding concrete. Apply grout materials only when the contact surfaces are prepared and if the atmospheric temperature range and contact surfaces are suitable for the specified type of epoxy adhesive or grout material.

G. CLEANUP:

1. Leave finished work and work area in a neat, clean condition. Remove all spillovers onto adjacent areas to the satisfaction of the District Representative. For epoxy injection system, after the epoxy resin adhesive has cured, the epoxy resin adhesive for sealing cracks and porting devices shall be removed. Clean the substrate in a manner to produce a finish appearance acceptable to the District Representative.

3.03 TESTING (NOT USED)

3.04 TRAINING (NOT USED)

****END OF SECTION****

SECTION 09 06 90

SCHEDULES FOR PAINTING AND COATING

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section lists the specific coating systems and colors for rooms, galleries, piping, equipment, and other items. Coating system requirements are specified in the PAINTING AND COATING Section (09 90 00).

1.02 REFERENCES (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.01 GENERAL (NOT USED)

3.02 INSTALLATION (NOT USED)

3.03 TESTING (NOT USED)

3.04 TRAINING (NOT USED)

3.05 COATING SYSTEMS SCHEDULE

- A. Refer to the PAINTING AND COATING Section (09 90 00) for coating system designations.
- B. Specific coating systems and colors for rooms, galleries, piping, equipment, and other items are specified in the attached Coating System Schedule.

COATING SYSTEM SCHEDULE

| Surface | Coating System | Color |
|--|----------------|----------|
| 1. Conduit, Outlet and Junction Boxes, Hangers and Supports (except stainless and nonferrous) | | |
| (a) Exterior | EM2 | Aluminum |
| 2. 120V & 480V Receptacle Stanchions and their Concrete Bases | | |
| (a) Exterior | EM2 | Aluminum |
| 3. Lighting Fixture Stanchions (Digester 4, 5, 6, 7 & 9) | | |
| (a) Exterior | EM2 | Aluminum |

END OF SECTION

SECTION 09 90 00

PAINTING AND COATING

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section specifies coating systems, surface preparations, and application requirements.

1.02 REFERENCES

- A. REFERENCE STANDARDS: The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of referenced publications in effect at the time of the bid shall govern. In case of conflict between the requirements of this section and the listed references, the requirements of this section shall prevail.

| <u>Reference</u> | <u>Title</u> |
|-----------------------------|--|
| ASTM D16 | Standard Terminology for Paint, Related Coatings, Materials, and Applications |
| SMAQMD Rule 442 | Sacramento Metropolitan Air Quality Management District - Architectural Coatings |
| SMAQMD Rule 451 | Sacramento Metropolitan Air Quality Management District – Surface Coating of Miscellaneous Metal Parts and Products |
| SSPC Good Painting Practice | SSPC: The Society for Protective Coatings (formerly Steel Structures Painting Council) Specifications, Vol. 1 and 2, latest edition. |
| SSPC Guide 6 | Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations |

B. DEFINITIONS:

1. Specific coating terminology used in this section is in accordance with definitions contained below and in ASTM D16:
 - a. DRY FILM THICKNESS (DFT): The thickness of one fully cured continuous application of coating.

- b. WET FILM THICKNESS (WFT): The thickness of one wet layer of coating taken shortly after application.
- c. FIELD COAT: The application of a coating after installation of the surface at the site of the work.
- d. SHOP COAT: One or more coats applied in a shop or plant prior to shipment to the site of erection or fabrication, where the field or finishing coat is applied.
- e. TIE COAT: An intermediate coat used to bond different types of paint coats. Coatings used to improve the adhesion of a succeeding coat.
- f. VINYL ACID WASH COAT: A coating supplied as one or two component systems on clean light alloy or ferrous surfaces, and on many nonferrous surfaces, to provide adhesion with the substrates, and for the application of subsequent coats of paint.
- g. PHOTOCHEMICALLY REACTIVE ORGANIC MATERIAL: Any organic material that will react with oxygen, excited oxygen, ozone or other free radicals generated by the action of sunlight on components in the atmosphere giving rise to secondary contaminants and reaction intermediates in the atmosphere which can have detrimental effects.
- h. VOLATILE ORGANIC CONTENT: The portion of the coating that is a compound of carbon, is photochemically reactive, and evaporates during drying or curing, expressed in grams per liter or pounds per gallon.
- i. TOUCH UP PAINTING: The application of paint on small areas of painted surfaces to repair marks, scratches, and small areas where the coating has deteriorated to restore the coating film to an unbroken condition.
- j. STRIPE COAT: Coating with brush or spray gun to all edges, corners, bolts and welds, with coating material prior to application of full surface coat. Striping will extend at least one inch minimum from all edges, corners and welds.
- k. The terms "solvent cleaning", "hand tool cleaning", "wire brushing", and "blast cleaning", or similar words of equal intent in these Specifications or in paint manufacturer's specifications refer to the applicable SSPC Surface Preparation Standards.
- l. SPREADING RATE: The amount of product that is applied to a specified area of a surface to be coated. The spreading rate is specified in square feet per gallon (SFPG) or square feet per gallon per coat (SFPGPC).
- m. FERROUS METAL: Iron, steel, and alloys containing iron as the principal element, except stainless steel.
- n. INTERIOR: Inside of a building or structure, unless otherwise specified.

- o. EXTERIOR: Outside of building or structures and exposed to weather elements.
- p. BURIED: Surfaces that are underground and either in contact with soil or encased in concrete.
- q. SUBMERGED: Surfaces that are underwater or are below the top elevation of structures or facilities that contain water, under normal operating conditions.
- r. MILD ENVIRONMENT: Standard commercial facility conditions.
- s. MODERATE ENVIRONMENT: Industrial facility conditions where surfaces may be occasionally exposed to light-moderately aggressive liquids or gases.
- t. HARSH ENVIRONMENT: Industrial facility conditions where surfaces may be subject to aggressive liquids or gases, or normally exposed to light-moderately aggressive liquids or gases.

1.03 SUBMITTALS

- A. The following information shall be submitted for review in accordance with SUBMITTAL PROCEDURES Section (01 33 00):
 - 1. A copy of this specification section, with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviations.
 - 2. Manufacturer's standard product data and material safety data sheet for all field applied primer, tie coat, thinners, intermediate and finish coating, abrasives and all shop applied primers, intermediate and finish coating including those from equipment manufacturers and suppliers. Copies of these data shall be posted at the job site at each field application area.
 - 3. List of materials proposed to be used under this section.
 - 4. Manufacturer's literature and written instructions for surface preparation, mixing and application of each primer and finish coating.
 - 5. Manufacturer's complete color selection chart.
 - 6. Applicator's SSPC QP-1 certification and manufacturer's certification of installation contractor.
 - 7. Containment system plan.
 - 8. Shop and field inspection records.

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

1.05 REGULATORY REQUIREMENTS

- A. All applicable federal, state, and local regulatory agency requirements shall be complied with during the course of the work. The Contractor's attention is directed to the following list of agency requirements that generally apply to coatings work; the Contractor is responsible for identifying and complying with any other agencies or requirements not listed.
1. OSHA – Personnel protection during all phases of work, including exposure to airborne solvents, dust, and lead.
 2. CAL/OSHA – Personnel protection; requirements may supersede OSHA regulations.
 3. California Title 22 – Environmental requirements, including definition of abrasive blast materials and residue relative to hazardous waste disposal requirements. Abrasives shall not contain metals or other substances that would classify abrasive as a hazardous waste under California Title 22 requirements.
 4. California Air Resources Board (CARB) and Sacramento Metropolitan Air Quality Management District (SMAQMD) – Environmental requirements for equipment and products. Also, environmental requirements for limiting emissions produced by paint removal and coating operations. Maximum VOC limits shall comply with SMAQMD Rule 442 and Rule 451.

1.06 QUALITY ASSURANCE

A. QUALIFICATIONS:

1. SSPC Painting Contractor Certification Program, QP-1 certification.
2. Coating manufacturer approved applicator when coating manufacturer has approved applicator program.

B. INSPECTION:

1. The District may retain the services of an independent third party NACE CIP Level III-Certified Inspector for partial or full-time inspection of the work.
2. The Contractor shall give the District Representative a minimum of 14 calendar days advanced notice of the start of all coating application work to allow scheduling for shop and field observation.
3. Provisions shall be made to allow the District Representative full access to facilities and appropriate documentation regarding coating materials, coating material storage, surface preparation and coating application. The Contractor shall provide access to the District Representative at all times during the contract period to observe the work.

4. Observation by the District Representative or the waiver of observation of any particular portion of the work shall not be construed to relieve the Contractor of his responsibility to perform the work in accordance with these Specifications.
5. Coating materials shall be subject to testing for conformance with this specification prior to or during incorporation into the work.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered to the job site in their original, unopened containers. Each container shall bear the manufacturer's name, coating type, batch number, date of manufacture, and special directions. All materials delivered to the job site shall be accompanied by the manufacturer's latest product data sheets which indicate storage life.
- B. All protective coating materials shall be used within the manufacturer's recommended shelf life. Shelf life shall not be extended beyond the stated periods for any reason, including statements or certifications by the manufacturer.
- C. Deliver and store abrasives in their original moisture-proof bags or airtight bulk containers.
- D. Materials shall be stored in enclosed structures and shall be protected from weather and excessive heat or cold. Flammable materials shall be stored in accordance with state and local codes. Materials exceeding storage life recommended by the manufacturer shall be removed from the site.
- E. Where shop-primed or shop-finished items are to be shipped to the job site, protect coatings from damage by the use of battens, padded straps, and nonmetallic slings. Excessive shipping damage will be considered grounds for rejection of shop primers and shop finishes.
- F. The Contractor shall keep and maintain records for all products delivered to the site. Information should include batch numbers, quantities, and dates used for all paints, solvents, and cleaners used. These records should be reported to the District Representative weekly.

PART 2 -- PRODUCTS

2.01 GENERAL

- A. Materials and supplies provided shall be the standard products of manufacturers. Materials in each coating system shall be the products of a single manufacturer.
- B. The standard products of manufacturers other than those specified will be accepted when it is demonstrated to the District that they are equal in composition, durability, usefulness, and convenience for the purpose intended. Requests for substitutions, in accordance with the SUBMITTAL PROCEDURES Section (01 33 00), will be

considered, provided the criteria specified in the SUBMITTAL PROCEDURES Section (01 33 00) are satisfied and the following minimum conditions are met:

1. The proposed coating system shall use an equal number of coats to achieve the required dry film thickness.
2. The proposed coating system shall use coatings of the same generic type as that specified.
3. Requests for substitution shall have directions for application and descriptive literature which includes generic type, percent solids by volume, volatile organic content (grams per liter), flammability, toxicity, and any other information required to determine if the substitution is equal to the specified coating system.
4. The Contractor shall provide a list of references where paint of the same generic type has been applied. The reference list shall give the project name, city, state, owner, phone number of owner, coating system reference and number, and year coating material was applied.
5. Any shop applied coating materials shall be compatible with the field applied coating materials specified.
6. Coatings shall contain $\leq 0.0000\%$ lead.
7. Coatings shall contain $\leq 0.0000\%$ zinc-chromate and $\leq 0.0000\%$ strontium-chromate.
8. Coatings shall contain $\leq 0.0000\%$ asbestos.
9. Coatings shall contain $\leq 0.0000\%$ mercury and $\leq 0.0000\%$ mercury compounds.
10. Coatings shall not contain any toxic chemicals in amounts greater than the amounts in the specified acceptable products.
11. Abrasives shall not contain metals or other substances that would classify abrasive as a hazardous waste under California Title 22 requirements.
12. Maximum VOC limits shall comply with Sacramento Metropolitan Air Quality Management District (SMAQMD) Rule 442 and Rule 451.

2.02 COATING SYSTEM SPECIFICATION SHEETS

- A. Coating systems are specified on the following Coating System Specification sheets:

| COATING SYSTEM SPECIFICATION | | |
|-------------------------------------|--|--|
| Coating System: | Epoxy Mastic – Epoxy Mastic | Symbol: EM2 |
| | Generic Description: | Acceptable Products: |
| Prime Coat: | 82-90% solids aluminum filled polyamine epoxy mastic | Carboline: Carbomastic 15 |
| | | Rustoleum: V9100 Low VOC DTM Epoxy Mastic 9115402, with Low VOC Standard Activator |
| | | |
| Finish Coat: | 82-90% solids aluminum filled polyamine epoxy mastic | Carboline: Carbomastic 15 |
| | | Rustoleum: V9100 Low VOC DTM Epoxy Mastic 9115402, with Low VOC Standard Activator |
| | | |
| Services: | Interior, Exterior Mild, Moderate, Harsh | |
| Surfaces: | Metal, Galvanized Steel | |
| Surface Preparation: | SSPC-SP3, per manufacturer's recommendation | |
| Application: | In accordance with manufacturer's written instructions, plus the following: <ul style="list-style-type: none"> 1. Apply 6 – 8 mils DFT prime coat 2. Apply 6 – 8 mils DFT finish coat to obtain a total system of 12-16 mils DFT | |

PART 3 -- EXECUTION

3.01 GENERAL (NOT USED)

3.02 INSTALLATION

A. SURFACE PREPARATION:

1. GENERAL:

- a. Surface preparations for each type of surface shall be in accordance with the specific manufacturer's requirements of each coating and its intended service, and the Coating System Specification sheets.
- b. All surfaces to be coated shall have a sharp angular surface profile of the minimum depth specified by the coating manufacturer.
- c. If existing lead-based coating is present, all Work shall comply with the LEAD-CONTAINING PAINT ABATEMENT Section (02 83 19.15).

2. ABRASIVE BLAST MEDIA:

- a. Blast media shall CARB-approved.

3. ABRASIVE BLAST CONTAINMENT SYSTEM:

- a. Provide a Class 3A Containment System in accordance with SSPC Technology Guide 6.
- b. Utilize Method G, Visual Assessment of Site Cleanliness, to monitor the amount of dust or debris that may escape the work area.

B. METAL SURFACE PREPARATION (UNGALVANIZED):

1. ABRASIVES:

- a. The type and size of abrasive shall be selected to produce a surface profile as specified and as recommended by the coating manufacturer for the particular coating and service conditions.
- b. Abrasive blasting nozzles shall be equipped with "deadman" emergency shut-off nozzles. Blast nozzle pressure shall be a minimum of 95 PSI and shall be verified by using an approved nozzle pressure gauge at each start-up period or as directed by the Engineer. The number of nozzles used during all blast cleaning operations must be sufficient to ensure timely completion of project.
- c. Interior blast cleaning shall be by dry method unless otherwise directed.

- d. The Contractor shall keep the area of his work in a clean condition and shall not permit blasting materials to accumulate as to constitute a nuisance or hazard to the workers or the existing facilities. Spent abrasives and other debris shall be removed at the Contractor's expense, as directed by the District Representative.
- e. Blast cleaned and coated interior surfaces shall be cleaned prior to application of specified coatings via a combination of blowing with clean dry air, brushing/brooming and/or vacuuming as necessary to achieve a clean surface condition.
- f. Compressed air for air blast cleaning shall be supplied at adequate pressure from well-maintained compressors equipped with oil and moisture separators which remove at least 95 percent of the contaminants. An oil and moisture separator shall be provided in the air line between the compressor and blast machine.
- g. Do not abrasive blast when air temperature is less than 5 degrees above the dew point.

C. PROTECTION OF SURFACES NOT TO BE COATED:

- 1. Surfaces which are not to receive protective coatings shall be protected during surface preparation, cleaning, and coating operations.
- 2. All hardware, lighting fixtures, switchplates, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not to be painted shall be removed, masked or otherwise protected. Dropcloths shall be provided to prevent coating materials from falling on or marring adjacent surfaces. The working parts of all mechanical and electrical equipment shall be protected from damage during surface preparation and coating operations. Openings in motors shall be masked to prevent entry of coating or other materials.
- 3. Project is subject to intermittent shutdown if, in the opinion of the District Representative, any operations are creating a condition detrimental to the site personnel or adjacent property. In the event of emergency shutdown by the District Representative, Contractor shall immediately correct deficiencies. All additional costs created by shutdown shall be borne by Contractor.

D. APPLICATION:

1. GENERAL:

- a. Coating products shall not be used until the District has inspected the materials.
- b. All of the manufacturer's printed recommendations with respect to surface preparation, mixing instructions, thinning, application method, application equipment, pot life, drying times, and any other manufacturer's

recommendations deemed applicable by the District shall be strictly adhered to by the Contractor.

- c. All steel coating application shall also comply with SSPC-PA 1.
- d. Application of the first coat shall follow immediately after completion of final surface preparation, dust removal operations, and before any rusting or other deterioration of the surface occurs. Cleaning shall be limited to only those surfaces that can be prime-coated in the same working day.
- e. All irregular surfaces shall receive a brush coat of the specified product prior to application of each coat. Irregular surfaces include edges, angles, weld seams, flanges, nuts and bolts, ends and flanges of structural members, crevices, surfaces with restricted access for spray application, and other places where insufficient film thicknesses are likely to be applied. During application to irregular surfaces, paint shall be brushed in multiple directions to ensure penetration and coverage. Care shall be exercised to ensure that the resulting dry film thicknesses do not exceed the maximum thicknesses allowed by the manufacturer for each product.

2. SHOP-APPLIED COATINGS:

- a. Except as otherwise specified herein, coatings may be shop applied or field applied. All coatings, whether shop applied or field-applied shall comply with the specifications.
- b. Shop-applied primers shall be compatible with the specified coating system and shall be applied at the dry film thickness recommended by the manufacturer. Product data sheets identifying the shop primer used shall be provided to the on-site finish coat applicator.
- c. If the shop-applied prime coat meets the requirements of this section, the field coating may consist of touching up the shop prime coat with a compatible field prime coat and then applying compatible intermediate and/or finish coats to achieve the specified film thickness and continuity. Intermediate or finish coats shall not be applied beyond the primer recoat window. If the primer recoat window is exceeded, the item shall be re-blasted and re-primed in accordance with the manufacturer's recommendations.
- d. Damaged, deteriorated and/or poorly applied shop coatings that do not meet the requirements of this section shall be removed and the surfaces recoated.

