EAST BAY MUNICIPAL UTILITY DISTRICT

REQUEST FOR QUOTATION (RFQ) No. 2503
for
MEDIUM VOLTAGE ELECTRICAL EQUIPMENT FOR PARDEE DAM POWERLINE INFRASTRUCTURE

Contact Person: Mel Go
Phone Number: 510-287-2017
E-mail Address: mel.go@ebmud.com
For complete information regarding this project, see RFQ posted at https://www.ebmud.com/business-center/materials-and-supplies-bids/current-requests-quotation-rfqs/ or contact the EBMUD representative listed above. Please note that prospective bidders are responsible for reviewing this site during the RFQ process, for any published addenda regarding this RFQ.

Bids Due
by
1:30 p.m.
on
October 23, 2024

All bid submissions hand delivered or mailed (USPS, FedEx, UPS, etc.) to the address or PO Box noted below and must be received no later than 1:30 p.m. on the bid due date.

RESPONSE DELIVERED BY SERVICE (UPS, FedEx, DHL, etc., during business hours: 8:00 AM – 4:00 PM only) to:	RESPONSE DELIVERED BY MAIL (U.S. Postal Service) to:	RESPONSE HAND-DELIVERED (during business hours: 8:00 AM – 4:00 PM only)
EBMUD–Purchasing Division RFQ 2503 - Medium Voltage Electrical Equipment for Pardee Dam Powerline Infrastructure 375 11th Street Oakland, CA 94607	EBMUD–Purchasing Division RFQ 2503 - Medium Voltage Electrical Equipment for Pardee Dam Powerline Infrastructure P.O. Box 24055 Oakland, CA 94623	EBMUD–Purchasing Division RFQ 2503 - Medium Voltage Electrical Equipment for Pardee Dam Powerline Infrastructure Purchasing Office 375-11TH Street, 1st Floor Oakland, CA 94607

EAST BAY MUNICIPAL UTILITY DISTRICT

RFQ No. 2503

for

Medium Voltage Electrical Equipment for Pardee Dam Powerline Infrastructure

TABLE OF CONTENTS

7. 05 05 19 – Mechanical Anchoring to Concrete and Masonry
8. 26 05 13 – Medium Voltage Cable
9. 26 05 19 – Low Voltage Electrical Power Conductors and Cables
10. 26 05 26 – Grounding and Bonding for Electrical Systems
11. 26 05 53 – Identification for Electrical Systems
12. 26 05 33 – Raceway and Boxes for Electrical Systems
13. 26 05 91 – Power Building and Electrical Equipment
14. 26 12 19 – Pad-Mounted Liquid-Filled Medium-Voltage Transformers
15. 26 13 16.13 – Medium Voltage Load Interrupter Switchgear
16. 26 13 16.14 – 15kV Medium Voltage Sectionalizing Cabinets
17. 26 22 13 – Low Voltage Distribution Transformers
18. 26 24 16 – Panelboards
19. 26 27 26 – Wiring Devices
20. 26 28 13 – Fuses
21. 26 53 00 – Exit Signs
22. 33 77 01 – 15kV Medium Voltage Automatic Delayed Transition Transfer Switch

Drawings

1. 101.00-E-301 – Revised One Line Diagram
2. 101.00-E-305 – Equipment Asset Tag List
3. 511.40-E-006 – Chemical Plant Switchgear Plan & Elevation
4. 511.40-E-007.1 – Chemical Plant Electrical House Plan
5. 511.40-E-007.2 – Chemical Plant Electrical House Section
6. 511.40-E-300 – Chemical Plant Switchgear Communication Diagram
7. 511.40-E-301 – Chemical Plant Switchgear One-Line Diagram-Switching
8. 511.40-E-302 – Chemical Plant Switchgear One-Line Diagram-C&R
9. 511.40-E-303.1 – Chemical Plant Switchgear Arrangements M1
10. 511.40-E-303.2 – Chemical Plant Switchgear Arrangements M2
11. 511.40-E-303.3 – Chemical Plant Switchgear Arrangements ATS
12. 511.40-E-303.4 – Chemical Plant Switchgear Arrangements BUS & ARC Flash
13. 511.40-E-304.1 – Chemical Plant Switchgear Arrangements L1
14. 511.40-E-304.2 – Chemical Plant Switchgear Arrangements L2
15. 511.40-E-304.3 – Chemical Plant Switchgear Arrangements L3
16. 511.40-E-305.1 – Chemical Plant Switchgear Schematics MPR1-M1
17. 511.40-E-305.2 – Chemical Plant Switchgear Schematics MPR2-M1
18. 511.40-E-305.3 – Chemical Plant Switchgear Schematics MPR1-M2
19. 511.40-E-305.4 – Chemical Plant Switchgear Schematics MPR2-M2
20. 511.40-E-305.5 – Chemical Plant Switchgear Schematics MPR1-N
21. 511.40-E-305.6 – Chemical Plant Switchgear Schematics MPR1-E
22. 511.40-E-305.7 – Chemical Plant Switchgear Schematics MPR1-L1
23. 511.40-E-305.8 – Chemical Plant Switchgear Schematics MPR1-L2
24. 511.40-E-305.9 – Chemical Plant Switchgear Schematics MPR1-L3
25. 511.40-E-306 – Chemical Plant Switchgear Schematics Overall

EXHIBIT F – Appendix A (referred from Specifications)

I. STATEMENT OF WORK

A. SCOPE/BACKGROUND

It is the intent of these specifications, terms, and conditions to describe the purchase of medium voltage equipment described in Section D. Specific Requirements.

East Bay Municipal Utility District (District) intends to award a contract to the lowest cost bidder(s) whose response meets the District's requirements. The bidder may submit a response on the power building (Schedule I), transformers (Schedule II), and load interrupter switchgear (Schedule III), the sectionalizer cabinets (Schedule IV) or a combination of any or all of the above schedules. The bids for each schedule will be considered and may be awarded separately.

The District is seeking medium voltage equipment for the following project:

1. The project involves the addition of a medium voltage transformers, power building, load interrupter switchgears, and sectionalizer cabinets at the Pardee Dam Reservoir structures (Pardee Powerhouse, South Spillway, Camp Pardee, and Pardee Chemical Plant) to support power load improvements.

2. All required National Electrical Testing Agency (NETA) testing for the equipment listed in this RFP shall be coordinated by the District's Contractor with the Contractor at a future date following installation. Testing must comply with the latest NETA standards and include, but limited to, comprehensive verification of electrical performance, insulation integrity, and equipment functionality. The District's Contractor will schedule the testing to ensure minimal disruption to facility operations while meeting all commissioning requirements.

B. ROLES AND RESPONSIBILITIES

A summary of roles and responsibilities of differing parties are listed below in Table 1. Note that Bidder is defined as the participant in the formal competitive process. and references to manufacturer, vendor, and supplier are used interchangeably with Contractor throughout RFQ 2503 and Exhibit E Specifications.