3. WORKMANSHIP:

- a. Coated surfaces shall be free from runs, drops, ridges, waves, laps, and brush marks. Coats shall be applied so as to produce an even film of uniform thickness completely coating corners and crevices. Painting shall be done in accordance with the requirements of SSPC Paint Application Specification No. 1.

- b. Each coat of paint shall be applied evenly and sharply cut to line. Each coat shall give a uniform appearance throughout. Lap marks for multiple coats shall be staggered. Care shall be exercised to avoid overspraying or spattering paint on surfaces not to be coated. Glass, hardware, floors, roofs, and other adjacent areas and installations shall be protected by taping, drop cloths, or other suitable measures.
- c. Where two or more coats of epoxy mastic are required, the alternate coats shall be of contrasting colors.
- d. Existing coating systems damaged by new construction shall be repaired and coated in accordance with the appropriate system specified for new work.
- e. Items which have been newly coated shall not be handled, worked on, or otherwise disturbed, until the paint is completely dry and hard.

E. CLEANUP:

- 1. Upon completion of coating, the Contractor shall remove surplus materials, protective coverings, and accumulated rubbish, and thoroughly clean all surfaces and repair any overspray or other paint related damage.

F. COATING SYSTEMS SCHEDULE:

- 1. Existing surfaces not damaged by work in this contract shall not be coated unless specifically shown on the drawings. Existing surfaces damaged by work in this contract shall be repaired to match existing coating and color.
- 2. Specific coating systems and colors for rooms, galleries, piping, equipment, and other items are specified in the SCHEDULES FOR PAINTING AND COATING Section (09 06 90).

3.03 TESTING

A. FIELD QUALITY CONTROL:

1. GENERAL:

- a. The District shall have the right to inspect at all times any tools, instrument, materials, staging, or equipment used or to be used in the performance of the work accessible for these inspections. The District shall have the right to take samples of the coating material at any time during the coating operation.
- b. The District shall have the right to observe all application procedures during the time the work is in progress, inspect and approve the surface preparation prior to the application of any coating, and to inspect and approve the condition of each coat prior to the application of the following one.

- c. The Contractor shall provide the same access to the inspector as for his painters. If necessary for safe inspection, scaffolding shall be provided for use by the inspector.
- d. The Contractor shall notify the District Representative 48 hours before work or part of the work commences.
- e. Where applicable, inspection of substrate anchor patterns shall be done with a surface profile indicator, surface profile comparator or Testex Press O Film Replica Tape.
- f. Abrasive blast samples shall be utilized for inspection purposes throughout the duration of blast cleaning operations.
- g. District may inspect coatings during application with a wet mil gauge. After drying, the District may inspect coatings with an Elcometer, Positest, or equivalent DFT instrument.
- h. Contractor shall furnish, until Final Acceptance of such coatings, inspection devices in good working condition for the detection of holidays and measurement of dry-film thicknesses of protective coatings.
- i. Contractor shall provide the services of a trained operator for the holiday detection devices.
- j. Holiday detection testing of coatings for submerged and severe service shall be performed in accordance with AWWA D.102-06 and NACE SPO 188.
 - 1) Testing shall be performed in the presence of the District Representative and shall be performed until the subject surfaces are 100% holiday-free.
 - 2) Contractor shall holiday test all coated ferrous surfaces. Areas which contain holidays shall be marked and repaired or recoated in accordance with the coating manufacturer's printed instructions and then retested.
 - 3) COATINGS WITH THICKNESS EXCEEDING 20 MILS: For surfaces having a total dry film coating thickness exceeding 20 mils, a pulse-type holiday detector such as Tinker & Razor Model AP-W, D.E. Stearns Co. Model 14/20, or equal shall be used. The unit shall be adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the specified coating thickness.
 - 4) COATINGS WITH THICKNESS OF 20 MILS OR LESS: For surfaces having a total dry film coating thickness of 20 mils or less, a Tinker & Razor Model M1 non-destructive type holiday detector, K-D Bird Dog, or equal shall be used. The unit shall operate at less than 75-volts. For thicknesses between 10 and 20 mils, a non-sudsing type wetting agent, such as Kodak

Photo-Flo, or equal, shall be added to the water prior to wetting the detector sponge.

- k. District may perform destructive coating adhesion tests with an Elcometer, Positest, or equivalent pull-off adhesion tester. Contractor shall be responsible for repairing the coatings.

2. FILM THICKNESS TESTING:

- a. On ferrous metals, the dry film coating thickness shall be measured in accordance with the SSPC-PA2 using a magnetic-type dry film thickness testing device such as Mikrotest model FM, Elcometer model 111/1EZ, "Inspector" or "Positest" or equal. Each coat shall be tested for the correct thickness.
- b. No measurements shall be made until at least 8 hours after application of the coating. On non-ferrous metals and other substrates, the coating thicknesses shall be measured at the time of application using a wet film gauge.

3. REJECTED WORK AND EQUIPMENT:

- a. The District shall have the right to condemn any and all tools, instruments, materials, staging, equipment, or work which does not conform to the specifications and CAL/OSHA regulations. Condemned areas of coating applications shall be marked with a compatible paint of contrasting color.
- b. Any condemned coating applications, defective preparatory work (i.e., blast cleaning, staging) or any defective work not conforming to this specification shall be rectified by the Contractor at no additional cost to the District. Any condemned tools, instruments, materials or equipment shall be replaced or rectified at no additional costs to the District.

4. APPROVAL:

- a. Prior to acceptance of part of the work or the complete work, an inspection of the work will be conducted by the District.

B. WARRANTY:

1. ELEVENTH MONTH INSPECTION:

- a. The District will conduct an inspection of coated surfaces prior to the end of the warranty period. The Contractor will be notified in advance of this inspection and may attend at his option and at no additional cost to the District. A list of all coating defects and failures identified during the inspection will be prepared and transmitted to the Contractor. The list will serve as notice of repairs required under warranty, at no additional cost to the District.

2. REPAIRS:

- a. All defective coatings shall be repaired by Contractor using coating materials, equipment, and methods similar to those used in the original work. Materials shall be of fresh manufacture and within the manufacturer's stated shelf life, at the time of application.
- b. Contractor shall complete all required coating repairs within 90 calendar days of the eleventh month inspection.

3.04 TRAINING (NOT USED)

****END OF SECTION****

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section specifies general requirements for electrical work. Detailed requirements for specific electrical items are specified in other sections but are subject to the general requirements of this section.
2. The electrical drawings and schedules included in the contract documents are based upon field conditions and indicate a constructible approach to installation of electrical systems. Existing raceway and/or cables shall be removed or identified as spare as specified in the ELECTRICAL RACEWAY SCHEDULE Section (26 06 20.21) and the ELECTRICAL CABLE SCHEDULE Section (26 06 20.25) or as shown on the drawings. Not all existing cables shown on the drawings have unique documented identification.
3. Demolition plan drawings show electrical equipment, raceways & cables to be either removed or retained for spare. Remaining segments of empty raceway shall be retagged in accordance with the ELECTRICAL RACEWAY SCHEDULE Section (26 06 20.21). Demolition Interconnection Diagrams show the termination points in existing equipment. Unless otherwise noted on the drawings or in the cable or raceway schedule, cables shall be identified as spare.
4. Cables & Raceways are shown on the plan drawings and/or specified in the ELECTRICAL CABLE SCHEDULE Section (26 06 20.25) and the ELECTRICAL RACEWAY SCHEDULE Sections (26 06 20.21). Other routes are reserved for future expansions. Raceway routing is shown on the plan drawings except for lighting and receptacle circuits. If the lighting or receptacle raceways are going to be embedded, submit and obtain approval of the embedded raceway and cable schedules prior to starting the work. Not all cable routes required for installation are shown on the drawings. The drawings do not show cables in trenches, or trays, unscheduled cables, or unscheduled raceways.
5. The ELECTRICAL PANELBOARD SCHEDULE Section (26 06 20.16) defines panelboards to be provided and modifications to existing panelboards.
6. (Not Used)

7. Existing plant single-line diagrams are included for reference. They define work or modifications to existing equipment as noted.
8. Do not shut down existing electrical equipment except as specified in the approved Outage Plan in accordance with the WORK RESTRICTIONS Section (01 14 00).

1.02 REFERENCES

- A. **REFERENCE STANDARDS:** The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of referenced publications in effect at the time of the bid shall govern. In case of conflict between the requirements of this section and the listed references, the requirements of this section shall prevail.

| <u>Reference</u> | <u>Title</u> |
|------------------|---------------------------------------|
| NFPA-70 | National Electrical Code (NEC) |
| CBC | California Building Code |
| CSC | Canadian Standards Association (CSA) |
| UL | Underwriters Laboratories Inc. (UL) |
| ETL | Electrical Testing Laboratories (ETL) |

- B. **DEFINITIONS:** (Not Used)

1.03 SUBMITTALS

- A. The following information shall be submitted for review in accordance with the SUBMITTAL PROCEDURES Section (01 33 00):
1. A copy of this specification section, with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviations.
 2. Electrical test results.
 3. Interconnection wiring diagrams.
 4. Electrical equipment nameplate engraving schedules.
 5. Electrical equipment seismic calculations.
 6. Embedded lighting and receptacle raceway and cable schedules.
- B. **GENERAL:**
1. When required in the individual specification sections attend a pre-submittal meeting prior to preparing the submittals for work described in this division.

2. The shop drawings or data required by the SUBMITTAL PROCEDURES Section (01 33 00) shall be submitted in one complete package for each electrical equipment or group of related equipment in accordance with the SUBMITTAL PROCEDURES Section (01 33 00). Submittals shall consist of the data hereinafter specified and under individual specification sections.

C. SUBSTITUTIONS:

1. Substitution for specified equipment requires a written application in accordance with the GENERAL CONDITIONS Section (00 72 00) and the SUBMITTAL PROCEDURES Section (01 33 00). Where standardized equipment is specified, it shall be provided in accordance with the GENERAL CONDITIONS Section (00 72 00).
2. CATALOG CUTS
 - a. Catalog information shall include technical specifications and application information, including ratings, range, weight, accuracy, etc. Catalog cuts shall be marked with bold arrows to identify the items, model numbers, and information that apply.
 - b. Catalog cuts shall be assembled in a folder. Each folder shall contain a cover sheet, item index, equipment numbers, and reference to the specification section and paragraph that describes the item being submitted.

D. TEST RESULTS:

1. Provide the test results in accordance with the ACCEPTANCE TESTING OF ELECTRICAL SYSTEMS Section (26 08 10) for motors and electrical systems on the forms specified.

E. PROJECT RECORD DOCUMENTS:

1. Where required to provide information on the drawings as part of the specified work, such drawings shall be prepared in accordance with the SUBMITTAL PROCEDURES Section (01 33 00). Provide project record documents (also known as “as-built drawings”) in accordance with the PROJECT RECORD DOCUMENTS Section (01 78 39).

F. INTERCONNECTION WIRING DIAGRAMS:

1. GENERAL: Prepare interconnection diagrams in accordance with the SUBMITTAL PROCEDURES Section (01 33 00). Cable shall not be pulled into raceway until the interconnection diagrams depicting the cable are approved.
2. DESCRIPTION: The conductor numbering shall consist of the equipment number, equipment designation letters, and a unique wire number; for example: P42318-B-C-1 where:

P42318 is the served equipment number (WAS pump 5)
B-C are equipment designation letters on the interconnection diagram
1 is a unique wire number for the equipment number

3. USAGE NOTES:

- a. Conductors common to two or more pieces of equipment shall, for simple interlocks, take on the number of the equipment controlled (not the one doing the controlling). For complex interlocking, the conductor's common to two or more pieces of equipment shall take on the number of the first piece of equipment in the series.
- b. Wherever possible, the conductor number shall be the same as the terminal to which it connects. The conductor numbering sequence shall start at and use the MCC terminal numbers.
- c. When factory wired equipment has terminal numbers different than the terminal numbers shown on the control and logic diagrams, use the factory numbers on the interconnection diagram and modify the control and logic diagram to show as-built conditions.

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

PART 2 -- PRODUCTS

2.01 IDENTIFICATION OF LISTED PRODUCTS

- A. Electrical equipment and materials shall be listed for the intended purposes by one or more of the following organizations: Underwriters Laboratories Inc. (UL), Canadian Standards Association (CSA), and Electrical Testing Laboratories (ETL). Other approved independent testing laboratories may be acceptable upon approval by the District Representative.

2.02 PROJECT/SITE CONDITIONS

- A. Equipment and materials shall be sized and rated for operation at full load in an ambient temperature of 40 degrees C at an elevation ranging from sea level to 1,000 feet, or other ambient conditions as specified, without exceeding the manufacturer's stated tolerances and without failure.

2.03 MATERIALS/EQUIPMENT

A. GENERAL:

1. Equipment and materials shall be new and free from defects. All material and equipment of the same or a similar type shall be of the same manufacturer throughout the work. Standard production materials shall be used wherever possible.

B. EQUIPMENT FINISH:

1. Unless otherwise specified in the particular equipment section, electrical equipment shall be finished using the manufacturer's standard factory finishing procedures. Hot-dipped galvanizing shall be in accordance with the HOT DIP ZINC COATING Section (05 05 14).

C. PHASE ARRANGEMENT:

1. The phase arrangement on three-phase buses on electrical distribution equipment shall be A, B, C (1,2,3) from front to back, top to bottom, or left to right, as viewed from the front of the equipment.

PART 3 -- EXECUTION

3.01 GENERAL

A. CONSTRUCTION:

1. The work under Division 26 shall be performed in accordance with these specifications and National Electrical Code where applicable.
2. Electrical plan drawings of existing areas, equipment location and sizes, routing and space on conduit racks, tray routing and locations of existing conduit are in reasonable agreement with actual field conditions. Plan drawings are based upon equipment sizes and configuration of the first specified equipment. Coordinate the location of electrical material and equipment with equipment pad sizes, other process equipment, piping or structures. Coordination shall be based upon the actual approved equipment and the material being provided. Equipment shall be located to accommodate access requirements identified in the manufacture's installations instructions. Minor adjustments and changes in location of electrical material or equipment made to suit the installation shall be made at no cost to the District.

B. NAMEPLATES, TAGS AND IDENTIFICATION:

1. Nameplates, tags and identification shall be provided for all electrical equipment, including junction and pull boxes and conduits.

2. For 120V and 480V receptacle nameplates, they shall be made from laminated phenolic plastic. The nominal size of the nameplates shall be 1 inch high by 3.5 inches long. Nameplates shall have black backgrounds with ½-inch white letters.
3. For conduit tags, they shall be made from RIGID stainless steel. The nominal size of the tag shall be 1 inch high by 3 inches long. Tags shall have round corners with ½-inch letters.
4. For junction and pull boxes, they shall be identified with the number shown on the drawings with spray painted stenciled numerals (1.5 inches letter sizing) or phenolic plastic nameplates attached with stainless steel screws (for stainless steel boxes).
5. If abbreviations are required because of space limitations, abbreviations shall be submitted to the District Representative prior to manufacture. The nameplate, tag or identification shall be engraved with the equipment number and description as shown on the drawings and specification schedules.

C. HOUSEKEEPING:

1. All electrical equipment including panels shall be kept dry, protected from dust, water, condensation and physical damage. Motor control centers, switchgear, and bus ducts shall be wiped free of dust and dirt on the outside, and shall be vacuumed on the inside before acceptance of the work.
2. Before final acceptance, touch up any scratches on equipment with factory supplied touchup paint of matching color.

3.02 INSTALLATION (NOT USED)

3.03 CORROSIVE AREAS AND HAZARDOUS AREAS

A. CORROSIVE AREAS:

1. The following areas are designated as corrosive:
 - a. All sumps
 - b. Manholes and handholes

B. HAZARDOUS (CLASSIFIED) AREAS:

1. The following areas are designated as hazardous (classified) areas:
 - a. Digesters

3.04 SEISMIC

- A. Electrical equipment and supports shall be braced in accordance with CBC for Risk Category III, Site Class D, and Seismic Design Category D.

- B. Provide seismic calculations for anchoring all floor mounted electrical equipment. Load and seismic calculations shall be provided for all suspended supports for bus ducts, wireways and cable trays. Load and seismic calculations shall also be provided for suspended conduit racks if they have more than 12 conduits or are different in any way from the "Typical Trapeze Pipe Support" detail shown on the drawings. All calculations shall be stamped and signed by a registered civil or structural engineer who is licensed to practice in the State of California.

3.05 WET AREAS

All outdoor and indoor areas except architecturally finished, HVAC, switchgear and motor control center rooms shall be defined as wet areas and are subject to wash down by high pressure water.

3.06 STORAGE OF MATERIALS AND EQUIPMENT

- A. Equipment and materials shall be stored as specified in the PRODUCT DELIVERY REQUIREMENTS Section (01 65 00).
- B. Equipment and materials to be located indoors shall be stored indoors and protected with plastic film wrap.

3.07 ELECTRICAL NUMBERING SYSTEMS (NOT USED)

3.08 TORQUEING ELECTRICAL CONNECTIONS

- A. All bolts and screws associated with electrical equipment for electrical connections shall be torqued in accordance with the manufacturer's instructions and in compliance with NEC Article 110. A torque wrench shall be used. The torque mechanism shall be the sensing type that automatically limits the torque to a preset value until it clicks. Beam type torque indicating wrenches are not acceptable. Torque wrenches shall be supplied in the following three ranges: a low range of 5-75 foot-pound, a medium range of 30 to 150 foot-pound, and a high range of 50 to 250 foot-pound, Klein 57000/57005/57010, or equal. Torque wrenches shall be available for each crew making connections.

3.09 DEMOLITION OF RACEWAY AND CABLES

A. CABLES:

1. Remove all wiring disconnected on this contract unless identified as spare on the plans or schedules. Spare cables shall not be removed from raceways containing active cables. Cables shall be coiled up at the nearest junction or pull box and retagged "SPARE" at both ends. Demolition schedules shall be annotated to indicate the demolished cables not removed and tagged spare. Conduits vacated by demolished cables shall be provided with a nylon pull cord fastened at each end.

B. RACEWAYS:

1. Unless otherwise specified or shown, leave in place all vacated raceways as "spares." Retag as indicated. Where exposed vacated conduit conflicts with new work, remove and cap at nearest coupling. Where embedded vacated conduit conflicts with new work, cut off, grind, and dam; plug with grout flush with building surface. Dam and grout the alternate end. Grout shall be nonshrink per the GROUTING Section (03 60 00). Plug all spaces left by removed conduits in panels, boxes, equipment, devices, fixtures, etc. The type of plug shall maintain the NEMA integrity (i.e., NEMA 12, NEMA 4X) of the equipment.

3.10 PROJECT RECORD DOCUMENTS

- A. Maintain an annotated set of contract shop drawings and a set of redline mark-ups of the contract documents in accordance with the PROJECT RECORD DOCUMENTS Section (01 78 39). These documents shall be available on-site for review by the District on request.

3.11 TESTING

A. GENERAL:

1. Equipment acceptance testing shall be performed in accordance with the requirements of the COMMISSIONING Section (01 91 00). Installation acceptance testing shall be performed in accordance with the requirements of the ACCEPTANCE TESTING OF ELECTRICAL SYSTEMS Section (26 08 10).

B. CONDUCTOR & CABLE TEST:

1. Continuity and insulation resistance measurements shall be made on conductors. The test specified herein shall be performed prior to energizing. Conductor to conductor and conductor to ground insulation resistance shall be measured for all circuits 120V and above except lighting circuits. Measurements shall be made after wire pulling and prior to connecting equipment. Insulation with a resistance of less than 50 megohms is not acceptable.

C. NETWORK CABLE CERTIFICATION: (NOT USED)

D. MOTOR TESTS: (NOT USED)

E. PRE-OPERATIONAL TESTING:

1. Prior to operational testing, all protective devices shall be adjusted and made operative. Prior to energizing of equipment, perform pre-operational testing of each device and control circuit. Pre-operational testing shall consist of energizing each control circuit and operating each control, alarm or malfunction device and each interlock in turn to verify that the specified action occurs. Submit pre-operational

tests procedures and results in accordance with the COMMISSIONING Section (01 91 00).

2. Verify that all fixtures and devices operate and are correctly polarized, that motors have correct rotation, and that all three-phase receptacles have correct phase sequence and polarity. Verification may be accomplished by momentarily energizing the motor, provided that neither the motor nor the driven equipment will be damaged by reverse operation.

3.12 TRAINING (NOT USED)

****END OF SECTION****

SECTION 26 05 21

ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section specifies conductors and cables rated 600 volts used for power, lighting and receptacle.
2. (Not Used)

1.02 REFERENCES

A. REFERENCE STANDARDS: The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of referenced publications in effect at the time of the bid shall govern. In case of conflict between the requirements of this section and the listed references, the requirements of this section shall prevail.

| <u>Reference</u> | <u>Title</u> |
|------------------|---|
| ASTM B3 | Soft or Annealed Copper Wire |
| ASTM B8 | Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft |
| ASTM D 1248 | Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable |
| ASTM D 3349 | Standard Test Method for Absorption Coefficient of Ethylene Polymer Material Pigmented with Carbon Black |
| IEEE 1202 | Standard for Flame Propagation Testing of Wire and Cable |
| NEMA WC5 | Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy |
| NEMA WC8 | Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy |
| NFPA 70 | National Electrical Code (NEC) |
| UL 44 | Rubber-Insulated Wires and Cables |

| <u>Reference</u> | <u>Title</u> |
|------------------|---|
| UL 83 | Thermoplastic-Insulated Wires and Cables |
| UL 224 | Extruded Insulated Tubing |
| UL 486A | Wire connectors and Soldering Lugs for Use with Copper Conductors |
| UL 486C | Splicing Wire Connectors |
| UL 510 | PVC and Rubber insulating Tape |
| UL 758 | Appliance Wiring Methods |
| UL 1277 | Electrical Power and Control Tray Cables with Optional Optical Fiber Members |
| UL 1666 | Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts |
| UL 1685 | Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical Fiber Cables |

B. DEFINITIONS: (NOT USED)

1.03 SUBMITTALS

A. The following information shall be submitted for review in accordance with the SUBMITTAL PROCEDURES Section (01 33 00)

1. GENERAL:

- a. A copy of this specification section, with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviations.
- b. Manufacturer's catalog data showing manufacturer's general information on the conductors and cable to be supplied.
- c. Manufacturer's catalog data on terminations, taps, splices, tapes, insulation type, insulation voltage, American Wire Gauge (AWG) size, conductor material, pulling compound, and compression tools.
- d. Manufacturer's catalog data for cable and wire markers.
- e. Conductor and wire marker schedule.
- f. SHOP DRAWINGS: Show splice locations for each proposed splice. Provide written justification describing why the splice is necessary.
- g. TEST REPORTS: Submit test reports for meg-ohm tests.

- h. CALCULATIONS (NOT USED)
- 2. MEDIUM VOLTAGE CABLE: (NOT USED)
- 3. FIBER OPTIC CABLE: (NOT USED)
- 4. CAT 6 CABLE: (NOT USED)
- 5. PROFIBUS DP AND PROFIBUS PA CABLE: (NOT USED)

1.04 STORAGE OF MATERIALS AND EQUIPMENT

A. As specified in COMMON WORK RESULTS FOR ELECTRICAL Section (26 05 00).

1.05 QUALITY ASSURANCE

A. As specified in COMMON WORK RESULTS FOR ELECTRICAL Section (26 05 00).

1.06 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

PART 2 -- PRODUCTS

2.01 GENERAL

A. Provide the type, size and number of conductors as shown and as specified in the raceway and cable schedule included in the ELECTRICAL RACEWAY SCHEDULE Section (26 06 20.21). Unscheduled lighting system and receptacle circuit conductors shall be provided.

2.02 COLOR CODING

A. CONTROL CONDUCTORS:

- 1. SINGLE CONDUCTOR: Single conductor No. 14 AWG control cable shall be violet except neutrals which shall be white.
- 2. MULTICONDUCTOR: Multi-conductor No. 14 or No. 16 AWG control cable shall be color coded per WC8, Part 5, Method 1, Table K-2.

B. POWER CONDUCTORS:

- 1. Power conductors shall have the following colors for the indicated voltage:

| | | |
|---------|-----------------|-----------------|
| | <u>120/208V</u> | <u>277/480V</u> |
| Phase A | Black | Brown |
| Phase B | Red | Orange |

| | | |
|---------|-------|------------------|
| Phase C | Blue | Yellow |
| Ground | Green | Green |
| Neutral | White | White/Red Tracer |

2. Cables sized No. 4 AWG and larger shall be black with phase colored 3/4-inch vinyl plastic tape.

2.03 LIGHTING AND RECEPTACLE CONDUCTORS

- A. Lighting and receptacle conductors shall be stranded. Minimum size conductor shall be No. 12 AWG.

1. 120V receptacle conductor shall be No. 12 AWG
2. 480V receptacle conductor shall be No. 6 AWG and No. 8 AWG for grounding

- B. Conductors shall be provided with the following characteristics:

| | |
|-------------------|---|
| VOLTAGE: | 600 Volts |
| CONDUCTOR: | Bare annealed copper; stranded, annealed copper per ASTM B8 |
| INSULATION: | THHN/THWN, 90 degree C dry, 75 degree C wet, polyvinylchloride (PVC) per UL 83. |
| JACKET: | Nylon |
| FLAME RESISTANCE: | UL 83 |
| MANUFACTURER: | Houston Wire & Cable type THHW/THWN; Southwire, Type THHN/THWN, or equal |

2.04 POWER AND CONTROL CONDUCTORS AND CABLE, 600 VOLT (NOT USED)

2.05 MEDIUM VOLTAGE POWER CONDUCTORS AND CABLE (5 KV-15 KV) (NOT USED)

2.06 SIGNAL CABLES (SC) (NOT USED)

2.07 DATA CABLE (NOT USED)

2.08 COMMUNICATION CABLE (NOT USED)

2.09 FIBER OPTIC CABLE (FOS AND FOM) (NOT USED)

2.10 INNERDUCT (NOT USED)

2.11 PROTECTIVE TUBING AND TEMPORARY CAPS (NOT USED)

2.12 LUBRICANT (NOT USED)

2.13 CABLE AND WIRE MARKERS

A. GENERAL:

1. Lettering shall be resistant to smudging, fading, chemical and harsh environment deterioration.
2. Sleeves shall be sized to fit the conductor insulation and shrunk to fit the conductor with hot air after installation.

B. CABLE AND WIRE MARKERS:

1. Cable and wire markers shall be heat shrinkable irradiated polyolefin, conforming to UL 224.
2. The letters and numbers that identify each cable or wire shall be machine-printed with 1/8-inch high characters on 2-inch sleeves with permanent black ink.
3. The wire marking system shall be Brady PermaSleeve PS-XXX-2-W series Wire Marking Sleeves and Brady PS Printer, or equal.

2.14 600V CONNECTORS, TAPS AND SPLICES

- A. One- and two-way connectors shall be tool applied compression types for stranded conductors conforming to UL 486A. The compression tool shall be designed to prevent the tool from releasing until the proper compression force is reached. The tool and connectors shall be of the same manufacture. Connectors shall be constructed with tin-plated high conductivity wrought copper. Connectors for wire sizes #8 AWG and larger shall be long barrel. One-way connectors shall be one-hole lugs up to size #3/0

AWG, and two-hole or four-hole lugs for size #4/0 and larger. Furnish T&B #549xxBE, #548xxBE, and #548xx series with hydraulic TBM tools, or equal. Mechanical clamp, dimple, screw-type one and two-way connectors are not acceptable.

- B. Tap connectors shall be split-bolt with spacer type conforming to UL 486A. Hex-head split-bolt and pressure bar shall be constructed of copper alloy. Spacer shall be contoured and constructed of electrolytic copper or bronze alloy. All pieces shall be tin-plated. Furnish T&B Blackburn xxHPS series, or equal.
- C. Connectors for wire sizes #10 AWG and smaller shall be nylon self-insulated locking forks or rings of high conductivity electrolytic copper conforming to UL 486A. Crimping tool shall be of the same manufacture as the connector. Furnish T&B RB22xx & RB14xx series with ERG tools, or equal. Standard spring connectors for #10 AWG and smaller conductors shall be flame-retardant winged nylon shells with a fixed square-wire plated steel spring conforming to UL 486C. Furnish 3M Ranger 512 series, or equal. Waterproof spring connectors shall be the same as the standard type, except filled with silicone sealant. Furnish King Safety Inc. King 3, 4, 5 sealed pro line series, or equal.
- D. Insulating tapes shall be weather resistant, flame retardant, rated for 80° C and 600 volts conforming to UL 510. Electrical tape shall be 7-mil vinyl plastic black. Phase tape shall be 7-mil vinyl plastic color code as specified herein. Furnish 3M Scotch 33, 35, or equal. Varnished cambric shall be 9-mil cotton tape impregnated with yellow insulating varnish and adhesive backed. Furnish 3M Scotch 2520, or equal. High temperature tape shall be rated for 130° C temperatures, linerless rubber, suitable for 1kV through 69kV. Furnish 3M Scotch 130C, or equal. Heat shrinkable insulators shall be rated 600v and 90° C conforming to UL 486D. Heat shrinkable tape, tubing, boots, and end caps shall be made of thermally stabilized cross-linked polyolefin with internal moisture sealant. Furnish T&B Shrink-konHSxx series, or equal.

2.15 5 KV AND 15 KV TERMINATIONS, SPLICES AND PULL ROPE (NOT USED)

2.16 PROFIBUS DP CONNECTORS (NOT USED)

2.17 FIREPROOFING MATERIALS

- A. Fireproofing tape shall be 3M Scotch 77, or equal. Tape shall be held in place with 3M Scotch 69, or equal, glass cloth tape.

PART 3 -- EXECUTION

3.01 GENERAL

- A. Each power conductor shall be identified at each terminal to which it is connected. The marking system shall comply with the COMMON WORK RESULTS FOR ELECTRICAL Section (26 05 00).

- B. Wire and cable shall not be pulled into conduits until conduits have been cleaned, and the associated interconnection diagrams have been approved.
- C. Pulling wire and cable into conduit or trays shall be completed without damaging or putting undue stress on the cable insulation. UL listed pulling compounds, American Polywater J or Ideal Yellow 77, are acceptable lubricants for pulling wire and cable. Grease is not acceptable. Raceway construction shall be complete and protected from the weather before cable is placed.
- D. Whenever a cable leaves a raceway, a cable support shall be provided such that no cable weight is transferred on the termination point.
- E. When flat bus bar connections are made with unplated bar, the contact areas shall be cleaned to a smooth bright metal. Bolts shall be torqued to the bus manufacturer's recommendations.
- F. Each field connection shall be connected to an individual terminal block, except for signal circuits where no more than two conductors shall be inserted into a terminal.
- G. Spare power conductors shall be identified with wire markers as "spare". A minimum of 12 inches of conductor length shall be coiled inside electrical equipment or pull boxes. Spare conductors shall be insulated with half lapped vinyl plastic tape on each end.
- H. Install cables and conductors so that the radius of bends is larger than the manufacturer's recommended minimum bending radius.

3.02 600 VOLT CONDUCTOR AND CABLE

A. ELECTRICAL PANELS:

1. Conductors in panels and electrical equipment, No. 6 AWG and smaller, shall be bundled and laced at intervals not greater than 6 inches, spread into trees and connected to their respective terminals. Lacing shall be made up with plastic cable ties. Lacing is not necessary in plastic panel wiring duct.
2. Conductors crossing hinges shall be bundled into groups not exceeding 12. Groups shall be so arranged that they will be protected from chafing and rotate instead of bend when the hinged member is moved.
3. Stranded conductors shall be terminated using connectors and tools described in herein. Where terminals will not accept such terminations, conductors shall be terminated directly on the terminal block.
4. (Not Used)

B. JUNCTION AND PULL BOXES:

1. Slack shall be provided in junction and pull boxes. Slack shall be sufficient to allow cables or conductors to be routed along the walls of the box.
2. Cable racks shall be placed at 2-foot intervals along the walls of large pull boxes. Cables shall be secured to the racks by plastic cable ties arranged in three phase circuits.
3. Splices shall be installed only in junction boxes, pull boxes, outlets, or cabinets. Splices shall be permitted inside panelboard as shown in the Contract drawings and specification schedules.
4. Indoor lighting fixtures and 120V receptacles shall be terminated with standard spring connectors. Outdoor lighting fixtures and 120V receptacles shall be terminated with waterproof spring connectors.
5. Two-way and split-bolt taps in outdoor boxes shall be insulated and waterproofed with heat shrink tubing or heat shrink boots. Two-way and split-bolt taps in indoor boxes shall be insulated with heat shrink tubing, heat shrink boots, or hand wrapped. Hand wrapping shall be varnished cambric first layer, high temperature tape second layer, and vinyl-plastic tape top layer.

C. MOTORS AND TRANSFORMERS: (NOT USED)

D. MOTOR CONTROL CENTERS:

1. Cables entering MCCs shall be bundled into groups of power for each digester receptacles with plastic cable ties. Each group shall also be supported within the vertical and horizontal wire troughs with plastic cable ties to the trough sides.

3.03 SIGNAL CABLE AND DATA CABLE (NOT USED)

3.04 5 KV AND 15 KV CABLE (NOT USED)

3.05 FIBER OPTIC CABLE (NOT USED)

3.06 PHASE INSTALLATION AND IDENTIFICATION

- A. The phase installation on three-phase buses or terminals shall be A,B,C from front to back, top to bottom, or left to right, as viewed from the front of the electrical power distribution equipment.

3.07 UNSCHEDULED CONDUCTORS

- A. The unscheduled conductors shall be sized by the Contractor to limit voltage drop to 3 percent and shall be sized in accordance with the NEC. The wire shall not be sized less than No. 12 AWG.

3.08 CONDUCTOR CODE COLOR

- A. (Not Used)
- B. (Not Used)
- C. Power conductors #6 AWG and smaller shall have the specified colored insulation throughout the circuit. Power conductors #4 AWG and larger shall have phase colored tape installed at the feeder termination and all utilization equipment terminations.
- D. (Not Used)

3.09 INNERDUCT INSTALLATION (NOT USED)

3.10 TESTING

A. GENERAL:

- 1. Test all conductors and cable unless otherwise specified herein. Test results shall be submitted under the COMMON WORK RESULTS FOR ELECTRICAL Section (26 05 00) for power conductors.

B. CONDUCTORS:

- 1. Conductor-to-conductor and conductor-to-ground insulation resistance shall be measured for all circuits, 120 volts and above. Measurements shall be made after the wire has been pulled and prior to connecting the equipment.

C. 5-15 KV CABLE: (NOT USED)

D. FIBER OPTIC CABLE: (NOT USED)

3.11 CABLE AND WIRE MARKERS

- A. All conductors and cables shall be identified with markers. Conductors shall be identified at each connection point with printed wire markers in accordance with the COMMON WORK RESULTS FOR ELECTRICAL Section (26 05 00).
- B. Each wire shall be numbered in accordance with the Contract drawings and specification schedules.
- C. Installed conductor markers shall be positioned to be read without twisting the conductor.
- D. Installed conductor markers that can be smudged or erased after installation shall be sprayed with a clear acrylic fixative.