Table 1: Summary of Roles and Responsibilities

	Power Building and Electrical Equipment	**Pad-Mounted Liquid-Filled Medium-Voltage Transformers**	**Medium Voltage Load Interrupter Switchgear**	**15kV Medium Voltage Sectionalizing Cabinets**
Factory Testing	Supplier performed	Supplier performed	Supplier performed	Supplier performed

	Power Building and Electrical Equipment	**Pad-Mounted Liquid-Filled Medium-Voltage Transformers**	**Medium Voltage Load Interrupter Switchgear**	**15kV Medium Voltage Sectionalizing Cabinets**
Factory Witness Testing	District will perform with Supplier	District will not Factory Witness Test	District will not Factory Witness Test	District will not Factory Witness Test
Delivery of Equipment	Supplier performed	Supplier performed	Supplier performed	Supplier performed
Unloading of Equipment	District's Contractor performed	District's Contractor performed	District's Contractor performed	District's Contractor performed
Assembly	Supplier performed	N/A	N/A	N/A
Anchor Installation	District's Contractor performed	District's Contractor performed	District's Contractor performed	District's Contractor performed
Test Procedures	Supplier responsibility	Supplier responsibility	Supplier responsibility	Supplier responsibility
Startup	Supplier performed	Supplier performed	Supplier performed	N/A
Manufacturer's Certificate	Supplier responsibility	Supplier responsibility	Supplier responsibility	Supplier responsibility
Functional Testing (NETA)	District's Contractor performed [1]	District's Contractor performed [1]	District's Contractor performed [1]	District's Contractor performed [1]
Operational Startup Test	District's Contractor performed [1]	District's Contractor performed [1]	District's Contractor performed [1]	District's Contractor performed [1]

[1] Supplier to provide field support to the District's Contractor

Note:

Unloading of Equipment: The Supplier must coordinate with the District's Contractor to ensure unloading of equipment can be performed at the time of delivery.
Operational startup test will test of all systems operating together to demonstrate satisfactory performance of the facility as a whole for a continuous period.
Startup: Manufacturer performed startup to ensure warranty and proper installation.

C. BIDDER QUALIFICATIONS

3. Bidder Minimum Qualifications

a. To bid on Schedule I, Bidder, bidder's principal, or bidder's staff shall have been regularly engaged in the business of providing Power Buildings enclosing electrical equipment for at least ten (10) years.

b. To bid on Schedule II, Bidder, bidder's principal, or bidder's staff shall have been regularly engaged in the business of providing Medium Voltage transformers for at least ten (10) years.

c. To bid on Schedule III, Bidder, bidder's principal, or bidder's staff shall have been regularly engaged in the business of providing Medium Voltage Load Interrupter Switchgear for at least ten (10) years.

d. To bid on Schedule IV, Bidder, bidder's principal, or bidder's staff shall have been regularly engaged in the business of providing Medium Voltage Sectionalizing Cabinets for at least ten (10) years.

e. Bidder shall possess all permits, licenses, and professional credentials necessary to supply product and perform services as specified under this RFQ.

D. SPECIFIC REQUIREMENTS

For Schedule I (Power Building and Electrical Equipment):

The District is seeking a bid for the following prefabricated power building complete with the following:

a. 15kV medium voltage metal clad switchgear

b. 15kV Medium Voltage Automatic Delayed Transition transfer Switch

c. 48 VDC liquid NiCad station battery systems

d. Low voltage alternating (AC) and direct current (DC) power distribution equipment protection

Detailed requirements for the submittals, products, and services required for the power building and electrical equipment are outlined in Specification Section 26 05 91 and all drawings listed in Exhibit E.

For Schedule II (Transformers):

The District is also seeking a bid for the following medium voltage transformers:

a. 25 kVA 1Ø Spillway, Asset Tag: 1529-EPS-XFR-001

b. 25kVA 1Ø Camanche House, Asset Tag: 24-EPS-XFR-004

c. 500kVA 3Ø Camp Pardee, Asset Tag: 24-EPS-XFR-008

d. 2MVA 3Ø Pardee Powerhouse, Asset Tag: 536-EPS-XFR-006

Detailed requirements for the submittals, products, and services required for the transformers are outlined in Specification Section 26 12 19 and Drawing 101.00-E-301 (Exhibit E).

For Schedule III (Load Interrupter Switchgears):

The District is also seeking a bid for the following medium voltage load interrupter switchgears:

a. 15kV Load Interrupter Switchgear Camp Pardee, Asset Tag: 24-EPS-SWF-001

b. 15kV Load Interrupter Switchgear South Spillway, Asset Tag: 1529-EPS-SWF-001

Detailed requirements for the submittals, products, and services required for the load interrupter switchgears are outlined in Specification Section 26 13 16.13 and Drawing 101.00-E-301 (Exhibit E).

For Schedule IV (Sectionalizing Cabinets):

The District is also seeking a bid for the following medium voltage load interrupt switchgears:

a. 15kV Sectionalizer Cabinet Camp Pardee, Asset Tag: 24-EPS-SWN-001

b. 15kV Sectionalizer Cabinet South Spillway, Asset Tag: 1529-EPS-SWN-001

Detailed requirements for the submittals, products, and services required for the sectionalizing cabinets are outlined in Specification Section 26 13 16.14 and Drawing 101.00-E-301 (Exhibit E and F).

For materials:

a. All products shall be in new and unused condition and shall be of the most current and up to date model.

b. Contractor shall store the equipment for up to two months until the District is ready to proceed with the installation. The District shall notify the Contractor of the delivery schedule 10 working days prior to shipping the equipment. The Contractor shall be responsible for delivery of the equipment to the site.

c. The Contractor shall coordinate delivery times and dates with the District staff contact Michael Hartlaub at 510-287-7189. Schedule deliveries only

between the hours of 8:00 am and 3:30 pm, Monday through Friday. No deliveries shall be accepted on Saturdays, Sundays, or District Holidays.

d. The District must approve the factory inspection and test reports prior to delivery of the equipment.

E. DELIVERABLES

Contractor shall supply all documentation, O&M manuals, submittals, and all other requirements as detailed in sections:

Specification 01 43 11 – Seismic Qualification and Certification
Specification 01 81 02 – Seismic Design Criteria
Specification 26 05 91 – Power Building and Electrical Equipment
Specification 26 12 19 – Pad-Mounted Liquid-Filled Medium-Voltage Transformers
Specification 26 13 16.13 – Medium Voltage Load Interrupter Switchgear
Specification 26 13 16.14 15kV Medium Voltage Sectionalizing Cabinets
Specification 33 77 01 15kV Medium Voltage Automatic Delayed Transition Transfer Switch
All other specifications listed in Exhibit E and drawings in Exhibit F.

All equipment shall be delivered to the following location:

Pardee Center
3535 Sandretto Road
Valley Springs, CA 95252

F. INSPECTION

The District will inspect material after its arrival at the delivery point. Contractor is solely responsible for ensuring the material arrives at the District's ship-to location free of defects and manufactured in strict conformance with the specifications.

In the case that an item or lot is rejected, District Inspectors will provide Contractor and the EBMUD Purchasing Division with an Inspectors Job Report which will itemize the product deficiencies and required corrective action.

The District reserves the right-of-access to the Contractor's facility to verify conformance to this specification at the District's expense.

G. FAILURE TO MEET SPECIFICATIONS

In the event any shipment or shipments of a Contractor's product do not meet the specification or delivery requirements, the District may reject the shipment or shipments and, at its option, may purchase this material from any supplier on the open

market who can meet the District's specification requirements, or the District may demand immediate replacement by Contractor of the non-conforming product. Any costs over and above the original contract price will be charged back to the Contractor. In addition, Contractor shall bear the costs of removal and disposition for any delivery which fails to conform to the specifications.

II. CALENDAR OF EVENTS

EVENT	DATE/LOCATION
RFQ Issued	October 9, 2024
Deadline For Submission of Questions	October 14, 2024
Response Due	October 23, 2024
Anticipated Contract Start Date	November 26, 2024
Draft Shop Drawings Due	6 weeks following Contract Start Date
Final Shop Drawings Due	2 weeks following receipt of District comments on Draft Shop Drawings
Delivery of equipment	64 weeks following approval of Final Shop Drawings

Note:All dates are subject to change **by District**.

Following the opening a list of submitted pricing will be posted to: https://www.ebmud.com/business-center/materials-and-supplies-bids/

Bidders are responsible for reviewing **https://www.ebmud.com/business-center/materials-and-supplies-bids/current-requests-quotation-rfqs/** for any published addenda. Hard copies of addenda will not be mailed out.

III. DISTRICT PROCEDURES, TERMS, AND CONDITIONS

A. RFQ ACCEPTANCE AND AWARD

1. RFQ responses will be evaluated to determine that they are responsive, responsible, and that they meet the specifications as stated in this RFQ.

2. The District reserves the right to award to a single or to multiple Contractors, dependent upon who provides the lowest overall cost to the District for each Schedule.

3. The District has the right to decline to award this contract or any part of it for any reason.

4. Any specifications, terms, or conditions, issued by the District, or those included in the bidder's submission, in relation to this RFQ, may be incorporated into any purchase order or contract that may be awarded as a result of this RFQ.

5. Award of contract. The District reserves the right to reject any or all proposals, to accept one part of a proposal and reject the other, unless the bidder stipulates to the contrary, and to waive minor technical defects and administrative errors, as the interest of the District may require. Award will be made, or proposals rejected by the District as soon as possible after bids have been opened.

B. BRAND NAMES, APPROVED EQUIVALENTS, DEVIATIONS, AND EXCEPTIONS

Any references to manufacturers, trade names, brand names, and/or catalog numbers are intended to be descriptive, but not restrictive, unless otherwise stated, and are intended to indicate the quality level desired. Bidders may offer an equivalent product that meets or exceeds the specifications.

The District reserves the right to be the sole judge of what shall be considered equal and/or acceptable and may require the bidder to provide additional information and/or samples. If the bidder does not specify otherwise, it is understood that the brand and/or product referenced in this RFQ will be supplied.

Taking exception to the RFQ, or failure on the part of the bidder to comply with all requirements and conditions of this RFQ, may subject the RFQ response to rejection. If no deviations are shown, the bidder will be required to furnish the material exactly as specified. The burden of proof of compliance with the specifications will be the responsibility of the bidder.

This RFQ is subject to acceptance only on the terms and conditions stated in this RFQ. Any additional or different terms and conditions proposed by the bidder are hereby rejected and shall be of no force or effect unless expressly assented to in writing by the District.

RFQ responses based on equivalent products must:

1. Use Exhibit A "Exceptions, Clarification and Amendments" to clearly describe the alternate offered and indicate specifically how it differs from the product specified in this RFQ.

2. Include complete descriptive literature and/or specifications as proof that the proposed alternate will be equal to or better than the product named in this RFQ.

C. PRICING

1. All prices are to be F.O.B. destination. Any freight/delivery charges are to be included.

2. All prices quoted shall be in United States dollars.

3. Price quotes shall include any and all payment incentives available to the District.

4. Final prices should include sales tax.

5. Bidders are advised that in the evaluation of cost, if applicable, it will be assumed that the unit price quoted is correct in the case of a discrepancy between the unit price and extended price.

D. NOTICE OF INTENT TO AWARD AND PROTESTS

At the conclusion of the RFQ response evaluation process, all entities who submitted a bid package will be notified in writing by e-mail or USPS mail with the name of the Bidder being recommended for contract award. The document providing this notification is the Notice of Intent to Award.

Protests must be in writing and must be received no later than seven (7) workdays after the District issues the Notice of Intent to Award. The District will reject the protest as untimely if it is received after this specified time frame. Protests will be accepted from bidders or potential bidders only.

If the protest is mailed and not received by the District, the protesting party bears the burden of proof to submit evidence (e.g., certified mail receipt) that the protest was sent in a timely manner so that it would be received by the District within the RFQ protest period.

Bid protests must contain a detailed and complete written statement describing the reason(s) for protest. The protest must include the name and/or number of the bid, the name of the firm protesting, and include a name, telephone number, email address and physical address of the protester. If a firm is representing the protester, they shall include their contact information in addition to that of the protesting firm.

Protests must be mailed, hand delivered, or emailed to the Manager of Purchasing, Mailstop 102, East Bay Municipal Utility District, 375 Eleventh Street, Oakland, CA 94607 or P.O. Box 24055, Oakland, California 94623. Facsimile and electronic mail protests must be followed by a mailed or hand delivered identical copy of the protest and must arrive within the seven workday time limit. Any bid protest filed with any other District office shall be forwarded immediately to the Manager of Purchasing.

The bid protester can appeal the determination to the requesting organization’s Department Director. The appeal must be submitted to the Department Director no later than five workdays from the date which the protest determination was transmitted by the District, to the protesting party. The appeal shall focus on the points raised in the original protest, and no new points shall be raised in the appeal.

Such an appeal must be made in writing and must include all grounds for the appeal and copies of the original protest and the District's response. The bid protester must also send the Purchasing Division a copy of all materials sent to the Department Director. The Department Director will make a determination of the appeal and respond to the protester by certified mail in a timely manner. If the appeal is denied, the letter will include the date, time, and location of the Board of Directors meeting at which staff will make a recommendation for award and inform the protester it may request to address the Board of Directors at that meeting.

The District may transmit copies of the protest and any attached documentation to all other parties who may be affected by the outcome of the protest. The decision of the District as to the validity of any protest is final. This District's final decision will be transmitted to all affected parties in a timely manner.

E. METHOD OF ORDERING

1. Written POs may be issued upon approval of written itemized quotations received from the Contractor.

2. POs and payments for products and/or services will be issued only in the name of Contractor.

3. Any and all change orders shall be in writing and agreed upon, in advance, by Contractor and the District.

F. TERM / TERMINATION / RENEWAL

1. The term of the contract, which may be awarded pursuant to this RFQ, will be three (3) years.

2. This Agreement may be terminated for convenience by the District provided the Contractor is given written notice of not less than 30 calendar days. Upon such termination, the District shall pay the Contractor the amount owing for the products ordered and satisfactorily received by the District. This shall be the sole and exclusive remedy to which the Contractor is properly entitled in the event of termination by the District.

3. This Agreement may be terminated for cause at any time, provided that the District notifies Contractor of impending action.