3.12 TRAINING (NOT USED)

****END OF SECTION****

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section specifies the system for grounding electrical equipment, exposed metal surfaces of equipment that could possibly become energized and metal structures. The grounding and bonding system is intended to minimize touch potential and to provide a safe and effective path for dissipation of lightning and fault currents. The grounding system is intended to provide a low resistance path (less than or equal to 2 ohms) to earth ground.

1.02 REFERENCES

- A. REFERENCE STANDARDS: The publication referred to hereinafter forms a part of this specification to the extent referenced. The publication is referred to in the text by the basic designation only. The latest edition of the referenced publication in effect at the time of the bid shall govern. In case of conflict between the requirements of this section and the listed reference, the requirements of this section shall prevail.

| <u>Reference</u> | <u>Title</u> |
|------------------|---|
| ASTM | Standard specification for Concentric-Lay Copper Conductors, Hard, Medium-Hard, or Soft |
| NFPA 70 | National Electrical Code (NEC) |
| NEC 250 | National Electrical Code (NEC) Grounding |
| UL 467 | Grounding and Bonding Equipment |

B. DEFINITIONS: (Not Used)

1.03 SUBMITTALS

- A. The following information shall be submitted for review in accordance with the SUBMITTAL PROCEDURES Sections (01 33 00):
1. A copy of this specification section, with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviations shall be submitted.

2. Manufacturer's catalog and application data for each material shall be submitted in accordance with this specification.
3. Manufacturer's installation instructions shall be submitted.

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

PART 2 -- PRODUCTS

2.01 GROUND RODS AND CLAMPS (NOT USED)

2.02 EXOTHERMIC CONNECTORS (NOT USED)

2.03 COMPRESSION CONNECTORS

- A. Compression connectors shall be the irreversible type and be constructed with tin-plated high conductivity wrought copper conforming to the ELECTRICAL POWER CONDUCTORS AND CABLES Section (26 05 21). Burndy YSCM Series, or equal.

2.04 GROUND PLATES (NOT USED)

2.05 GROUND WELL (NOT USED)

PART 3 -- EXECUTION

3.01 GENERAL

- A. The grounding electrode system consists of the bonding together of the ground ring conductors with the ground rods, duct bank grounding conductors, foundation rebar, metal frame of the building(s), metal underground water pipes and other made electrodes. The ground ring conductors shall be buried a minimum of 30 inches deep.

3.02 INSTALLATION

A. CONNECTIONS: (NOT USED)

B. EMBEDDED GROUND CABLES:

1. Ground cables embedded in slabs or pads shall be laid underneath the top layer of reinforcing steel. Ground cables shall be securely attached to reinforcing steel with tie wires to prevent displacement from the steel during concrete placement. Ground cables shall be bonded by exothermic welds to the reinforcing steel at 40-foot intervals but in two places at a minimum.
2. Ground cables embedded in duct banks shall be bonded together in manholes and handholes. Duct bank ground cables shall also be bonded to distribution equipment

served by the duct bank. Manhole ground cables shall be connected by exothermic weld.

3. The District shall be notified 24 hours prior to backfilling or encasing in concrete any part of a ground system.

C. EXPOSED GROUNDING CONDUCTORS:

1. Grounding conductors which extend beyond concrete surfaces for connection to equipment shall be extended a sufficient length to reach the final connection point without splicing. The minimum extension shall be 6 feet. Grounding conductors which project from a concrete surface shall be located as close as possible to the equipment grounding pad and shall be protected from mechanical damage by a conduit sleeve. Exposed grounding conductors shall be supported by noncorrosive metallic hardware at 4-foot intervals or less. Grounding conductors for substation transformers and future equipment shall be terminated using a four-hole copper flush mounted grounding plate.

D. ELECTRICAL EQUIPMENT GROUNDING:

1. Ground conductors, except signal conductor shields, entering metallic enclosures shall be bonded together to the enclosure or ground bus. Prior to making ground connections or bonds, the metal surface at the point of connection shall be cleaned to a smooth bright metal.
2. Lightning arresters shall be directly connected to the ground system using copper conductors.
3. Metal device boxes shall be drilled and tapped and fitted with a grounding screw for the terminating of the equipment grounding conductor.
4. Metallic sheaths or shields of shielded power cable shall be terminated by connecting the cable sheath or shield grounding strap (provided with the cable termination or splice kit or connector) to the grounding system.
5. (Not Used)
6. (Not Used)

E. RACEWAY GROUND:

1. Metallic conduits shall be assembled to provide a continuous ground path from the point of supply to the utilization equipment. Metallic conduits shall be bonded to the ground system using insulated grounding bushings and conductors sized in compliance with NFPA 70.
2. An insulated (green) stranded copper equipment grounding conductor shall be installed in conduits that contain circuits operating above 50 volts. The equipment

grounding conductor shall provide a continuous ground path from the point of supply to the utilization equipment. When the size of the equipment grounding conductor is not shown on the drawings or cable schedules, the equipment grounding conductor shall be sized in accordance with Table 250-95 of NFPA 70.

3. Metal parts of nonmetallic boxes and plastic coated boxes shall be bonded to the conduit system.
4. Cable trays shall have No. 2/0 AWG bare copper bonding jumper looped on the outside of each tray. The ground conductor shall be connected to each section or fitting.

F. EQUIPMENT AND ENCLOSURE GROUND: (NOT USED)

G. BUILDING GROUND: (NOT USED)

3.03 CABLE SIZES

- A. Ground cable shall be annealed bare or insulated copper, concentric stranded as shown on the drawings. If ground cable sizes are not shown on the drawings, the minimum sizes shall be in accordance with NEC Article 250 and as follows:

| <u>Item</u> | <u>Ground Cable Size</u> |
|------------------------------------|--------------------------|
| Cable tray | 2/0 AWG |
| Lighting panels | 2 AWG |
| Exposed metal (possibly energized) | 2 AWG |

3.04 TESTING (NOT USED)

3.05 TRAINING (NOT USED)

****END OF SECTION****

SECTION 26 05 34

RACEWAYS, FITTINGS, AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section specifies raceways, fittings and supports, and boxes for electrical conductors and cables.

1.02 REFERENCES

- A. REFERENCE STANDARDS: The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of referenced publications in effect at the time of the bid shall govern. In case of conflict between the requirements of this section and the listed references, the requirements of this section shall prevail.

| <u>Reference</u> | <u>Title</u> |
|------------------|---|
| ANSI/NFPA 70 | National Electric Code (NEC) |
| ANSI C80.1 | Electric Rigid Steel Conduit-Zinc Coated (ERSC) |
| ASTM A123 | Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products |
| ASTM 153 | Zinc (Hot Dipped) Coating on Iron and Steel Hardware |
| ASTM A240 | Heat-Resisting Chromium and Chromium-Nickel Stainless Plate, Steel and Strip |
| ASTM A570 | Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality |
| ASTM A576 | Steel Bars, Carbon, Hot-Wrought, Special Quality |
| ASTM A193 | Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service |
| ASTM B633 | Electrodeposited Coating of Zinc and Iron and Steel |
| ASTM C857 | Minimum Structural Design Loading for Underground Precast Concrete Utility Structures |
| ASTM E814 | Methods for Fire Tests of Through-Penetration Fire Stops |
| NEMA ICS-6 | Enclosures for Industrial Controls and Systems |
| NEMA RN-1 | Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit |
| NEMA TC2 | Electrical Plastic Tubing (EPT) and Conduit (EPC 40 and EPC 80) |

| <u>Reference</u> | <u>Title</u> |
|------------------|---|
| NEMA VE1 | Cable Tray Systems |
| UL 6 | UL Standard for Safety, Rigid Metal Conduit, 10th Edition |
| UL 50 | Enclosures for Electrical Equipment, Non-Environmental Considerations |
| UL 467 | Grounding and Bonding Equipment |
| UL 514A | Metallic Outlet Boxes |
| UL 514B | Fittings for Conduit and Outlet Boxes |
| UL 870 | Wireways, Auxiliary Gutters, and Associated Fittings |
| UL 886 | Outlet Boxes and Fittings for Use in Hazardous Locations |
| UL 1479 | Fire Tests of Through-Penetration Fire stops |

B. DEFINITIONS: (NOT USED)

1.03 SUBMITTALS

A. The following information shall be submitted for review in accordance with the SUBMITTAL PROCEDURES Section (01 33 00):

1. A copy of this specification section, with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviations.
2. Shop drawings for all large fabricated pull boxes.
3. Raceway support seismic and safety factor calculations
4. MANUFACTURERS CATALOG DATA:
 - a. Galvanized rigid steel conduit, hazardous location fittings and conduit outlet boxes
 - b. (Not Used)
 - c. (Not Used)
 - d. (Not Used)
 - e. Boxes grouped by NEMA classification and size.
 - f. (Not Used)
 - g. (Not Used)
 - h. Individual, embedded and suspended raceway supports

- i. Conduit tags and fire stops
- j. Conduit engraving schedule

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

PART 2 -- PRODUCTS

2.01 STEEL CONDUIT, FITTINGS AND CONDUIT OUTLET BOXES

A. GALVANIZED RIGID STEEL CONDUIT:

1. Galvanized rigid steel conduit and elbows shall comply with ANSI C80.1 and UL 6; minimum size shall be ¾-inch. Zinc coating shall be applied after fabrication and then coated with a chromate finish. Conduit shall be as manufactured by Allied Tube and Conduit, Type GRC.

B. CONDUIT OUTLET BODIES: (NOT USED)

C. FITTINGS: (NOT USED)

D. HAZARDOUS LOCATION FITTINGS AND CONDUIT OUTLET BOXES

1. Conduit seals and unions shall conform to UL 886 and the requirements of Class I, Division 1, Group D hazardous atmospheres per NEC Articles 500 series. The seal fittings shall be fabricated from cast ferrous alloy finished with zinc electroplate and aluminum acrylic paint. All vertical fittings shall be provided with stainless steel drain fittings. Seal fittings shall be Emerson Appleton EYS series. Unions shall be electrogalvanized ferrous alloy type Emerson Appleton UNF or UNY series.
2. Conduit outlet boxes shall conform to UL 886 and the requirements of Class I, Division 1, Group D hazardous atmospheres per NEC Articles 500 series. The conduit outlet boxes shall be fabricated from copper-free aluminum cover with malleable iron body for ½” to 1”. They shall be fabricated from malleable iron cover and body for 1-¼” to 2”. Standard finishes shall be zinc electroplated aluminum enamel. Conduit outlet boxes shall be Emerson Appleton GUAT series.
3. Recessed head close-up plug shall conform to UL 886 and the requirements of Class I, Division 1, Group D hazardous atmospheres per NEC Articles 500 series. The recessed head close-up plugs shall be fabricated from malleable iron or steel with zinc electroplate finish. Recessed head close-up plug shall be Emerson Appleton PLG series.
4. Fiber filler shall be used to make dams around and between all conductors to prevent sealing compound from leaking while being poured in its liquid state. Sealing cement shall be poured in sealing fittings and hardens to contain and restrict the

passage of gases and explosions in classified areas. Conduit sealing kits shall be Emerson Appleton Kwiko® A Sealing Cement and Fiber Filler Kits AC1F01-A.

2.02 PVC COATED RIGID STEEL CONDUIT, FITTINGS AND ACCESSORIES (NOT USED)

2.03 FLEXIBLE CONDUIT (NOT USED)

2.04 RIGID NONMETALLIC CONDUIT (NOT USED)

2.05 WIREWAYS (NOT USED)

2.06 CABLE TRAYS (NOT USED)

2.07 NEMA 3R CAST FERROUS ALLOY BOXES (NOT USED)

2.08 NEMA 7 CAST FERROUS ALLOY BOXES (NOT USED)

2.09 NEMA 12 BOXES

A. MID-SIZE BOXES:

1. Boxes shall be fabricated from welded 14/16-gauge steel. Finish shall be ANSI 61 light gray enamel over phosphate pretreatment. Fasteners, screws and hardware shall be 316 stainless steel and hinged doors shall be provided with gaskets. Boxes shall conform to NEMA ICS6 type 12 requirements. All screws shall be captive. Manufacturer shall be Hoffman Bulletin A51, or equal. Provide Hoffman A1210CHQR or equal.

B. LARGE CUSTOM FABRICATED PULL BOXES: (NOT USED)

2.10 NEMA 4 AND 4X BOXES (NOT USED)

2.11 NEMA 1 PRESSED STEEL BOXES (NOT USED)

2.12 WIRING TROUGH (NOT USED)

2.13 EXPANSION, WALL AND ROOF FITTINGS (NOT USED)

2.14 HANDHOLES (NOT USED)

2.15 MANHOLES (NOT USED)

2.16 RACEWAY SUPPORTS

A. INDIVIDUAL CONDUIT SUPPORTS:

1. STANDARD DUTY: Individual conduit supports shall include strap and clamp backs, beam clamps, tray clamps and jay hangers. Supports shall be fabricated from

malleable iron finished with hot-dipped galvanization or zinc electroplate and aluminum paint. Furnish Emerson Appleton BH series, CL/B series, CH/D series, TCC/D series, Uni-strut J12XX series, or equal.

2. **CORROSIVE DUTY:** Corrosive duty individual conduit supports shall be the same as standard duty; except shall have 40 mil PVC jacket and #316 stainless steel hardware. Furnish Robroy Industries Plasti-Bond Redh2ot, C149 series, RA series, PAR series, CLB-M series, or equal.

B. EMBEDDED SUPPORTS:

1. **STANDARD DUTY:** Concrete inserts shall include; spot inserts and framing channels. Embedded supports shall be fabricated from cold rolled 12-gauge steel conforming to ASTM A570 GR33 with hot-dipped galvanized finish conforming to ASTM A123. Dimension shall be nominal 1-5/8-inch width with 1-1/2-inch welded tabs on 4-inch centerlines. Channels shall be Styrofoam filled with welded tab end caps. Furnish Uni-strut P3245, P3704, P3270 series, or equal.
2. **CORROSIVE DUTY:** Corrosive duty concrete inserts shall be the same as standard duty; except shall be 1-5/8-inches wide by 7/8-inch deep and be fabricated from 12-gauge stainless steel conforming to ASTM A240 type 316. Furnish special order Uni-strut P335X-SS, P3703-SS, P3370-SS series, or equal.

C. SUSPENDED RACEWAY SUPPORTS:

1. **STANDARD DUTY:** Suspended raceway supports shall be trapeze type consisting of threaded rods, nuts, square washers, fittings, framing channels, cable tray clamps and conduit clamps. Fittings and framing channels shall be fabricated from cold rolled 12-gauge steel conforming to ASTM A570 GR33 with hot-dipped galvanized finish conforming to ASTM A123. Channels shall have nominal 1-5/8-inch square slot with inturned lips. Double strut shall be two channels welded back to back. Hardware shall be fabricated from case hardened mild steel in conformance with ASTM A576, GR 1015 with electrogalvanized finish conforming to ASTM B633, Type III SC1. Threads shall be American coarse screw threads UNC, Class 2A/B. Channel conduit clamps shall be two-piece steel with hex head screw and nut. Plastic end caps shall be made specifically for framing channel ends. Furnish Uni-strut P1000/P1001 series, P11XX/P15XX series, P286X series, P2860-XX series and HTHRXXX series, Legrand P W Industries Cablofil 1811 series, or equal.
2. **CORROSIVE DUTY:** Corrosive duty suspended raceway supports shall be the same as standard duty; except they shall have a 40-mil PVC jacket and all rods, nuts and hardware shall be #316 stainless steel. Furnish Robroy Industries Plasti-Bond RedH2OT, P1000 series, C105 series, or equal.

2.17 CONDUIT TAGS

- A. Conduit tags shall be ¾-inch wide by 3-inch long with round corners made from RIGID stainless steel engraved with ¼-inch high characters. Tags shall be attached to the raceway with No. 14 AWG, 316 stainless steel wire.
- B. If abbreviations are required because of space limitations, abbreviations shall be submitted to the District Representative prior to manufacture. The nameplate shall be engraved with the equipment number and description as shown on the drawings and specification schedules.

2.18 RACEWAY PLAQUES (NOT USED)

2.19 FIRESTOPS

A. FIRESTOP MORTAR (NOT USED)

B. FIRESTOP BAGS (NOT USED)

C. FIRESTOP SEALANT:

- 1. Firestop sealant shall be water based, high solids, elastomeric sealant, which forms an intumescent barrier conforming to UL 1479 and ASTM E814. Firestop sealant shall be packaged in caulk tubes or pails. Furnish Emerson Nelson Firestop CLK, ES1399, LBS3, or equal.

D. FIRESTOP PUTTY:

- 1. Firestop putty shall be adhesive, non-hardening, dielectric compound that forms an intumescent barrier conforming to UL 1479 and ASTM E814. Furnish 3M Company stix MP; Emerson Nelson Firestop FSP, or equal.

2.20 CABLE RACKS (NOT USED)

2.21 DUCT CABLE SEALS AND PLUGS (NOT USED)

PART 3 -- EXECUTION

3.01 GENERAL

- A. **CONDUIT RUNS BETWEEN BOXES:** The Contractor shall limit the number of directional changes of the conduit to total not more than 270 degrees in any run between pull boxes. Conduit runs shall be limited to a maximum of 400 feet, less 100 feet for every 90 degrees of change in direction. Bends and offsets shall be avoided where possible but, where necessary, shall be made with a hickey or conduit bending machine, or shall be factory preformed bends. Turns shall be made with cast metal fittings or conduit bends. Welding, brazing or otherwise heating of conduit is not acceptable.