G. WARRANTY

1. For any contract awarded pursuant to this RFQ, Contractor expressly warrants that all goods furnished will conform strictly with the specifications and requirements contained herein and with all approved submittals, samples and/or

models and information contained or referenced therein, all affirmations of fact or promises, and will be new, of merchantable quality, free from defects in materials and workmanship, including but not limited to leaks, breaks, penetrations, imperfections, corrosion, deterioration, or other kinds of product deficiencies. Contractor expressly warrants that all goods to be furnished will be fit and sufficient for the purpose(s) intended. Contractor expressly warrants that all goods shall be delivered free from any security interest, lien, or encumbrance of any kind, and free from any claim of infringement, copyright or other intellectual property violation, or other violation of laws, statutes, regulations, ordinances, rules, treaties, import restrictions, embargoes or other legal requirements. Contractor guarantees all products and services against faulty or inadequate design, manufacture, negligent or improper transport, handling, assembly, installation or testing, and further guaranties that there shall be strict compliance with all manufacturer guidelines, recommendations, and requirements, and that Contractor guaranties that it will conform to all requirements necessary to keep all manufacturer warranties and guarantees in full force and effect. These warranties and guarantees are inclusive of all parts, labor, and equipment necessary to achieve strict conformance, and shall take precedence over any conflicting warranty or guarantee. These warranties and guaranties shall not be affected, limited, discharged, or waived by any examination, inspection, delivery, acceptance, payment, course of dealing, course of performance, usage of trade, or termination for any reason and to any extent. In the absence of any conflicting language as to duration, which conflicting language will take precedence as being more specific, Contractor's aforesaid warranties and guarantees shall be in full force and effect for a period of **three (3)** years from the date of acceptance by the District but shall continue in full force and effect following notice from District of any warranty or guarantee issue, until such issue has been fully resolved to the satisfaction of District.

H. INVOICING

1. Payment will be made within thirty (30) days following receipt of a correct invoice and upon satisfactory receipt of product and/or performance of services. The payment shall be made according to the following schedule:

    a. Ten (10) percent upon approval of design submittals as outlined in Specifications listed in Exhibit E

    b. Eighty (80) percent upon acceptance of the delivered equipment as outlined in Specification listed in Exhibit E.

    c. Five (5) percent upon acceptance of the Certificate of Proper Installation as outlined in Specification listed in Exhibit E .

d. Five (5) percent upon acceptance of all O&M manuals as outlined in Specification listed in Exhibit E .

2. The District shall notify Contractor of any invoice adjustments required.

3. Invoices shall contain, at a minimum, District purchase order number, invoice number, remit to address, and itemized products and/or services description.

4. The District will pay Contractor in an amount not to exceed the total amount quoted in the RFQ response.

I. LIQUIDATED DAMAGES

1. A deduction for liquidated damages of $500 per day will be assessed for not delivering equipment as prescribed in this RFQ after 64 weeks following approval of Final Shop Drawings. Liquidated damages shall be a maximum of 15 percent of the total bid price.

2. It being impracticable or extremely difficult to fix the actual damage, the amount set forth above is hereby agreed upon as liquidated damages and will be deducted from any money due under the agreement arising from this RFQ.

3. In the event performance and/or deliverables have been deemed unsatisfactory, the District reserves the right to withhold future payments until the performance and/or deliverables are deemed satisfactory.

IV. RFQ RESPONSE SUBMITTAL INSTRUCTIONS AND INFORMATION

A. DISTRICT CONTACTS

All contact during the competitive process is to be through the contact listed on the first page of this RFQ. The following persons are to be contacted only for the purposes specified below.

TECHNICAL SPECIFICATIONS:
Attn: Elaine Horng
EBMUD-Design
E-Mail: elaine.horng@ebmud.com
PHONE: (510) 287-0250

CONTRACT EQUITY PROGRAM:
Attn: Contract Equity Office
PHONE: (510) 287-0114

AFTER AWARD:
Attn: Michael Hartlaub
EBMUD-Construction
E-Mail: michael.hartlaub@ebmud.com
PHONE: (510) 287-1665

B. SUBMITTAL OF RFQ RESPONSE

1. Responses must be submitted in accordance with Exhibit A – RFQ Response Packet, including all additional documentation stated in the "Required Documentation and Submittals" section of Exhibit A.

2. Late and/or unsealed responses will not be accepted.

3. RFQ responses submitted via electronic transmissions will not be accepted. Electronic transmissions include faxed RFQ responses or those sent by electronic mail ("e-mail").

4. All RFQ responses must be SEALED and received by 1:30 p.m. on the due date specified in the Calendar of Events. Any RFQ response received after that time/date, or at a place other than the stated addresses, cannot be considered and will be returned to the bidder unopened. The EBMUD mailroom and Purchasing Division timestamp shall be considered the official timepiece for the purpose of establishing the actual receipt of RFQ responses.

5. RFQ responses are to be addressed/delivered as follows:

Mailed (USPS):

East Bay Municipal Utility District
Medium Voltage Electrical Equipment for Pardee Dam Powerline Infrastructure
RFQ No. 2503
EBMUD–Purchasing Division
P.O. Box 24055
Oakland, CA 94623

Hand Delivered, delivered by courier or package delivery service (UPS, FedEx, DHL, etc.):

East Bay Municipal Utility District
Medium Voltage Electrical Equipment for Pardee Dam Powerline Infrastructure
RFQ No. 2503
EBMUD–Purchasing Division
375 Eleventh Street, First Floor
Oakland, CA 94607

Bidder's name, return address, and the RFQ number and title must also appear on the mailing package.

6. All costs required for the preparation and submission of an RFQ response shall be borne by the bidder.

7. California Government Code Section 4552: In submitting an RFQ response to a public purchasing body, the bidder offers and agrees that if the RFQ response is accepted, it will assign to the purchasing body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2, commencing with Section 16700, of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the bidder for sale to the purchasing body pursuant to the RFQ response. Such assignment shall be made and become effective at the time the purchasing body tenders final payment to the bidder.

8. Bidder expressly acknowledges that it is aware that if a false claim is knowingly submitted (as the terms “claim” and “knowingly” are defined in the California False Claims Act, Cal. Gov. Code, §12650 et seq.), the District will be entitled to civil remedies set forth in the California False Claim Act.

9. The RFQ response shall remain open to acceptance and is irrevocable for a period of one hundred eighty (180) days, unless otherwise specified in the RFQ documents.

10. It is understood that the District reserves the right to reject any or all RFQ responses.

11. RFQ responses, in whole or in part, are NOT to be marked confidential or proprietary. The District may refuse to consider any RFQ response or part thereof so marked. RFQ responses submitted in response to this RFQ may be subject to public disclosure. The District shall not be liable in any way for disclosure of any such records.

EXHIBIT A
RFQ RESPONSE PACKET
RFQ No. 2503 – Medium Voltage Electrical Equipment for Pardee Dam Powerline Infrastructure

To: The EAST BAY MUNICIPAL UTILITY District ("District")

From: _____

(Official Name of Bidder)

RFQ RESPONSE PACKET GUIDELINES

- **BIDDERS ARE TO SUBMIT ONE (1) ORIGINAL HARDCOPY RFQ RESPONSE WITH ORIGINAL INK SIGNATURES, CONTAINING THE FOLLOWING IN THEIR ENTIRETY:**
  - **EXHIBIT A – RFQ RESPONSE PACKET**
    - **INCLUDING ALL REQUIRED DOCUMENTATION AS DESCRIBED IN "EXHIBIT A-REQUIRED DOCUMENTATION AND SUBMITTALS"**

- **ALL PRICES AND NOTATIONS MUST BE PRINTED IN INK OR TYPEWRITTEN; NO ERASURES ARE PERMITTED; ERRORS MAY BE CROSSED OUT AND CORRECTIONS PRINTED IN INK OR TYPEWRITTEN ADJACENT AND MUST BE INITIALED IN INK BY PERSON SIGNING THE RFQ RESPONSE.**

- **BIDDERS THAT DO NOT COMPLY WITH THE REQUIREMENTS, AND/OR SUBMIT AN INCOMPLETE RFQ RESPONSE MAY BE SUBJECT TO DISQUALIFICATION AND THEIR RFQ RESPONSE REJECTED IN TOTAL.**

- **IF BIDDERS ARE MAKING ANY CLARIFICATIONS AND/OR AMENDMENTS, OR TAKING EXCEPTION TO ANY PART OF THIS RFQ, THESE MUST BE SUBMITTED IN THE EXCEPTIONS, CLARIFICATIONS, AND AMENDMENTS SECTION OF THIS EXHIBIT A – RFQ RESPONSE PACKET. THE DISTRICT, AT ITS SOLE DISCRETION, MAY ACCEPT AMENDMENTS/EXCEPTIONS, OR MAY DEEM THEM TO BE UNACCEPTABLE, THEREBY RENDERING THE RFQ RESPONSE DISQUALIFIED.**

- **BIDDERS SHALL NOT MODIFY DISTRICT LANGUAGE IN ANY PART OF THIS RFQ OR ITS EXHIBITS, NOR SHALL THEY QUALIFY THEIR RFQ RESPONSE BY INSERTING THEIR OWN LANGUAGE OR FALSE CLAIMS IN THEIR RESPONSE. ANY EXCEPTIONS AND CLARIFICATIONS MUST BE PLACED IN THE "EXCEPTIONS/ CLARIFICATIONS" PAGE, NOT BURIED IN THE PROPOSAL ITSELF."**

EBMUD

BIDDER INFORMATION AND ACCEPTANCE

1. The undersigned declares that all RFQ documents, including, without limitation, the RFQ, Addenda, and Exhibits, have been read and that the terms, conditions, certifications, and requirements are agreed to.

2. The undersigned is authorized to offer, and agrees to furnish, the articles and services specified in accordance with the RFQ documents.

3. The undersigned acknowledges acceptance of all addenda related to this RFQ.

4. The undersigned hereby certifies to the District that all representations, certifications, and statements made by the bidder, as set forth in this RFQ Response Packet and attachments, are true and correct and are made under penalty of perjury pursuant to the laws of California.

5. The undersigned acknowledges that the bidder is, and will be, in good standing in the State of California, with all the necessary licenses, permits, certifications, approvals, and authorizations necessary to perform all obligations in connection with this RFQ and associated RFQ documents.

6. It is the responsibility of each bidder to be familiar with all of the specifications, terms, and conditions and, if applicable, the site condition. By the submission of an RFQ response, the bidder certifies that if awarded a contract it will make no claim against the District based upon ignorance of conditions or misunderstanding of the specifications.

7. Patent indemnity: Contractors who do business with the District shall hold the District, its Directors, officers, agents, and employees, harmless from liability of any nature or kind, including cost and expenses, for infringement or use of any patent, copyright, or other proprietary right, secret process, patented or unpatented invention, article, or appliance furnished or used in connection with the contract or purchase order.

8. Insurance certificates are not required at the time of submission. However, by signing Exhibit A – RFQ Response Packet, the bidder agrees to meet the minimum insurance requirements stated in the RFQ. This documentation must be provided to the District prior to execution of an agreement by the District and shall include an insurance certificate which meets the minimum insurance requirements, as stated in the RFQ.

9. The undersigned acknowledges that RFQ responses, in whole or in part, are NOT to be marked confidential or proprietary. The District may refuse to consider any RFQ response or part thereof so marked. RFQ responses submitted in response to this RFQ may be subject to public disclosure. The District shall not be liable in any way for disclosure of any such records.

10. The undersigned bidder hereby submits this RFQ response and binds itself on award to the District under this RFQ to execute in accordance with such award a contract and to furnish the bond or bonds and insurance required by the RFQ. The RFQ, subsequent Addenda, bidder's Response Packet, and any attachments, shall constitute the Contract, and all provisions thereof are hereby accepted.

11. The undersigned acknowledges ***ONE*** of the following (please check only one box):

☐ Bidder is not an SBE and is ineligible for any bid preference; **OR**

☐ Bidder is an SBE or DVBE as described in the Contract Equity Program (CEP) and Equal Employment Opportunity (EEO) Guidelines, is requesting a 7% bid preference, and has completed the CEP and EEO forms at the hyperlink contained in the CEP and EEO section of this Exhibit A.

For additional information on SBE bid preference, please refer to the Contract Equity Program and Equal Employment Opportunity Guidelines at the above referenced hyperlink.

Official Name of Bidder (exactly as it appears on Bidder's corporate seal and invoice): _____

Street Address Line 1: _____

Street Address Line 2: _____

City: _____ State: _____ Zip Code: _____

Webpage: _____

Type of Entity / Organizational Structure (check one):

☐ Corporation ☐ Joint Venture

☐ Limited Liability Partnership ☐ Partnership

☐ Limited Liability Corporation ☐ Non-Profit / Church

☐ Other: _____

Jurisdiction of Organization Structure: _____

Date of Organization Structure: _____

Federal Tax Identification Number: _____

Primary Contact Information:

Name / Title: _____

Telephone Number: _____ Fax Number: _____

E-mail Address: _____

Street Address Line 1: _____

City: _____ State: _____ Zip Code: _____

SIGNATURE: _____

Name and Title of Signer (printed): _____

Dated this _____ day of _____ 20_____

BID FORM(S)

Cost shall be submitted on this Bid Form as is. The prices quoted shall not include Sales Tax or Use Tax; said tax, wherever applicable, will be paid by the District to the Contractor, if licensed to collect, or otherwise directly to the State.

No alterations or changes of any kind to the Bid Form(s) are permitted. RFQ responses that do not comply may be subject to rejection in total. The cost quoted below shall be the cost the District will pay for the term of any contract that is a result of this RFQ process.

Bidders may quote on Schedule I, Schedule II, Schedule III, Schedule IV, or any combination of the above. Please indicate No Bid, if you will not be bidding on a schedule. However, each schedule's lines must be indicated.