- B. **JUNCTION AND PULL BOXES:** Where required for pulling cable and as necessary to meet the requirements specified herein, the Contractor shall provide condulets, cast junction or pull boxes. Pull boxes used for multiple conduit runs shall not combine circuits fed from different MCCs, switchboards, or switchgear. All junction and pull boxes shall be identified with the number shown on the drawings with spray painted stenciled numerals.
- C. **CONDUIT TERMINATIONS:** Conduit entering NEMA 1 type sheet steel boxes or cabinets shall be secured by a locknut on the exterior of the box or cabinet and an insulated bonding and grounding bushing on the interior side. Steel conduit entering all other boxes shall be terminated into a threaded hub. Boxes without threaded hubs shall be provided with conduit hubs with a grounding locknut for each conduit entry. Joints shall be made with standard couplings or threaded unions. Running threads shall not be used in lieu of conduit nipples, nor shall excessive thread be used on any conduit. The ends of conduit shall be cut square, reamed, and threaded with straight threads. Rigid steel conduit shall be made up tight and without thread compound. Exposed male threads on rigid steel conduit shall be coated with electrically conductive zinc-rich paint. All underground conduits that terminate at junction boxes, panels, switchgear, MCCs or structures shall be sealed with approved duct seal to prevent the transfer of moisture.
- D. **MATCHING EXISTING FACILITIES:** When new conduit is added to areas that are already painted the conduit and its supports shall be painted to match the existing facilities. Where new conduit is used to replace existing conduit, the existing conduit and supports shall be removed, resulting blemishes shall be patched and repainted to match original conditions. Similarly, if existing conduits are to be reused and rerouted, resulting blemishes shall be corrected in the same manner.
- E. Each conduit, wire way and tray shall be identified by a specified number. The numbering system is specified in the COMMON WORK RESULTS FOR ELECTRICAL Section (26 05 00). All raceways identified in the ELECTRICAL RACEWAY SCHEDULE Section (26 06 20.21) shall be tagged, even if not identified as such on the drawings.
- F. **CONDUIT SEPARATION:**
1. Signal conduits shall be separated from AC power or control conduits. The separation shall be a minimum of 12 inches for metallic conduits and 24 inches for nonmetallic conduits.
 2. (Not Used)
 3. (Not Used)

3.02 INSTALLATION (NOT USED)

3.03 CONDUIT

A. CONDUIT LOCATIONS:

1. Unless otherwise specified in Table A below, conduit shall be galvanized rigid steel.

| Table A. Conduit Locations | |
|-----------------------------------|---|
| Conduit type | Location |
| Galvanized rigid steel | All exposed noncorrosive areas. |
| Schedule 40 PVC | Encased in concrete duct banks, concrete capped lighting and receptacle underground raceways |
| PVC coated rigid steel | Exposed in corrosive areas and conduits which are stubbed-up through the soil or concrete |
| Liquidtight flexible | Final raceway connections to equipment subject to vibration or adjustment in nonhazardous areas |
| Explosionproof flexible | Final raceway connections to equipment subject to vibration or adjustment in hazardous areas |

2. Examine equipment outline and dimension drawings to coordinate routing of conduit with manufacturer's installation instructions. Conduit routing shall not interfere with subsequent maintenance activities. Position of new conduit within conduit racks shall be adjusted as necessary to minimize interference with existing raceways, boxes, piping, structural openings, future equipment and other equipment. Conduit shall not block access to boxes, equipment, or unused rack space. In general, conduits shall be located at positions near the top of racks and near walls where possible. Any conduit that interferes with maintenance activities shall be removed and rerouted at the Contractor's expense. The Contractor shall make allowance in his bid to make minor changes in routings at no additional cost to the District.

B. CONDUIT SUPPORT:

1. Exposed rigid steel or plastic coated conduit shall be run on supports spaced not more than 10 feet apart, within 3 feet of 90 degree turns and junction boxes and shall be constructed with runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceiling. No conduit shall approach closer than 6 inches to any object operating above the rated temperature of the cable insulation it

contains. Where three or more conduits are located in a parallel run, they shall be spaced out from the wall using framing channel or suspended raceway supports. All framing channel conduit support systems shall be oversized to allow for 25 percent additional conduit space. All exposed ends of framing channels shall be protected with plastic end caps. Exposed expansion fittings shall be installed where conduit crossed building expansion joints.

2. Steel conduit shall be supported away from the structures using standard duty individual or suspended raceway supports. PVC coated conduit shall be supported away from the structure using corrosive duty individual or suspended raceway supports.
3. Conduit racks shall be secured to concrete walls and ceilings by means of standard duty embedded supports. Plastic inserts or gunpowder-driven inserts are not acceptable as a base to secure conduit supports. Stainless steel expansion anchors shall be used to support individual conduit supports in exterior areas.

C. CONDUIT ENCASEMENT: (NOT USED)

D. RACEWAY PENETRATIONS:

1. Raceway routed perpendicular through floors, walls or other concrete structures shall pass through cast- in-place openings. In cases where cast-in-place openings are not possible, appropriate size holes shall be bored through the concrete to accommodate the raceway and sealing fitting. The size and location of the holes shall not impair the structure's integrity. After completion, grout or caulk around raceway and finish to match surroundings. A 3½-inch-high concrete pad with a sloping top shall protect raceway that rises vertically through a floor or slab. All penetrations shall be fire stopped.
2. (Not Used)
3. (Not Used)

E. PVC COATED CONDUIT: (NOT USED)

F. FLEXIBLE CONDUIT: (NOT USED)

G. UNSCHEDULED RACEWAY:

1. The lighting system and receptacle circuits are unscheduled and shall be provided.
2. The raceway shall be sized by the Contractor in accordance with the NEC Table C8 (RH insulation). Minimum size shall be ¾-inch for exposed and 1 inch for embedded raceway; minimum size in duct bank interconnecting manholes or handholes shall be 2 inches.

H. SCHEDULED RACEWAY:

1. Provide the raceways as shown and specified in the ELECTRICAL RACEWAY SCHEDULE Section (26 06 20.21).
2. The Contractor shall bring all conflicts between the drawings and the schedule to the attention of the District Representative prior to installation of the raceways.

I. CONDUIT SEALS:

1. Conduit seals shall be provided for hazardous (classified) locations in accordance with the NFPA 70 Chapter 5 Article 501-5. The conduit seals shall be filled with appropriate "A" compound prior to final acceptance.
2. Conduit bodies shall be provided for all conduits entering and leaving corrosive areas. The conduit bodies provided for corrosive areas shall be filled with a nonsetting compound such as electrical duct seal putty to prevent the migration of corrosive gases from the area.

3.04 RACEWAY SUPPORT SYSTEM (NOT USED)

3.05 RACEWAY NUMBERING

A. CONDUIT IDENTIFICATION:

1. A stainless steel tag with characters shall be fixed to each end of each conduit segment and at each pull box. Tags shall also be placed within 3 feet of every wall, ceiling, floor penetration or fire stop.

B. WIREWAY AND TRAY IDENTIFICATION: (NOT USED)

C. RACEWAY DEMOLITION: (NOT USED)

3.06 DEMOLITION RACEWAY SCHEDULE (NOT USED)

3.07 RACEWAY SCHEDULE

- A. New and/or reused raceway is included in the ELECTRICAL RACEWAY SCHEDULE Section (26 06 20.21).

3.08 CABLE TRAY AND WIREWAY (NOT USED)

3.09 DEVICE, PULL AND JUNCTION BOXES

A. LOCATION:

1. Unless otherwise specified in Table B, boxes shall be NEMA 3R cast ferrous alloy type.

Table B. Box Locations

| Box type | Location |
|----------------------------|---|
| NEMA 1 | Concealed in sheet rock and masonry walls only |
| NEMA 3R cast | Exposed indoor or outdoor locations in noncorrosive and nonhazardous areas |
| NEMA 3R cast PVC jacket | Embedded in outdoor or indoor nonhazardous areas |
| NEMA 4 | Exposed in process areas below 7 feet in nonhazardous, non-corrosive areas |
| NEMA 4X | Corrosive nonhazardous areas |
| NEMA 7 | Hazardous areas |
| NEMA 12 | Exposed in conduit racks in nonhazardous, noncorrosive areas above 7 feet. Exposed in switchgear rooms. |

3.10 MANHOLES AND HANDHOLES (NOT USED)

3.11 FIRESTOPS

- A. (Not Used)
- B. (Not Used)
- C. Firestop sealant shall be installed to fill gaps around raceway and sleeves. Install polyurethane backer rod for widths larger than 3/8 inch.
- D. Firestop putty shall be packed inside the open end of conduits routed from cable trays through walls or floors. Do not install firestop putty in conduits routed from cable trays to panels or devices in the same room.

3.12 DUCT CABLE SEALS AND PLUGS (NOT USED)

3.13 TESTING (NOT USED)

3.14 TRAINING (NOT USED)

****END OF SECTION****

SECTION 26 06 20.16

ELECTRICAL PANELBOARD SCHEDULE

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE

1. This section lists panelboards to be modified.

1.01 REFERENCES (NOT USED)

1.02 SUBMITTALS (NOT USED)

1.03 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

PART 2 -- PRODUCTS

2.01 PANELBOARD SCHEDULES

- A. Materials shall be provided in accordance with the PANELBOARDS Section (26 24 16).

PART 3 -- EXECUTION

3.01 GENERAL

A. RECORD KEEPING:

1. The panelboard schedules shall be maintained in as-built status in accordance with the PROJECT RECORD DOCUMENTS Section (01 78 39).

3.02 INSTALLATION

- A. Panelboards shall be installed in accordance with the PANELBOARDS Section (26 24 16).
- B. Panelboard nameplates shall include the number and description.

3.03 TESTING (NOT USED)

3.04 TRAINING (NOT USED)

3.05 PANELBOARD SCHEDULES

A. Panelboard PNL8LD

1. Modify Circuit # 19, 21 and 23 to feed both Digester 4 and 5 120V receptacles
2. Provide three (3) matching 20A circuit breakers at Circuit location 32, 34 and 36 to feed both Digester 6 and 7 120V receptacles
3. Use pigtails inside panelboard for same circuit feeding two (2) digesters
4. See drawing # PNL8LD for details

****END OF SECTION****

SECTION 26 06 20.21

ELECTRICAL RACEWAY SCHEDULE

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section lists raceway to be provided or existing raceway to be reused. Raceway numbering system is described in the COMMON WORK RESULTS FOR ELECTRICAL Section (26 05 00).

1.02 REFERENCES (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.01 GENERAL

A. EXISTING RACEWAY

1. Existing conduits shall only be reused where specified. Existing cable trays, wireways, and conduits in duct banks shall be reused as noted on the schedules or the drawings.
2. Cables listed in *italic* font style under the "CONTAINS" column of existing raceways are existing cables. Cables listed in regular font style under the "CONTAINS" column of existing raceways are new cables added under this Contract.
3. Existing conduit identification tags shall be removed and replaced with new tags as shown under "NOTES" column. They shall be generally treated as installed raceway in accordance with the COMMON WORK RESULTS FOR ELECTRICAL Section (26 05 00) and this specification section.

3.02 INSTALLATION (NOT USED)

3.03 TESTING (NOT USED)

3.04 TRAINING (NOT USED)

3.05 RECORD KEEPING

- A. The raceway schedule shall be maintained in as-built status in accordance with the PROJECT RECORD DOCUMENTS Section (01 78 79).

3.06 NEW RACEWAY SCHEDULE

- A. EXPLANATION OF DATA FIELDS:

| <u>FIELD</u> | <u>EXPLANATION</u> |
|----------------------|--|
| REV: | Revision and change status of change. Format is "XN" where "X" is change status code, A=addition, C=change, D=deletion; and "N" is addendum issue number |
| RACEWAY DESIGNATION: | Unique raceway identification per the COMMON WORK RESULTS FOR ELECTRICAL Section (26 05 00) |
| FROM: | Origination of raceway |
| TO: | Destination of raceway |
| SIZE IN.: | Nominal diameter or size of raceway (in inches) |
| CONTAINS: | List of cables/conductors routed through the raceway |
| DWG REF: | Plan drawing reference |
| NOTES: | Notes related to the raceway |

- B. New raceway schedule follows.

NEW RACEWAY SCHEDULE

RFB # 8218

| <u>REV</u> | <u>RACEWAY DESIGNATION</u> | <u>FROM</u> | <u>TO</u> | <u>SIZE IN.</u> | <u>CONTAINS</u> | <u>DWG REF</u> | <u>NOTES</u> |
|------------|----------------------------|-------------|----------------------|-----------------|--|----------------|---|
| | P8102 | PNL8F | PB823 | 1.25 | P-8F6-DIG6-7-A P-8F6-DIG6-7-B P-8F6-DIG6-7-C P-8F6-DIG6-7-G | E8140 | Cables pass through PB823 |
| | P8102A | PB823 | PB830 | 1.25 | P-8F6-DIG6-7-A P-8F6-DIG6-7-B P-8F6-DIG6-7-C P-8F6-DIG6-7-G | E8140 E8160 | Cable splices in PB830 |
| | P8102B | PB823 | PB822 | 1.25 | <i>Pull String</i> | E8140 | |
| | P8102B1 | PB822 | Dig 4 Seal @ EL 115' | 1.25 | <i>Pull String</i> | E8170 | Re-tag conduit at each end as P8102B1 |
| | P8102C | PB822 | PB825 | 1.25 | <i>Pull String</i> | E8140 | |
| | P8102C1 | PB825 | Dig 5 Seal @ EL 115' | 1.25 | <i>Pull String</i> | E8170 | Re-tag conduit at each end as P8102C1 |
| | P8102D | PB830 | PB829 | 1.25 | P-8F6-DIG6-7-A P-8F6-DIG6-7-B P-8F6-DIG6-7-C P-8F6-DIG6-7-G | E8160 | Cable splices in PB830 |
| | P8102D1 | PB829 | MEE82315 | 1.25 | P-8F6-DIG6-7-A P-8F6-DIG6-7-B P-8F6-DIG6-7-C P-8F6-DIG6-7-G | E8170 | (1) Re-tag conduit at each end as P8102D1 (2) Label 480V Receptacle as 8F6 in the field for Digester 6 |
| | P8102E | PB830 | PB831 | 1.25 | P-8F6-DIG6-7-A P-8F6-DIG6-7-B P-8F6-DIG6-7-C P-8F6-DIG6-7-G | E8160 | Cable splices in PB830 |
| | P8102E1 | PB831 | MEE82415 | 1.25 | P-8F6-DIG6-7-A P-8F6-DIG6-7-B P-8F6-DIG6-7-C P-8F6-DIG6-7-G | E8170 | (1) Re-tag conduit at each end as P8102E1 (2) Label 480V Receptacle as 8F6 in the field for Digester 7 |

NEW RACEWAY SCHEDULE

RFB # 8218

| <u>REV</u> | <u>RACEWAY DESIGNATION</u> | <u>FROM</u> | <u>TO</u> | <u>SIZE IN.</u> | <u>CONTAINS</u> | <u>DWG REF</u> | <u>NOTES</u> |
|------------|----------------------------|-------------|----------------------|-----------------|--|----------------|---|
| | P8104 | PNL8F | PB823 | 1.25 | P-8F7-DIG4-5-A P-8F7-DIG4-5-B P-8F7-DIG4-5-C P-8F7-DIG4-5-G | E8140 | Cables pass through PB823 |
| | P8104A | PB823 | PB830 | 1.25 | Pull String | E8140 E8160 | |
| | P8104B | PB823 | PB822 | 1.25 | P-8F7-DIG4-5-A P-8F7-DIG4-5-B P-8F7-DIG4-5-C P-8F7-DIG4-5-G | E8140 | Cable splices in PB823 |
| | P8104B1 | PB822 | MEE82116 | 1.25 | P-8F7-DIG4-5-A P-8F7-DIG4-5-B P-8F7-DIG4-5-C P-8F7-DIG4-5-G | E8170 | (1) Re-tag conduit at each end as P8104B1 (2) 480V Receptacle labeled as 8F7 in the field for Digester 4 |
| | P8104C | PB823 | PB825 | 1.25 | P-8F7-DIG4-5-A P-8F7-DIG4-5-B P-8F7-DIG4-5-C P-8F7-DIG4-5-G | E8140 | Cable splices in PB823 |
| | P8104C1 | PB825 | MEE82216 | 1.25 | P-8F7-DIG4-5-A P-8F7-DIG4-5-B P-8F7-DIG4-5-C P-8F7-DIG4-5-G | E8170 | (1) Re-tag conduit at each end as P8104C1 (2) Label 480V Receptacle as 8F7 in the field for Digester 5 |
| | P8104D | PB830 | PB829 | 1.25 | Pull String | E8160 | |
| | P8104D1 | PB829 | Dig 6 Seal @ EL 115' | 1.25 | Pull String | E8170 | Re-tag conduit at each end as P8104D1 |
| | P8104E | PB830 | PB831 | 1.25 | Pull String | E8160 | |
| | P8104E1 | PB831 | Dig 7 Seal @ EL 115' | 1.25 | Pull String | E8170 | Re-tag conduit at each end as P8104E1 |