Schedule I: Power Building and Electrical Equipment

Description	**Unit of Measure**	**Estimated Quantity**	**Unit Cost**	**Extended Cost (Quantity x Unit Cost)**
Power Building and Electrical Equipment per Specification Section 26 05 91	EACH	1	**$**	**$**
Up to two (2) months of storage of equipment before delivery	--	--	**--**	**$**
			SCHEDULE I TOTAL COST	**$**

For information only (These costs will not to be used to evaluate/determine RFQ Bid Amount): Please quote below the expected shipping/freight costs.:

Schedule I Shipping/Freight Cost: $_____

Additional Storage of Equipment (per month) $_____

BID FORM (Continued)

Cost shall be submitted on this Bid Form as is. The prices quoted shall not include Sales Tax or Use Tax; said tax, wherever applicable, will be paid by the District to the Contractor, if licensed to collect, or otherwise directly to the State.

No alterations or changes of any kind to the Bid Form(s) are permitted. RFQ responses that do not comply may be subject to rejection in total. The cost quoted below shall be the cost the District will pay for the term of any contract that is a result of this RFQ process.

Bidders may quote on Schedule I, Schedule II, Schedule III, Schedule IV, or any combination of the above. Please indicate No Bid, if you will not be bidding on a schedule. However, each schedule's lines must be indicated.

Schedule II: Transformers

Description	**Unit of Measure**	**Estimated Quantity**	**Unit Cost**	**Extended Cost (Quantity x Unit Cost)**
25 kVA 1Ø Spillway and Camanche	EACH	2	**$**	**$**
500kVA 3Ø Camp Pardee	EACH	1	**$**	**$**
2MVA 3Ø Pardee Powerhouse	EACH	1	**$**	**$**
Up to two (2) months of storage of equipment before delivery	--	--	**--**	**$**
			SCHEDULE II TOTAL COST	**$**

For information only (These costs will not to be used to evaluate/determine RFQ Bid Amount): Please quote below the expected shipping/freight costs.:

Schedule II Shipping/Freight Cost: $_____

Additional Storage of Equipment (per month) $_____

BID FORM (Continued)

Cost shall be submitted on this Bid Form as is. The prices quoted shall not include Sales Tax or Use Tax; said tax, wherever applicable, will be paid by the District to the Contractor, if licensed to collect, or otherwise directly to the State.

No alterations or changes of any kind to the Bid Form(s) are permitted. RFQ responses that do not comply may be subject to rejection in total. The cost quoted below shall be the cost the District will pay for the term of any contract that is a result of this RFQ process.

Bidders may quote on Schedule I, Schedule II, Schedule III, Schedule IV, or any combination of the above. Please indicate No Bid, if you will not be bidding on a schedule. However, each schedule's lines must be indicated.

Schedule III: Load Interrupter Switchgears

Description	**Unit of Measure**	**Estimated Quantity**	**Unit Cost**	**Extended Cost (Quantity x Unit Cost)**
15kV Load Interrupter Switchgear Camp Pardee, Asset Tag: 24-EPS-SWF-001	EACH	1	**$**	**$**
15kV Load Interrupter Switchgear South Spillway, Asset Tag: 1529-EPS-SWF-001	EACH	1	**$**	**$**
Up to two (2) months of storage of equipment before delivery	--	--	**--**	**$**
			SCHEDULE III TOTAL COST	**$**

For information only (These costs will not to be used to evaluate/determine RFQ Bid Amount): Please quote below the expected shipping/freight costs.:

Schedule III Shipping/Freight Cost: $_____

Additional Storage of Equipment (per month) $_____

BID FORM (Continued)

Cost shall be submitted on this Bid Form as is. The prices quoted shall not include Sales Tax or Use Tax; said tax, wherever applicable, will be paid by the District to the Contractor, if licensed to collect, or otherwise directly to the State.

No alterations or changes of any kind to the Bid Form(s) are permitted. RFQ responses that do not comply may be subject to rejection in total. The cost quoted below shall be the cost the District will pay for the term of any contract that is a result of this RFQ process.

Bidders may quote on Schedule I, Schedule II, Schedule III, Schedule IV, or any combination of the above. Please indicate No Bid, if you will not be bidding on a schedule. However, each schedule's lines must be indicated.

Schedule IV: Sectionalizing Cabinets

Description	Unit of Measure	Estimated Quantity	Unit Cost	Extended Cost (Quantity x Unit Cost)
15kV Sectionalizer Cabinet Camp Pardee, Asset Tag: 24-EPS-SWN-001	EACH	1	**$**	**$**
15kV Sectionalizer Cabinet South Spillway, Asset Tag: 1529-EPS-SWN-001	EACH	1	**$**	**$**
Up to two (2) months of storage of equipment before delivery	--	--	--	**$**
			SCHEDULE IV TOTAL COST	**$**

For information only (These costs will not to be used to evaluate/determine RFQ Bid Amount): Please quote below the expected shipping/freight costs.:

Schedule IV Shipping/Freight Cost: $_____

Additional Storage of Equipment (per month) $_____

REQUIRED DOCUMENTATION AND SUBMITTALS

All of the specific documentation listed below is required to be submitted with the Exhibit A – RFQ Response Packet. Bidders shall submit all documentation, in the order listed below, and clearly label each section of the RFQ response with the appropriate title (i.e. Table of Contents, Letter of Transmittal, Key Personnel, etc.).

1. **Description of the Proposed Equipment/System**: RFQ response shall include a description of the proposed equipment/system, as it will be finally configured during the term of the contract. The description shall specify how the proposed equipment/system will meet or exceed the requirements of the District and shall explain any advantages that this proposed equipment/system would have over other possible equipment/systems. The description shall include any disadvantages or limitations that the District should be aware of in evaluating the RFQ response. Finally, the description shall describe all product warranties provided by bidder.

2. **Implementation Plan and Schedule**: The RFQ response shall include an implementation plan and schedule. The plan for implementing the proposed equipment/system and services shall include an Acceptance Test Plan. In addition, the plan shall include a detailed schedule indicating how the bidder will ensure adherence to the timetables for the final equipment/system and/or services.

3. **Evidence of Qualification Testing**: RFQ response provides evidence that the proposed equipment/system has successfully completed the qualification test standard requirements defined in this RFQ. Evidence shall include a statement from an Independent Testing Authority (ITA) that both the hardware elements and the software elements of the proposed equipment/system comply with the requirements of the qualification standard. If the equipment/system specified requires the addition of components or features not previously tested by the ITA, the District will determine, in its sole discretion, whether qualification testing of such components or features will be required prior to the award of a contract.

4. **Sustainability Statement:** Contractors shall submit a statement regarding any sustainable or environmental initiatives or practices that they or their suppliers engage in. This information can be in relation to the specific products procured under this RFQ or in relation to the manufacture, delivery, or office practices of your firm.

   If applicable, please also provide any information you have available on the below:

   a) Has your firm taken steps to enhance its ability to assess, track and address issues regarding Greenhouse Gas (GHG) Emissions in answer to recent legislations such as the Buy Clean California Act? If so, please attach any data you can on the embedded greenhouse gas emissions in the production and transport of the products and/or services which will be provided via this RFQ. If this is not available, please describe the approach you plan to take in order to gather and report this information in the future. For further information in this topic, please see: http://www.ghgprotocol.org/scope-3-technical-calculation-guidance

5. **References:**

(a) Bidders must use the templates in the "References" section of this Exhibit A – RFQ Response Packet to provide references.