NEW RACEWAY SCHEDULE

RFB # 8218

| <u>REV</u> | <u>RACEWAY DESIGNATION</u> | <u>FROM</u> | <u>TO</u> | <u>SIZE IN.</u> | <u>CONTAINS</u> | <u>DWG REF</u> | <u>NOTES</u> |
|------------|----------------------------|-------------|---|-----------------|--|----------------|---|
| | P8105 | PNL8F | PB823 | 1.25 | P-8F8-DIG7-A P-8F8-DIG7-B P-8F8-DIG7-C P-8F8-DIG7-G | E8140 | Cables pass through PB823 |
| | P8105A | PB823 | PB830 | 1.25 | P-8F8-DIG7-A P-8F8-DIG7-B P-8F8-DIG7-C P-8F8-DIG7-G | E8140 E8160 | Cables pass through PB830 |
| | P8105B | PB823 | PB822 | 1.25 | <i>Pull String</i> | E8140 | |
| | P8105B1 | PB822 | Dig 4 Seal @ EL 115' | 1.25 | <i>Pull String</i> | E8170 | Re-tag conduit at each end as P8105B1 |
| | P8105C | PB822 | PB825 | 1.25 | <i>Pull String</i> | E8140 | |
| | P8105C1 | PB825 | Dig 5 Seal @ EL 115' | 1.25 | <i>Pull String</i> | E8170 | Re-tag conduit at each end as P8105C1 |
| | P8105D | PB830 | PB829 | 1.25 | <i>Pull String</i> | E8160 | |
| | P8105D1 | PB829 | Dig 6 North Wall Below Grade Conduit | 1.25 | Empty | E8170 | (1) Re-tag conduit at tunnel end as P8105D1 (2) Install firestop putty inside PB829 |
| | P8105E | PB830 | PB831 | 1.25 | P-8F8-DIG7-A P-8F8-DIG7-B P-8F8-DIG7-C P-8F8-DIG7-G | E8160 | Cables pass through PB830 |
| | P8105E1 | PB831 | MEE82417 | 1.25 | P-8F8-DIG7-A P-8F8-DIG7-B P-8F8-DIG7-C P-8F8-DIG7-G | E8170 | (1) Re-tag conduit at each end as P8105E1 (2) Label 480V Receptacle as 8F8 in the field for Digester 7 |

NEW RACEWAY SCHEDULE

RFB # 8218

| <u>REV</u> | <u>RACEWAY DESIGNATION</u> | <u>FROM</u> | <u>TO</u> | <u>SIZE IN.</u> | <u>CONTAINS</u> | <u>DWG REF</u> | <u>NOTES</u> |
|------------|----------------------------|-------------|---|-----------------|--|----------------|---|
| | P8107 | PNL8F | PB823 | 1.25 | P-8F9-DIG4-5-A P-8F9-DIG4-5-B P-8F9-DIG4-5-C P-8F9-DIG4-5-G | E8140 | Cables pass through PB823 |
| | P8107A | PB823 | PB830 | 1.25 | Pull String | E8140 E8160 | |
| | P8107B | PB823 | PB822 | 1.25 | P-8F9-DIG4-5-A P-8F9-DIG4-5-B P-8F9-DIG4-5-C P-8F9-DIG4-5-G | E8140 | Cable splices in PB823 |
| | P8107B1 | PB822 | MEE82118 | 1.25 | P-8F9-DIG4-5-A P-8F9-DIG4-5-B P-8F9-DIG4-5-C P-8F9-DIG4-5-G | E8170 | (1) Re-tag conduit at each end as P8107B1 (2) 480V Receptacle labeled as 8F9 in the field for Digester 4 |
| | P8107C | PB823 | PB825 | 1.25 | P-8F9-DIG4-5-A P-8F9-DIG4-5-B P-8F9-DIG4-5-C P-8F9-DIG4-5-G | E8140 | Cable splices in PB823 |
| | P8107C1 | PB825 | MEE82218 | 1.25 | P-8F9-DIG4-5-A P-8F9-DIG4-5-B P-8F9-DIG4-5-C P-8F9-DIG4-5-G | E8170 | (1) Re-tag conduit at each end as P8107C1 (2) Label 480V Receptacle as 8F9 in the field for Digester 5 |
| | P8107D | PB830 | PB829 | 1.25 | Pull String | E8160 | |
| | P8107D1 | PB829 | Dig 6 North Wall Below Grade Conduit | 1.25 | Empty | E8170 | (1) Re-tag conduit at tunnel end as P8107D1 (2) Install firestop putty inside PB829 |
| | P8107E | PB830 | PB831 | 1.25 | Pull String | E8160 | |
| | P8107E1 | PB831 | Dig 7 Seal @ EL 115' | 1.25 | Pull String | E8170 | Re-tag conduit at each end as P8107E1 |

NEW RACEWAY SCHEDULE

RFB # 8218

| REV | RACEWAY DESIGNATION | FROM | TO | SIZE IN. | CONTAINS | DWG REF | NOTES |
|------------|----------------------------|---------------|-----------|-----------------|--|------------------------|---|
| | P83100E3 | MCC-8W 5DR | JB889 | 6.00 | P-8W-5DR-DIG9-A P-8W-5DR-DIG9-B P-8W-5DR-DIG9-C P-8W-5DR-DIG9-G | E801 E803 MCC-8W | Re-tag conduit at each end as P83100E3 |
| | P83100E2 | JB889 | JB895 | 1.75 | P-8W-5DR-DIG9-A P-8W-5DR-DIG9-B P-8W-5DR-DIG9-C P-8W-5DR-DIG9-G | E6 | Re-tag conduit at each end as P83100E2 |
| | P83100E1 | JB895 | JB810 | 1.75 | P-8W-5DR-DIG9-A P-8W-5DR-DIG9-B P-8W-5DR-DIG9-C P-8W-5DR-DIG9-G | E811 E811A | Re-tag conduit at each end as P83100E1 |
| | P83100E | JB810 | JB8F | 1.75 | P-8W-5DR-DIG9-A P-8W-5DR-DIG9-B P-8W-5DR-DIG9-C P-8W-5DR-DIG9-G | E811 E811A | (1) Re-tag conduit at each end as P83100E (2) Cable splices in JB8F |
| | P83100D | JB8F | MEE83100D | 1.00 | P-8W-5DR-DIG9-A P-8W-5DR-DIG9-B P-8W-5DR-DIG9-C P-8W-5DR-DIG9-G | E811 E814 | (1) Re-tag conduit at each end as P83100D (2) Cable splices in JB8F (3) Label 480V Receptacle (South) as 8W-5DR in the field for Digester 9 |
| | P830100C | JB8F | MEE83100C | 1.00 | P-8W-5DR-DIG9-A P-8W-5DR-DIG9-B P-8W-5DR-DIG9-C P-8W-5DR-DIG9-G | E811 E814 | (1) Re-tag conduit at each end as P83100C (2) Cable splices in JB8F (3) Label 480V Receptacle (West) as 8W-5DR in the field for Digester 9 |

NEW RACEWAY SCHEDULE

RFB # 8218

| <u>REV</u> | <u>RACEWAY DESIGNATION</u> | <u>FROM</u> | <u>TO</u> | <u>SIZE IN.</u> | <u>CONTAINS</u> | <u>DWG REF</u> | <u>NOTES</u> |
|------------|----------------------------|-----------------------------|-----------------------------|-----------------|---|----------------|---|
| | | PNL8LD | PNL8LD | | <i>P-8LD-19-DIG4-5-A P-8LD-21-DIG4-5-B P-8LD-23-DIG4-5-C P-8LD-DIG4-5-G</i> | PNL8LD | (1) Pigtail wires for Digester 4 & 5 120V receptacles (2) Label all wires inside PNL8LD |
| | P-8LD-19-21-23-DIG4-A | PNL8LD | DIG 4 - RECEP 1 JB (8LD-19) | 1.00 | <i>P-8LD-19-DIG4-A P-8LD-21-DIG4-B P-8LD-23-DIG4-C P-8LD-DIG4-G</i> | E8130 E8140 | (1) Re-tag conduit "8LD 19 21 23" at each end as P-8LD-19-21-23-DIG4-A (2) Label all wires inside PNL8LD |
| | P-8LD-19-21-23-DIG4-B | DIG 4 - RECEP 1 JB (8LD-19) | DIG 4 - RECEP 2 JB (8LD-19) | 1.00 | <i>P-8LD-19-DIG4-A P-8LD-21-DIG4-B P-8LD-23-DIG4-C P-8LD-DIG4-G</i> | E8130 | Tag conduit at each end as P-8LD-19-21-23-DIG4-B |
| | P-8LD-19-21-23-DIG4-C | DIG 4 - RECEP 2 JB (8LD-19) | DIG 4 - RECEP 3 JB (8LD-21) | 1.00 | <i>P-8LD-21-DIG4-B P-8LD-23-DIG4-C P-8LD-DIG4-G</i> | E8130 | Tag conduit at each end as P-8LD-19-21-23-DIG4-C |
| | P-8LD-19-21-23-DIG4-D | DIG 4 - RECEP 3 JB (8LD-21) | DIG 4 - RECEP 4 JB (8LD-21) | 1.00 | <i>P-8LD-21-DIG4-B P-8LD-23-DIG4-C P-8LD-DIG4-G</i> | E8130 | Tag conduit at each end as P-8LD-19-21-23-DIG4-D |
| | P-8LD-19-21-23-DIG4-E | DIG 4 - RECEP 4 JB (8LD-21) | DIG 4 - RECEP 5 JB (8LD-23) | 1.00 | <i>P-8LD-23-DIG4-C P-8LD-DIG4-G</i> | E8130 | Tag conduit at each end as P-8LD-19-21-23-DIG4-E |
| | P-8LD-19-21-23-DIG4-F | DIG 4 - RECEP 5 JB (8LD-23) | DIG 4 - RECEP 6 (8LD-23) | 1.00 | <i>P-8LD-23-DIG4-C P-8LD-DIG4-G</i> | E8130 | Tag conduit at each end as P-8LD-19-21-23-DIG4-F |

NEW RACEWAY SCHEDULE

RFB # 8218

| <u>REV</u> | <u>RACEWAY DESIGNATION</u> | <u>FROM</u> | <u>TO</u> | <u>SIZE IN.</u> | <u>CONTAINS</u> | <u>DWG REF</u> | <u>NOTES</u> |
|------------|----------------------------|--------------------|--------------------|-----------------|---|----------------|--|
| | | PNL8LD | PNL8LD | | <i>P-8LD-19-DIG4-5-A P-8LD-21-DIG4-5-B P-8LD-23-DIG4-5-C P-8LD-DIG4-5-G</i> | PNL8LD | (1) Pigtail wires for Digester 4 & 5 120V receptacles (2) Label all wires inside PNL8LD |
| | P-8LD-19-21-23-DIG5-A | PNL8LD | DIG 5 - RECEP 1 JB | 1.00 | P-8LD-19-DIG5-A P-8LD-21-DIG5-B P-8LD-23-DIG5-C P-8LD-DIG5-G | E8130 E8140 | (1) Re-tag conduit "8LD 21 23 25" at each end as P-8LD-19-21-23-DIG5-A (2) Label all wires inside PNL8LD (3) Label 120V Receptacle # 1 as 8LD-19 |
| | P-8LD-19-21-23-DIG5-B | DIG 5 - RECEP 1 JB | DIG 5 - RECEP 2 JB | 1.00 | P-8LD-19-DIG5-A P-8LD-21-DIG5-B P-8LD-23-DIG5-C P-8LD-DIG5-G | E8130 | (1) Tag conduit at each end as P-8LD-19-21-23-DIG5-B (2) Label 120V Receptacle # 2 as 8LD-21 (3) Label all wires |
| | P-8LD-19-21-23-DIG5-C | DIG 5 - RECEP 2 JB | DIG 5 - RECEP 3 JB | 1.00 | P-8LD-19-DIG5-A P-8LD-21-DIG5-B P-8LD-23-DIG5-C P-8LD-DIG5-G | E8130 | (1) Tag conduit at each end as P-8LD-19-21-23-DIG5-C (2) Label 120V Receptacle # 3 as 8LD-23 (3) Label all wires |
| | P-8LD-19-21-23-DIG5-D | DIG 5 - RECEP 3 JB | DIG 5 - RECEP 4 JB | 1.00 | P-8LD-19-DIG5-A P-8LD-21-DIG5-B P-8LD-23-DIG5-C P-8LD-DIG5-G | E8130 | (1) Tag conduit at each end as P-8LD-19-21-23-DIG5-D (2) Label 120V Receptacle # 4 as 8LD-19 (3) Label all wires |
| | P-8LD-19-21-23-DIG5-E | DIG 5 - RECEP 4 JB | DIG 5 - RECEP 5 JB | 1.00 | P-8LD-21-DIG5-B P-8LD-23-DIG5-C P-8LD-DIG5-G | E8130 | (1) Tag conduit at each end as P-8LD-19-21-23-DIG5-E (2) Label 120V Receptacle # 5 as 8LD-21 (3) Label all wires |
| | P-8LD-19-21-23-DIG5-F | DIG 5 - RECEP 5 JB | DIG 5 - RECEP 6 | 1.00 | P-8LD-23-DIG5-C P-8LD-DIG5-G | E8130 | (1) Tag conduit at each end as P-8LD-19-21-23-DIG5-F (2) Label 120V Receptacle # 6 as 8LD-23 (3) Label all wires |

NEW RACEWAY SCHEDULE

RFB # 8218

| <u>REV</u> | <u>RACEWAY DESIGNATION</u> | <u>FROM</u> | <u>TO</u> | <u>SIZE IN.</u> | <u>CONTAINS</u> | <u>DWG REF</u> | <u>NOTES</u> |
|------------|----------------------------|--------------------|--------------------|-----------------|---|----------------|--|
| | | PNL8LD | PNL8LD | | P-8LD-32-DIG6-7-A P-8LD-34-DIG6-7-B P-8LD-36-DIG6-7-C P-8LD-DIG6-7-G | PNL8LD | (1) Pigtail wires for Digester 6 & 7 120V receptacles (2) Label all wires inside PNL8LD |
| | P-8LD-32-34-36-DIG6-A | PNL8LD | DIG 6 - RECEP 1 JB | 1.00 | P-8LD-32-DIG6-A P-8LD-34-DIG6-B P-8LD-36-DIG6-C P-8LD-DIG6-G | E8130 E8140 | (1) Re-tag conduit "8LD 20 22 24" at each end as P-8LD-32-34-36-DIG6-A (2) Label all wires inside PNL8LD (3) Label 120V Receptacle # 1 as 8LD-32 |
| | P-8LD-32-34-36-DIG6-B | DIG 6 - RECEP 1 JB | DIG 6 - RECEP 2 JB | 1.00 | P-8LD-32-DIG6-A P-8LD-34-DIG6-B P-8LD-36-DIG6-C P-8LD-DIG6-G | E8130 | (1) Tag conduit at each end as P-8LD-32-34-36-DIG6-B (2) Label 120V Receptacle # 2 as 8LD-34 (3) Label all wires |
| | P-8LD-32-34-36-DIG6-C | DIG 6 - RECEP 2 JB | DIG 6 - RECEP 3 JB | 1.00 | P-8LD-32-DIG6-A P-8LD-34-DIG6-C P-8LD-DIG6-G | E8130 | (1) Tag conduit at each end as P-8LD-32-34-36-DIG6-C (2) Label 120V Receptacle # 3 as 8LD-36 (3) Label all wires |
| | P-8LD-32-34-36-DIG6-D | DIG 6 - RECEP 3 JB | DIG 6 - RECEP 4 | 1.00 | P-8LD-32-DIG6-A P-8LD-DIG6-G | E8130 | (1) Tag conduit at each end as P-8LD-32-34-36-DIG6-D (2) Label 120V Receptacle # 4 as 8LD-32 (3) Label all wires |

NEW RACEWAY SCHEDULE

RFB # 8218

| <u>REV</u> | <u>RACEWAY DESIGNATION</u> | <u>FROM</u> | <u>TO</u> | <u>SIZE IN.</u> | <u>CONTAINS</u> | <u>DWG REF</u> | <u>NOTES</u> |
|------------|----------------------------|--------------------|--------------------|-----------------|---|----------------|--|
| | | PNL8LD | PNL8LD | | P-8LD-32-DIG6-7-A P-8LD-34-DIG6-7-B P-8LD-36-DIG6-7-C P-8LD-DIG6-7-G | PNL8LD | (1) Pigtail wires for Digester 6 & 7 120V receptacles (2) Label all wires inside PNL8LD |
| | P-8LD-32-34-36-DIG7-A | PNL8LD | DIG 7 - RECEP 1 JB | 1.00 | P-8LD-32-DIG7-A P-8LD-34-DIG7-B P-8LD-36-DIG7-C P-8LD-DIG7-G | E8130 E8140 | (1) Re-tag conduit "8LD 22 24 26" at each end as P-8LD-32-34-36-DIG7-A (2) Label all wires inside PNL8LD (3) Label 120V Receptacle # 1 as 8LD-32 |
| | P-8LD-32-34-36-DIG7-B | DIG 7 - RECEP 1 JB | DIG 7 - RECEP 2 JB | 1.00 | P-8LD-32-DIG7-A P-8LD-34-DIG7-B P-8LD-36-DIG7-C P-8LD-DIG7-G | E8130 | (1) Tag conduit at each end as P-8LD-32-34-36-DIG7-B (2) Label 120V Receptacle # 2 as 8LD-34 (3) Label all wires |
| | P-8LD-32-34-36-DIG7-C | DIG 7 - RECEP 2 JB | DIG 7 - RECEP 3 JB | 1.00 | P-8LD-32-DIG7-A P-8LD-34-DIG7-B P-8LD-36-DIG7-C P-8LD-DIG7-G | E8130 | (1) Tag conduit at each end as P-8LD-32-34-36-DIG7-C (2) Label 120V Receptacle # 3 as 8LD-36 (3) Label all wires |
| | P-8LD-32-34-36-DIG7-D | DIG 7 - RECEP 3 JB | DIG 7 - RECEP 4 JB | 1.00 | P-8LD-32-DIG7-A P-8LD-34-DIG7-B P-8LD-36-DIG7-C P-8LD-DIG7-G | E8130 | (1) Tag conduit at each end as P-8LD-32-34-36-DIG7-D (2) Label 120V Receptacle # 4 as 8LD-32 (3) Label all wires |
| | P-8LD-32-34-36-DIG7-E | DIG 7 - RECEP 4 JB | DIG 7 - RECEP 5 JB | 1.00 | P-8LD-34-DIG7-B P-8LD-36-DIG7-C P-8LD-DIG7-G | E8130 | (1) Tag conduit at each end as P-8LD-32-34-36-DIG7-E (2) Label 120V Receptacle # 5 as 8LD-34 (3) Label all wires |
| | P-8LD-32-34-36-DIG7-F | DIG 7 - RECEP 5 JB | DIG 7 - RECEP 6 | 1.00 | P-8LD-36-DIG7-C P-8LD-DIG7-G | E8130 | (1) Tag conduit at each end as P-8LD-32-34-36-DIG7-F (2) Label 120V Receptacle # 6 as 8LD-36 (3) Label all wires |

NEW RACEWAY SCHEDULE

RFB # 8218

| <u>REV</u> | <u>RACEWAY DESIGNATION</u> | <u>FROM</u> | <u>TO</u> | <u>SIZE IN.</u> | <u>CONTAINS</u> | <u>DWG REF</u> | <u>NOTES</u> |
|------------|----------------------------|--------------------|--------------------|-----------------|--|----------------|---|
| | P-8LK-22-24-DIG9-A | PNL8LK | DIG 9 - RECEP 0 | 0.75 | P-8LK-22-DIG9-B P-8LK-24-DIG9-C P-8LK-DIG9-G | PNL8LK E815 | (1) Tag conduit at each end as P-8LK-22-24-DIG9-A (2) Label all wires (3) Label 120V Receptacle # 0 as 8LK-22 |
| | P-8LK-22-24-DIG9-B | DIG 9 - RECEP 0 | DIG 9 - RECEP 1 JB | 0.75 | P-8LK-22-DIG9-B P-8LK-24-DIG9-C P-8LK-DIG9-G | E815 | (1) Tag conduit at each end as P-8LK-22-24-DIG9-B (2) Label all wires (3) Label 120V Receptacle # 1 as 8LK-24 |
| | P-8LK-22-24-DIG9-C | DIG 9 - RECEP 1 JB | DIG 9 - RECEP 2 JB | 0.75 | P-8LK-22-DIG9-B P-8LK-24-DIG9-C P-8LK-DIG9-G | E815 | (1) Tag conduit at each end as P-8LK-22-24-DIG9-C (2) Label all wires (3) Label 120V Receptacle # 2 as 8LK-22 |
| | P-8LK-22-24-DIG9-D | DIG 9 - RECEP 2 JB | DIG 9 - RECEP 3 JB | 0.75 | P-8LK-22-DIG9-B P-8LK-24-DIG9-C P-8LK-DIG9-G | E815 | (1) Tag conduit at each end as P-8LK-22-24-DIG9-D (2) Label all wires (3) Label 120V Receptacle # 3 as 8LK-24 |
| | P-8LK-22-24-DIG9-E | DIG 9 - RECEP 3 JB | DIG 9 - RECEP 4 JB | 0.75 | P-8LK-22-DIG9-B P-8LK-24-DIG9-C P-8LK-DIG9-G | E815 | (1) Tag conduit at each end as P-8LK-22-24-DIG9-E (2) Label all wires (3) Label 120V Receptacle # 4 as 8LK-22 |
| | P-8LK-22-24-DIG9-F | DIG 9 - RECEP 4 JB | DIG 9 - RECEP 5 JB | 0.75 | P-8LK-22-DIG9-B P-8LK-24-DIG9-C P-8LK-DIG9-G | E815 | (1) Tag conduit at each end as P-8LK-22-24-DIG9-F (2) Label all wires (3) Label 120V Receptacle # 5 as 8LK-24 |
| | P-8LK-22-24-DIG9-G | DIG 9 - RECEP 5 JB | DIG 9 - RECEP 6 | 0.75 | P-8LK-22-DIG9-B P-8LK-DIG9-G | E815 | (1) Tag conduit at each end as P-8LK-22-24-DIG9-G (2) Label all wires (3) Label 120V Receptacle # 6 as 8LK-22 |

****END OF SECTION****

SECTION 26 06 20.25

ELECTRICAL CABLE SCHEDULE

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section lists cables to be provided or existing cable to be reused or modified. Cable numbering system is described in the COMMON WORK RESULTS FOR ELECTRICAL Section (26 05 00). Cable types are specified in the ELECTRICAL POWER CONDUCTORS AND CABLES Section (26 05 21) and in this specification section.

1.02 REFERENCES (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.01 GENERAL

A. EXISTING CABLE

1. Existing cable shall only be reused where specified and in such cases only when a device is to be relocated and the location results in a shorter cable.
2. Existing cables are being shown in *italic* font style under "CABLE ID" column of Electrical Cable Schedule.

B. NEW CABLE

1. New cables are being shown in regular font style under "CABLE ID" column of Electrical Cable Schedule.

3.02 INSTALLATION (NOT USED)

3.03 TESTING (NOT USED)

3.04 TRAINING (NOT USED)

3.05 RECORD KEEPING

- A. The cable schedules shall be maintained in as-built status in accordance with PROJECT RECORD DOCUMENTS Section (01 78 39).

3.06 NEW CABLE SCHEDULE

A. EXPLANATION OF DATA FIELDS:

| <u>FIELD</u> | <u>EXPLANATION</u> | | | | |
|---------------------|--|---------------------|--------------------------------|--------|----------------------------------|
| REV: | Revision and change status of change. Format is "XN" where "X" is change status code, A=addition, C=change, D=deletion; and "N" is addendum issue number | | | | |
| CABLE ID: | Unique cable identification tag, assigned to the aggregation of one or more conductors or cables of the type listed in the "TYPE" column and the ground conductor as listed | | | | |
| FROM: | Origination of cable | | | | |
| TO: | Destination of cable | | | | |
| ROUTING: | Listing of raceways cable route must take to get from origination to destination | | | | |
| TYPE: | <table><thead><tr><th><u>Abbreviation</u></th><th><u>Conductor or Cable Type</u></th></tr></thead><tbody><tr><td>P&C SC</td><td>Power & Control Single Conductor</td></tr></tbody></table> | <u>Abbreviation</u> | <u>Conductor or Cable Type</u> | P&C SC | Power & Control Single Conductor |
| <u>Abbreviation</u> | <u>Conductor or Cable Type</u> | | | | |
| P&C SC | Power & Control Single Conductor | | | | |
| QTY COND: | Quantity of conductors or cables listed in the "TYPE" field | | | | |
| SIZE COND: | Size of conductors (AWG or Kcmil) | | | | |
| SIZE GRD: | Size of grounding conductor (AWG or Kcmil) | | | | |
| VOLTS: | Conductor insulation rating | | | | |
| NOTES: | Notation regarding raceway or cable installation | | | | |

- B. New cable schedule follows.

NEW CABLE SCHEDULE

REB # 8218

| REV | CABLE ID | FROM | TO | ROUTING | TYPE | QTY. COND | SIZE COND | SIZE GRD | VOLTS | NOTES |
|------------|--|-------------|-----------|--------------------------------------|-------------|----------------------|----------------------|---------------------|--------------|---|
| | P-8F6-DIG6-7-A P-8F6-DIG6-7-B P-8F6-DIG6-7-C P-8F6-DIG6-7-G | PNL8F | MEE82315 | P8102 P8102A P8102D P8102D1 | P&C SC | 3 | 6 | 8 | 600 | (1) Cable splices in PB830 (2) Label new Digester 6 480V Receptacle (Northwest) as 8F6 |
| | P-8F6-DIG6-7-A P-8F6-DIG6-7-B P-8F6-DIG6-7-C P-8F6-DIG6-7-G | PNL8F | MEE82415 | P8102 P8102A P8102E P8102E1 | P&C SC | 3 | 6 | 8 | 600 | (1) Cable splices in PB830 (2) Label new Digester 7 480V Receptacle (East) as 8F6 |
| | <i>P-8F7-DIG4-5-A P-8F7-DIG4-5-B P-8F7-DIG4-5-C P-8F7-DIG4-5-G</i> | PNL8F | MEE82116 | P8104 P8104B P8104B1 | P&C SC | 3 | 6 | 8 | 600 | <i>Existing Digester 4 480V Receptacle (West) labeled as 8F7</i> |
| | P-8F7-DIG4-5-A P-8F7-DIG4-5-B P-8F7-DIG4-5-C P-8F7-DIG4-5-G | PNL8F | MEE82216 | P8104 P8104C P8104C1 | P&C SC | 3 | 6 | 8 | 600 | (1) Cable splices in PB823 (2) Label new Digester 5 480V Receptacle (East) labeled as 8F7 |
| | P-8F8-DIG7-A P-8F8-DIG7-B P-8F8-DIG7-C P-8F8-DIG7-G | PNL8F | MEE82417 | P8105 P8105A P8105E P8105E1 | P&C SC | 3 | 6 | 8 | 600 | Label new Digester 7 480V Receptacle (North) as 8F8 |
| | <i>P-8F9-DIG4-5-A P-8F9-DIG4-5-B P-8F9-DIG4-5-C P-8F9-DIG4-5-G</i> | PNL8F | MEE82118 | P8107 P8107B P8107B1 | P&C SC | 3 | 6 | 8 | 600 | <i>Existing Digester 4 480V Receptacle (South) labeled as 8F9</i> |
| | P-8F9-DIG4-5-A P-8F9-DIG4-5-B P-8F9-DIG4-5-C P-8F9-DIG4-5-G | PNL8F | MEE82218 | P8107 P8107C P8107C1 | P&C SC | 3 | 6 | 8 | 600 | (1) Cable splices in PB823 (2) Label new Digester 5 480V Receptacle (South) labeled as 8F9 |

NEW CABLE SCHEDULE

REB # 8218

| <u>REV</u> | <u>CABLE ID</u> | <u>FROM</u> | <u>TO</u> | <u>ROUTING</u> | <u>TYPE</u> | <u>QTY.</u> <u>COND</u> | <u>SIZE</u> <u>COND</u> | <u>SIZE</u> <u>GRD</u> | <u>VOLTS</u> | <u>NOTES</u> |
|------------|--|-------------|-----------|--|-------------|----------------------------|----------------------------|---------------------------|--------------|--|
| | P-8W-5DR-DIG9-A P-8W-5DR-DIG9-B P-8W-5DR-DIG9-C P-8W-5DR-DIG9-G | MCC-8W 5DR | MEE83100C | P83100E3 P83100E2 P83100E1 P83100E P83100C | P&C SC | 3 | 6 | 8 | 600 | (1) Replace existing Aluminum wires with new Copper wires (2) Cable splices in JB8F (3) Label new Digester 9 480V Receptacle (West) as 8W-5DR |
| | P-8W-5DR-DIG9-A P-8W-5DR-DIG9-B P-8W-5DR-DIG9-C P-8W-5DR-DIG9-G | MCC-8W 5DR | MEE83100D | P83100E3 P83100E2 P83100E1 P83100E P83100D | P&C SC | 3 | 6 | 8 | 600 | (1) Replace existing Aluminum wires with new Copper wires (2) Cable splices in JB8F (3) Label new Digester 9 480V Receptacle (South) as 8W-5DR |

NEW CABLE SCHEDULE

REB # 8218

| <u>REV</u> | <u>CABLE ID</u> | <u>FROM</u> | <u>TO</u> | <u>ROUTING</u> | <u>TYPE</u> | <u>QTY.</u> <u>COND</u> | <u>SIZE</u> <u>COND</u> | <u>SIZE</u> <u>GRD</u> | <u>VOLTS</u> | <u>NOTES</u> |
|------------|---|-------------|-----------------------------|--|-------------|----------------------------|----------------------------|---------------------------|--------------|---|
| | P-8LD-19-DIG4-A P-8LD-21-DIG4-B P-8LD-23-DIG4-C P-8LD-DIG4-G | PNL8LD | DIGESTER 4 RECPT. 1 to 6 | P-8LD-19-21-23-DIG4-A P-8LD-19-21-23-DIG4-B P-8LD-19-21-23-DIG4-C P-8LD-19-21-23-DIG4-D P-8LD-19-21-23-DIG4-E P-8LD-19-21-23-DIG4-F | P&C SC | 3 | 12 | 12 | 600 | (1) Existing six (6) Digester 4 120V receptacles (2) Pigtail with Digester 5 wires inside PNL8LD |
| | P-8LD-19-DIG5-A P-8LD-21-DIG5-B P-8LD-23-DIG5-C P-8LD-DIG5-G | PNL8LD | DIGESTER 5 RECPT. 1 to 6 | P-8LD-19-21-23-DIG5-A P-8LD-19-21-23-DIG5-B P-8LD-19-21-23-DIG5-C P-8LD-19-21-23-DIG5-D P-8LD-19-21-23-DIG5-E P-8LD-19-21-23-DIG5-F | P&C SC | 3 | 12 | 12 | 600 | (1) New six (6) Digester 5 120V receptacles (2) Pigtail with Digester 4 wires inside PNL8LD (3) Place new wires from PNL8LD to Receptacle # 6 |
| | P-8LD-32-DIG6-A P-8LD-34-DIG6-B P-8LD-36-DIG6-C P-8LD-DIG6-G | PNL8LD | DIGESTER 6 RECPT. 1 to 4 | P-8LD-32-34-36-DIG6-A P-8LD-32-34-36-DIG6-B P-8LD-32-34-36-DIG6-C P-8LD-32-34-36-DIG6-D | P&C SC | 3 | 12 | 12 | 600 | (1) New four (4) Digester 6 120V receptacles (2) Pigtail with Digester 7 wires inside PNL8LD (3) Place new wires from PNL8LD to Receptacle # 4 |
| | P-8LD-32-DIG7-A P-8LD-34-DIG7-B P-8LD-36-DIG7-C P-8LD-DIG7-G | PNL8LD | DIGESTER 7 RECPT. 1 to 6 | P-8LD-32-34-36-DIG7-A P-8LD-32-34-36-DIG7-B P-8LD-32-34-36-DIG7-C P-8LD-32-34-36-DIG7-D P-8LD-32-34-36-DIG7-E P-8LD-32-34-36-DIG7-F | P&C SC | 3 | 12 | 12 | 600 | (1) New six (6) Digester 7 120V receptacles (2) Pigtail with Digester 6 wires inside PNL8LD (3) Place new wires from PNL8LD to Receptacle # 6 |

NEW CABLE SCHEDULE

REB # 8218

| <u>REV</u> | <u>CABLE ID</u> | <u>FROM</u> | <u>TO</u> | <u>ROUTING</u> | <u>TYPE</u> | <u>QTY.</u> <u>COND</u> | <u>SIZE</u> <u>COND</u> | <u>SIZE</u> <u>GRD</u> | <u>VOLTS</u> | <u>NOTES</u> |
|------------|--|-------------|-----------------------------|--|-------------|----------------------------|----------------------------|---------------------------|--------------|---|
| | P-8LK-22-DIG9-B P-8LK-24-DIG9-C P-8LK-DIG9-G | PNL8LK | DIGESTER 9 RECPT. 0 to 6 | P-8LK-22-24-DIG9-A P-8LK-22-24-DIG9-B P-8LK-22-24-DIG9-C P-8LK-22-24-DIG9-D P-8LK-22-24-DIG9-E P-8LK-22-24-DIG9-F P-8LK-22-24-DIG9-G | P&C SC | 2 | 12 | 12 | 600 | (1) Install seven (7) new Digester 9 120V receptacles (2) Place new wires from existing conduit seal at Receptacle # 1 to Receptacle # 6 |

****END OF SECTION****

SECTION 26 06 50.16
LIGHTING FIXTURE SCHEDULE

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section lists lighting fixtures.

1.02 REFERENCES (NOT USED)

1.03 SUBMITTALS (NOT USED)

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

PART 2 -- PRODUCTS

2.01 FIXTURE SCHEDULE

- A. The fixtures shall be as specified in the following fixture schedule. All fixtures shall be manufactured in conformance with
1. UL-8750 – LED Lighting
 2. UL-844 – Electrical Lighting Fixtures for use in Hazardous Locations
 3. CSA C22.2 no. 137-M1981 – Electric Luminaires for use in Hazardous Locations
 4. NEMA 3, 4, 4X, 7CD, 9EFG

PART 3 -- EXECUTION

3.01 GENERAL (NOT USED)

3.02 INSTALLATION

- A. Fixtures shall be installed in accordance with the LIGHTING Section (26 50 00).

3.03 TESTING (NOT USED)

3.04 TRAINING (NOT USED)

3.05 LIGHTING FIXTURE SCHEDULE

A. EXPLANATION OF DATA FIELDS:

| <u>FIELD</u> | <u>EXPLANATION</u> |
|-------------------------|--|
| QTY: | Total number of lighting fixtures provided under this Contract |
| WATTS / TYPE: | Wattage and type of lamp blub |
| VOLTS: | Voltage of lamp bulb |
| DESCRIPTION: | Detail description of lighting fixture |
| MANUFACTURER CATALOG #: | Manufacturer and its catalog number |

B. New lighting fixture schedule follows.

| LIGHTING FIXTURE SCHEDULE | | | | |
|----------------------------------|--------------|------------|---|-------------------------------|
| QTY | WATTS / TYPE | VOLTS | DESCRIPTION | MANUFACTURER CATALOG # |
| 12 | 50W LED | 120-277VAC | HOSTILELITE® EML LED Series 25° Stanchion with Optic and Guard (120-277VAC 50W LED with Fluted Globe and Guard) | KILLARK LIGHTING # EML5030D4G |

****END OF SECTION****

SECTION 26 08 10

ACCEPTANCE TESTING OF ELECTRICAL SYSTEMS

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section specifies the acceptance testing of electrical materials, equipment and systems as specified in this section and in each section of Division 26 except the following:
 - a. Insulation resistance of cable/motor tests and cable continuity tests in accordance with the COMMON WORK RESULTS FOR ELECTRICAL Section (26 05 00).
 - b. Pre-operational checkouts in accordance with the COMMON WORK RESULTS FOR ELECTRICAL Section (26 05 00).
 - c. (Not Used)
2. (Not Used)
3. Provide all labor, tools, material, power and technical supervision to perform the specified tests and inspections.