(b) References should have similar scope, volume, and requirements to those outlined in these specifications, terms, and conditions.

- Bidders must verify the contact information for all references provided is current and valid.
- Bidders are strongly encouraged to notify all references that the District may be contacting them to obtain a reference.

(c) The District may contact some or all of the references provided in order to determine Bidder's performance record on work similar to that described in this RFQ. The District reserves the right to contact references other than those provided in the RFQ response.

6. **Exceptions, Clarifications, Amendments:**

(a) The RFQ response shall include a separate section calling out all clarifications, exceptions, and amendments, if any, to the RFQ and associated RFQ documents, which shall be submitted with Bidder's RFQ response using the template in the "Exceptions, Clarifications, Amendments" section **of** this Exhibit A – RFQ Response Packet.

(b) **THE DISTRICT IS UNDER NO OBLIGATION TO ACCEPT ANY EXCEPTIONS, AND SUCH EXCEPTIONS MAY BE A BASIS FOR RFQ RESPONSE DISQUALIFICATION.**

7. **Contract Equity Program:**

(a) Every bidder must fill out, sign, and submit the appropriate sections of the Contract Equity Program and Equal Employment Opportunity documents located at the hyperlink contained in the last page of this Exhibit A. Special attention should be given to completing Form P-25, "Contractor Employment Data and Certification". Any bidder needing assistance in completing these forms should contact the District's Contract Equity Office at (510) 287-0114 prior to submitting an RFQ response.

EBMUD

REFERENCES

RFQ No. 2503 – Medium Voltage Electrical Equipment for Pardee Dam Powerline Infrastructure

Bidder Name: ________________________________

Bidder must provide a minimum of 2 references.

Company Name:	Contact Person:
Address:	Telephone Number:
City, State, Zip:	E-mail Address:
Services Provided / Date(s) of Service:	

Company Name:	Contact Person:
Address:	Telephone Number:
City, State, Zip:	E-mail Address:
Services Provided / Date(s) of Service:	

Company Name:	Contact Person:
Address:	Telephone Number:
City, State, Zip:	E-mail Address:
Services Provided / Date(s) of Service:	

Company Name:	Contact Person:
Address:	Telephone Number:
City, State, Zip:	E-mail Address:
Services Provided / Date(s) of Service:	

Company Name:	Contact Person:
Address:	Telephone Number:
City, State, Zip:	E-mail Address:
Services Provided / Date(s) of Service:	

EXCEPTIONS, CLARIFICATIONS, AMENDMENTS

RFQ No. 2503 - Medium Voltage Electrical Equipment for Pardee Dam Powerline Infrastructure

Bidder Name: _____

List below requests for clarifications, exceptions, and amendments, if any, to the RFQ and associated RFQ Documents, and submit with bidder's RFQ response. **The District is under no obligation to accept any exceptions and such exceptions may be a basis for RFQ response disqualification.**

Reference to:			**Description**
Page No.	Section	Item No.	
p. 23	**D**	**1.c.**	***Bidder takes exception to…***

*Print additional pages as necessary

CONTRACT EQUITY PROGRAM & EQUAL EMPLOYMENT OPPORTUNITY

The District's Board of Directors adopted the Contract Equity Program (CEP) to enhance equal opportunities for business owners of all races, ethnicities, and genders who are interested in doing business with the District. The program has contracting objectives, serving as the minimum level of expected contract participation for the three availability groups: white-men owned businesses, white-women owned businesses, and ethnic minority owned businesses. The contracting objectives apply to all contracts that are determined to have subcontracting opportunities, and to all Contractors regardless of their race, gender, or ethnicity.

All Contractors and their subContractors performing work for the District must be Equal Employment Opportunity (EEO) employers and shall be bound by all laws prohibiting discrimination in employment. There shall be no discrimination against any person, or group of persons, on account of race, color, religion, creed, national origin, ancestry, gender including gender identity or expression, age, marital or domestic partnership status, mental disability, physical disability (including HIV and AIDS), medical condition (including genetic characteristics or cancer), genetic information, or sexual orientation.

Contractor and its subContractors shall abide by the requirements of 41 CFR §§ 60-1.4(a), 60-300.5(a) and 60-741.5(a). These regulations prohibit discrimination against qualified individuals based on their status as protected veterans or individuals with disabilities and prohibit discrimination against all individuals based on their race, color, religion, sex, sexual orientation, gender identity, or national origin in the performance of this contract. Moreover, these regulations require that covered prime Contractors and subContractors take affirmative action to employ and advance in employment individuals without regard to race, color, religion, sex, national origin, protected veteran status or disability.

All Contractors shall include the nondiscrimination provisions above in all subcontracts.
Please include the required completed forms with your bid.
Non-compliance with the Guidelines may deem a bid non-responsive, and therefore, ineligible for contract award. Your firm is responsible for:

1) Reading and understanding the CEP guidelines.

2) Filling out and submitting with your bid the appropriate forms.

The CEP guidelines and forms can also be downloaded from the District website at the following link:
http://ebmud.com/business-center/contract-equity-program/

If you have questions regarding the Contract Equity Program, please call (510) 287-0114.

EXHIBIT B
INSURANCE REQUIREMENTS

CONTRACTOR/COMPANY NAME: _____

PROPOSER shall take out and maintain during the life of the Agreement all insurance required and PROPOSER shall not commence work until such insurance has been approved by DISTRICT. The proof of insurance shall be on forms provided by DISTRICT directly following these Insurance Requirements.

PROPOSERS are not required to submit completed insurance verification documents with their bid but will be required to submit them upon notification of award. By signing Exhibit A – RFP Response Packet, the BIDDER agrees to meet the minimum insurance requirements stated in the RFP.

The following are provisions applicable to all required insurance

A. Prior to the beginning of and throughout the duration of Services, and for any additional period of time as specified below, CONTRACTOR shall, at its sole cost and expense, maintain insurance in conformance with the requirements set forth below.

B. CONTRACTOR shall provide Verification of Insurance as required by this Agreement by providing the completed Verification of Insurance as requested below by signing and submitting Exhibit B ("Insurance Requirements") to the DISTRICT. The Insurance Requirements may be signed by the insurance broker or the insurance broker's agent (Insurance Broker/Agent) for the CONTRACTOR, or by an officer of the CONTRACTOR (Officer), or by the CONTRACTOR's risk manager (Risk Manager). The Notice to Proceed shall not be issued, and CONTRACTOR shall not commence Services until a signed Verification of Insurance evidencing the specific coverages and limits required by this Agreement has been received by the DISTRICT.

C. CONTRACTOR shall carry and maintain the minimum insurance requirements as defined in this Agreement. CONTRACTOR shall require any contractor/subcontractor to carry and maintain the minimum insurance required in this Agreement to the extent the insurance applies to the scope of the services to be performed by contractor/subcontractor.

D. Receipt of a signed Verification of Insurance by the DISTRICT shall not relieve CONTRACTOR of any of the insurance requirements, nor decrease liability of CONTRACTOR.