1.02 REFERENCES

- A. REFERENCE STANDARDS: The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of referenced publications in effect at the time of the bid shall govern. In case of conflict between the requirements of this section and the listed references, the requirements of this section shall prevail.

| <u>Reference</u> | <u>Title</u> |
|------------------|---|
| NETA ATS | International Electrical Testing Association, Inc.; Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems |
| ANSI/NETA ETT | Standard for Certification of Electrical Testing Personnel |

- B. DEFINITIONS: (Not Used)

1.03 SUBMITTALS

- A. The following information shall be submitted for review in accordance with the SUBMITTAL PROCEDURES Section (01 33 00):
1. A copy of this specification section, with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviations.
 2. (Not Used)
 3. (Not Used)
 4. (Not Used)
 5. Completed test report no later than 30 days after completion of the tests.

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

PART 2 -- PRODUCTS

2.01 DOCUMENTATION

A. GENERAL:

1. The collection and documentation of test data shall be provided.

B. DEFECTS:

1. Notify the District Representative of any material or workmanship found defective within 24 hours of discovery.

C. TEST REPORT:

1. Provide the test report with all items required in NETA ATS, paragraph 5.4.
2. All blanks on the test forms shall be filled in. If the item is not applicable, enter "N/A". All disparities and irregularities in the test results shall be noted on the test form and addressed and evaluated in accordance with industry standards in the report Recommendations. Where defective material is noted on the test form, the item shall be initialed and dated when the issue has been resolved and the item re-tested.

2.02 TEST EQUIPMENT AND MATERIALS

- A. Test instruments shall be calibrated to references traceable to the National Bureau of Standards and shall have a current sticker showing date of calibration, deviation from standard, name of calibration laboratory and technician, and date recalibration is required.

2.03 INDEPENDENT TESTING FIRMS (NOT USED)

PART 3 -- EXECUTION

3.01 GENERAL

- A. Acceptance testing shall be performed, test report submitted and approved prior to energizing of the tested equipment.
- B. Requirements for testing in accordance with this section are specified in other sections of Division 26. All discrepancies shall be noted on the test sheets, shall be resolved to the satisfaction of the District and then re-tested. All failed tests resulting in adjustment, repair, or replacement shall be re-tested, re-submitted, and approved prior to acceptance of material, equipment or systems.

3.02 INSTALLATION (NOT USED)

3.03 TESTING (NOT USED)

3.04 TRAINING (NOT USED)

****END OF SECTION****

SECTION 26 24 16

PANELBOARDS

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section specifies panelboards for lighting and power distribution.

1.02 REFERENCES

- A. The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of referenced publications in effect at the time of the bid shall govern. In case of conflict between the requirements of this section and the listed references, the requirements of this section shall prevail.

| <u>Reference</u> | <u>Title</u> |
|------------------|---|
| NFPA 70 | National Electrical Code (NEC) |
| UL 489 | Molded-Case Circuit Breakers and Circuit Breaker Enclosures |
| UL 50 | Enclosures for Electrical Equipment |
| UL 67 | Underwriters Laboratories, Electric Panelboards |

B. DEFINITIONS: (Not Used)

1.03 SUBMITTALS

- A. The following information shall be submitted for review in accordance with the SUBMITTAL PROCEDURES Section (01 33 00):
 1. A copy of this specification section, with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviations.
 2. Manufacturer's catalog data for breakers.
 3. (Not Used)
 4. (Not Used)
 5. (Not Used)

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

PART 2 -- PRODUCTS

2.01 GENERAL (NOT USED)

2.02 ARRANGEMENT AND CONSTRUCTION (NOT USED)

2.03 BUS (NOT USED)

2.04 CIRCUIT BREAKERS AND FUSES

A. GENERAL:

1. Circuit breakers shall provide circuit protection of inverse time and instantaneous tripping and shall be listed in UL 489. Breakers shall be operated by a quick make/break toggle handle with over-center switching mechanism that is mechanically trip free. Automatic tripping shall be indicated by the handle position. Breaker shall be molded-case, bolt on type with internal trips for multi-pole configurations. Contacts shall be nonwelding silver alloy and arc extinction shall be accomplished in arc chutes. Breakers shall have the current ratings and pole configurations specified on the panelboard schedule.

B. AC RATED CIRCUIT BREAKERS:

1. Circuit breakers shall be fully rated; series rated breakers are not acceptable. Circuit breakers rated 120/208-volt alternating current shall have a minimum interrupting current rating of 18,000 amperes (symmetrical) at 240V AC. Circuit breakers rated 277/480-volt alternating current shall have a minimum interrupting current rating of 25,000 amperes (symmetrical) at 480V AC.

C. DC RATED CIRCUIT BREAKERS (NOT USED)

D. DC RATED FUSES (NOT USED)

2.05 ENCLOSURE (NOT USED)

2.06 NAMEPLATES (NOT USED)

PART 3 -- EXECUTION

3.01 GENERAL

- A. Type the circuit description as shown on the final record drawing panelboard schedule. Directories on modified existing panelboards shall be updated to represent as-built condition. Illegible or missing directories shall be replaced with new.

B. (Not Used)

C. (Not Used)

3.02 INSTALLATION (NOT USED)

3.03 SCHEDULES

A. Panelboard schedules listing panelboard requirements are described and included in the ELECTRICAL PANELBOARD SCHEDULE Section (26 06 20.16).

3.04 TORQUING

A. All electrical connections shall be torqued in accordance with the COMMON WORK RESULTS FOR ELECTRICAL Section (26 06 00).

3.05 TESTING

A. Panelboards shall be tested in accordance with the ACCEPTANCE TESTING OF ELECTRICAL SYSTEMS Section (26 08 10).

3.06 TRAINING (NOT USED)

****END OF SECTION****

SECTION 26 27 26

WIRING DEVICES

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section specifies three phase receptacles and wiring devices consisting of receptacles, plugs, switches and appurtenances.

1.02 REFERENCES

- A. REFERENCE STANDARDS: The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of referenced publications in effect at the time of the bid shall govern. In case of conflict between the requirements of this section and the listed references, the requirements of this section shall prevail.

| <u>Reference</u> | <u>Title</u> |
|------------------|---|
| NFPA 70 | National Electrical Code (NEC) |
| NEMA 250 | Enclosures for Electrical Equipment (1,000 volts maximum) |
| NEMA WD-1 | General Requirements for Wiring Devices |
| UL 20 | General-Use Snap Switches |
| UL 498 | Attachment Plugs and Receptacles |
| UL 894 | Switches for use in Hazardous Locations |
| UL 943 | Ground-Fault Circuit Interrupters |
| UL 1010 | Receptacle-Plug Combinations for use in Hazardous Locations |
| UL 1203 | Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous Locations |
| UL 1682 | Plugs, Receptacles, and Cable Connectors, of the Pin and Sleeve Type |
| UL 1686 | Pin and Sleeve Configurations |

B. DEFINITIONS: (Not Used)

1.03 SUBMITTALS

- A. The following information shall be submitted for review in accordance with the SUBMITTAL PROCEDURES Section (01 33 00):

1. A copy of this specification section, with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviations.
2. Manufacturer's catalog data:
 - a. Receptacles (all types)
 - b. (Not Used)
 - c. Device plates
 - d. Nameplate engraving schedule
 - e. Nameplate engraving material and double-sided tape

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

PART 2 -- PRODUCTS

2.01 EXPLOSION-PROOF THREE PHASE RECEPTACLES

- A. Receptacles shall be NEC Class I, Division 1 explosion-proof hazardous location devices. They shall be suitable for 480 volt, 3-phase, 3-wire service with 60-ampere and conforming to UL1010, UL 894, UL 1682 and UL 1686.
- B. Receptacles shall have interlocked circuit breaker which provides interlocked connect and disconnect operation as well as short circuit and thermal time delay overload protection.
- C. Receptacle enclosures shall be made of copper-free aluminum material with fiber glass reinforced polyester insulating blocks.
- D. Furnish Emerson Appleton EBR Series 60-ampere, 3-wire explosion-proof receptacle EBR6034EH60.

2.02 EXPLOSION-PROOF 125V RECEPTACLES WITH GFCI

- A. Receptacles shall be NEC Class I, Division 1 explosion-proof hazardous location devices.
- B. Receptacles shall be rated 20 Amp, 125 Vac with 5 mA trip setting.
- C. Receptacles shall provide required ground fault protection with factory sealed construction.
- D. Furnish Emerson Appleton EFS275-2023GFI (EFSR-GFI cover installed on 2-gang EFD box together with U-Line 20 Amp, 125 Vac factory sealed receptacle).

2.03 125V RECEPTACLES

A. GROUNDING RECEPTACLES (NOT USED)

B. GROUND FAULT RECEPTACLES:

1. Ground fault receptacles shall be duplex 20-ampere, NEMA 5-20R, and shall accept NEMA 5-20P plug caps. Receptacles shall be ground-fault circuit interrupter type conforming to UL 498 and UL 943. Bodies shall be brown colored nylon compound. External wiring shall be provided by side mounted terminal screws and clamps. Furnish Hubbell GF5362, or equal.

2.04 INDUSTRIAL TOGGLE SWITCHES (NOT USED)

2.05 DEVICE PLATES

A. ARCHITECTURALLY FINISHED AREAS (NOT USED)

B. SWITCHGEAR, HVAC, AND ACC ROOMS (NOT USED)

C. ALL OTHER AREAS

1. (Not Used)
2. Receptacle device plates shall be die cast aluminum weatherproof lift covers for GFIC receptacles, Emerson Appleton FSK-WGF1, or equal.

2.06 NAMEPLATES

A. Device plate nameplates shall be made from 2-ply microsurfaced impact acrylic, 1/16 inch thick. The nominal size of the nameplates shall be 1 inch high by 3-½ inches long. Nameplates shall have BLACK background with ½ inch high WHITE engraved letters. Furnish Rowmark LaserMax LM922-204 or equal.

B. If abbreviations are required because of space limitations, abbreviations shall be submitted to the District Representative prior to manufacture. The nameplate shall be engraved with the equipment number and description as shown on the drawings and specification schedules.

PART 3 -- EXECUTION

3.01 GENERAL (NOT USED)

3.02 INSTALLATION

- A. Boxes shall be independently supported by galvanized brackets, expansion bolts, toggle bolts, or machine or wood screws as appropriate. Wooden plugs inserted in masonry or concrete shall not be used as a base to secure boxes, nor shall welding or brazing be used for attachment.
- B. In architecturally finished areas, receptacles and switches installed in sheet steel boxes shall be flush mounted. Switches shall be located at 48 inches and receptacles shall be located at 18 inches above the floor, unless otherwise shown on the drawings.
- C. In process areas both switches and receptacles installed in cast device boxes shall be located 48 inches above the floor.
- D. Multi-gang device boxes housing 277 volt lighting circuits shall be suitable for 480 volt (terminal-to-terminal) clearances. Multi-gang device boxes shall be provided with barriers, or adequate spacing shall be provided to meet UL listing requirements.
- E. ISOLATED GROUND RECEPTACLES (NOT USED)
- F. DEVICE COLORS
 - 1. Install ivory colored receptacles in architecturally finished areas. Install brown colored receptacles in all other process areas.

3.03 NAMEPLATES

- A. All receptacles shall be identified with nameplates. Nameplate for receptacles shall identify the feeder panel and circuit number.
- B. The nameplate shall be attached by applying 3M VHB 5952 (or equal) 45 mil double-sided tape to the entire cleaned back surface of the nameplate.

3.04 TESTING

- A. THREE PHASE RECEPTACLES:
 - 1. 480 volt, 3 phase receptacles shall be tested to prove clockwise ABC phase rotation using a phase rotation meter. Testing shall be in accordance with the COMMON WORK RESULTS FOR ELECTRICAL Section (26 05 00).
- B. 125V RECEPTACLES:

1. Receptacles shall be function tested for correct polarization and GFI trip with a receptacle tester.
2. (Not Used)

3.05 TRAINING (NOT USED)

****END OF SECTION****

SECTION 26 50 00

LIGHTING

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section specifies lighting fixtures and their installation.

1.02 REFERENCES

- A. REFERENCE STANDARDS: The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of referenced publications in effect at the time of the bid shall govern. In case of conflict between the requirements of this section and the listed references, the requirements of this section shall prevail.

| <u>Reference</u> | <u>Title</u> |
|------------------|---|
| EPAct | United States Department of Energy (USDOE) |
| NEMA 250 | Enclosures for Electrical Equipment (1,000Volts Maximum) |
| NFPA 70 | National Electrical Code (NEC) |
| NFPA 101 | Life Safety Code |
| UL 844 | Electrical Lighting Fixtures for use in Hazardous Locations |
| UL 1598 | Luminaires |
| UL 8750 | LED Lighting |

B. DEFINITIONS: (Not Used)

1.03 SUBMITTALS

- A. The following information shall be submitted for review in accordance with the SUBMITTAL PROCEDURES Section (01 33 00):
1. A copy of this specification section, with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviations
 2. Manufacturer's catalog data for fixtures, ballasts and all options
 3. List of manufacturer's catalog numbers per fixture type
 4. Lighting fixture label

5. Lighting fixture engraving schedule

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

PART 2 -- PRODUCTS

2.01 FIXTURES

A. The fixtures shall be as specified in the LIGHTING FIXTURE SCHEDULE (26 06 50.16).

2.02 BALLASTS (NOT USED)

2.03 LAMPS (NOT USED)

2.04 PHOTOELECTRIC CELL UNITS (NOT USED)

2.05 EXPLOSION-PROOF LED LIGHT

A. Applications

1. This lighting fixture can be used in locations made hazardous due to the presence of flammable or explosive gases, vapors and combustible dusts as defined by NEC.

B. Compliances

1. UL-8750 – LED Lighting
2. UL-844 – Electrical Lighting Fixtures for use in Hazardous Locations
3. CSA C22.2 no. 137-M1981 – Electric Luminaires for use in Hazardous Locations
4. NEMA 3, 4, 4X, 7CD, 9EFG

C. Materials

1. Ballast tank, splice box and guards corrosion resistant copper-free aluminum alloy
2. Baked powder epoxy/polyester finish, electrostatically applied for complete, uniform corrosion protection.
3. All external hardware – Stainless Steel
4. Reflectors are aluminum with white finish

D. LED Luminaire Features

1. Fluted Clear Globe
2. Stanchion mounting
3. Energy Savings – less than 55 Watts of Power
4. Long Life – 50,000 – 55,000 Maintenance Free Hours to 70% Initial Lumens
5. Crisp White Light for Excellent Color Rendering
6. Ambient suitability – 40°C to 55°C
7. Instant on – including after power interruption
8. “World Voltage” 120-277VAC 50/60Hz

E. Furnish KILLARK LIGHTING HOSTILELITE® EML LED Series

2.06 LIGHTING FIXTURE LABELS

- A. Lighting fixture labels shall be ¾-inch wide by 3-inch long with round corners made from RIGID stainless steel engraved with ½-inch high characters. Labels shall be attached to the bottom of the stanchion with No. 14 AWG stainless steel wire.

PART 3 -- EXECUTION

3.01 GENERAL (NOT USED)

3.02 INSTALLATION

A. LOCATION AND MOUNTING:

1. The location and type of fixtures are shown on the drawings. Raceways and conductors shall be provided from the fixtures and switches to the lighting panel.
2. Install lighting fixtures after major equipment, crane rail, ductwork, etc., are in place. Fixtures shall be aligned and directed to illuminate the area shown on the drawings. Review the final fixture location with the District Representative prior to installation. Make minor adjustments in the fixture layout to avoid obstructions and to provide un-shadowed lighting on the floor and equipment.
3. Catalog numbers given on the fixture schedule shall not be used for selection of mounting hardware, but only as a reference to the type of fixture required. Provide the mounting hardware and appurtenances for the specified fixture to make a complete installation at the specific location. Fixtures shall be directly and rigidly mounted on the supporting structures. Conduit system shall not be used to support fixtures. Where brackets or supports for lighting fixtures are welded to

steel members, the welded area shall be treated with rust-resistant primer and finish paint.

4. (Not Used)

B. RACEWAYS AND CONDUCTORS:

1. Raceways and conductors are not shown on the drawings or included in the raceway and conductor schedules. Raceways and conductors shall be provided from the fixtures and switches to the lighting panel in accordance with the COMMON WORK RESULTS FOR ELECTRICAL Section (26 05 00), the RACEWAYS, FITTINGS, AND BOXES FOR ELECTRICAL SYSTEMS Section (26 05 34), and the ELECTRICAL POWER CONDUCTORS AND CABLES Section (26 05 21).
2. Fixtures labeled to require conductors with a temperature rating exceeding 75 degrees C shall be spliced to circuit conductors in a separately mounted junction box. Fixture shall be connected to junction box using flexible conduit with a temperature rating equal to that of the fixture.
3. (Not Used)

C. CLEANING:

1. Labels and marks, except the UL label, shall be removed from exposed parts of the fixtures. Fixtures shall be cleaned.

3.03 LIGHTING FIXTURE IDENTIFICATION

- A. A stainless steel label with characters shall be fixed to the bottom of each lighting fixture stanchion.

3.04 LIGHTING FIXTURE SCHEDULE

- A. Provide the fixtures as listed and specified in the LIGHTING FIXTURE SCHEDULE Section (26 06 50.16).

3.05 TESTING

- A. Fixtures shall be tested in accordance with the COMMON WORK RESULTS FOR ELECTRICAL Section (26 05 00).

3.06 TRAINING (NOT USED)

****END OF SECTION****