E. Insurance must be maintained, and an updated Verification of Insurance must be provided to the DISTRICT before the expiration of insurance by having the Insurance Broker/Agent, Officer, or Risk Manager update, sign and return the Insurance Requirements to the DISTRICT's contract manager. The updated Insurance Requirements shall become a part of the Agreement but shall not require a change order to the Agreement. It is the CONTRACTOR's sole responsibility to provide or to ensure that an updated Verification of Insurance is provided to the DISTRICT. The DISTRICT has no obligation to solicit, remind, prompt, request, seek, or otherwise obtain any updated Verification of Insurance, and any actual or alleged failure on the part of the DISTRICT to obtain any updated Verification of Insurance under this Agreement shall not in any way be construed to be a waiver of any right or remedy of the DISTRICT, in this or any regard.

F. The insurance required hereunder may be obtained by a combination of primary, excess and/or umbrella insurance, and all coverage shall be at least as broad as the requirements listed in this Agreement.

G. Any deductibles, self-insurance, or self-insured retentions (SIRs) applicable to the required insurance coverage must be declared to and accepted by the DISTRICT.

H. At the option and request of the DISTRICT, CONTRACTOR shall provide documentation of its financial ability to pay the deductible, self-insurance, or SIR.

I. CONTRACTOR is responsible for the payment of any deductibles or SIRs pertaining to the policies required under this Agreement. In the event CONTRACTOR is unable to pay the required SIR, CONTRACTOR agrees that such SIR may be satisfied, in whole or in part, by the DISTRICT as the additional insured at the DISTRICT's sole and absolute discretion, unless to do so would terminate or void the policy(ies).

J. Unless otherwise accepted by the DISTRICT, all required insurance must be placed with insurers with a current A.M. Best's rating of no less than A- V.

K. CONTRACTOR shall defend the DISTRICT and pay any damages as a result of failure to provide the waiver of subrogation from the insurance carrier required by this Agreement.

L. For any coverage that is provided on a claims-made coverage form (which type of form is permitted only where specified), the retroactive date must be shown, must be before the date of this Agreement, and must be before the beginning of any Services related to this Agreement.

M. For all claims-made policies the updated Verification of Insurance must be provided to the DISTRICT for at least three (3) years after expiration or termination of this Agreement.

N. If claims-made coverage is canceled or is non-renewed and if the claims-made coverage is not replaced with another claims-made policy form with a retroactive date prior to the effective date of this Agreement and prior to the start of any Services related to this Agreement, CONTRACTOR must purchase an extended reporting period for a minimum of three (3) years after expiration or termination of the Agreement.

O. In the event of a claim or suit, and upon request by the DISTRICT, CONTRACTOR agrees to provide a copy of the pertinent policy(ies) within 10 days of such request to the DISTRICT for review. Any actual or alleged failure on the part of the DISTRICT to request a copy of the pertinent policy(ies) shall not in any way be construed to be a waiver of any right or remedy of the DISTRICT, in this or any regard. Additionally, the DISTRICT may, at any time during CONTRACTOR's performance under this Agreement, request a copy of the Declarations pages and Schedule of Forms and Endorsements of any policy required to be maintained by CONTRACTOR hereunder, whether or not a suit or claim has been filed. Premium details may be redacted from any such documents requested.

P. The defense and indemnification obligations of this Agreement are undertaken in addition to, and shall not in any way be limited by, the insurance obligations contained herein.

Q. Where additional insured coverage is required, the additional insured coverage shall be primary and non-contributory, and will not seek contribution from the DISTRICT's insurance or self-insurance.

R. CONTRACTOR agrees to provide immediate Notice to the DISTRICT of any loss or claim against CONTRACTOR arising out of, pertaining to, or in any way relating to this Agreement or to Services performed under this Agreement. The DISTRICT assumes no obligation or liability by such Notice but has the right (but not the duty) to monitor the handling of any such claim(s) if the claim(s) is likely to involve the DISTRICT.

S. It is the obligation of the CONTRACTOR to ensure all contractors/subcontractors performing services under this Agreement maintain the necessary coverages and limits. CONTRACTOR shall ensure that all contractors/subcontractors agree to the same indemnity obligation that CONTRACTOR agrees to in this Agreement based on the nature and scope of services being performed by each contractor/subcontractor. CONTRACTOR shall require that each contractor/subcontractor include the DISTRICT, its directors, officers, and employees as additional insureds on its liability policy(ies) (excepting Professional Liability and Workers' Compensation) for all ongoing and completed operations with coverage as broad as required of CONTRACTOR under this Agreement. Failure or inability to secure fully adequate insurance shall in no way relieve the CONTRACTOR or all contractors/subcontractors of the responsibility for its own acts or the acts of any contractors/subcontractors or any employees or agents of either. All contractors/subcontractors are to waive subrogation against the DISTRICT on all policies. CONTRACTOR shall be responsible for maintaining records evidencing contractors'/subcontractors' compliance with the necessary insurance coverages and limits, and such records shall be made available to the DISTRICT within 10 days upon request.

T. It is CONTRACTOR's responsibility to ensure its compliance with the insurance requirements. Any actual or alleged failure on the part of the DISTRICT to obtain proof of insurance required under this Agreement shall not in any way be construed to be a waiver of any right or remedy of the DISTRICT, in this or any regard.

U. Notice of Cancellation/Non-Renewal/Material Reduction**.** The insurance requirements hereunder are mandatory, and the DISTRICT may, at its sole and absolute discretion, terminate the services provided by CONTRACTOR, should CONTRACTOR breach its obligations to maintain the required coverage and limits set forth in this Agreement. No coverage required hereunder shall be cancelled, non-renewed or materially reduced in coverage or limits without the DISTRICT being provided at least thirty (30) days prior written notice, other than cancellation for the non-payment of premiums, in which event the DISTRICT shall be provided ten (10) days prior written notice. Replacement of coverage with another policy or insurer, without any lapse in coverage or any reduction of the stated requirements does not require notice beyond submission to the DISTRICT of an updated Verification of Insurance which shall be met by having the Insurance Broker/ Agent, or Officer, or Risk Manager update, sign and return the Insurance Requirements.

I. Workers' Compensation and Employer's Liability Insurance Coverage

A. Workers' Compensation insurance including Employer's Liability insurance with minimum limits as follows:

Coverage A.	Statutory Benefits Limits	
Coverage B.	Employer's Liability of not less than:	
	Bodily Injury by accident:	$1,000,000 each accident
	Bodily Injury by disease:	$1,000,000 each employee
	Bodily Injury by disease:	$1,000,000 policy limit

B. If there is an onsite exposure of injury to CONTRACTOR, and/or contractor/subcontractor's employees under the U.S. Longshore and Harbor Workers' Compensation Act, the Jones Act, or under laws, regulations or statutes applicable to maritime employees, coverage is required for such injuries or claims.

C. If CONTRACTOR is exempt from carrying Workers' Compensation Insurance, CONTRACTOR must return the completed Verification of Insurance confirming that CONTRACTOR has no employees and is exempt from the State of California Workers' Compensation requirements.

D. If CONTRACTOR is self-insured with respect to Workers' Compensation coverage, CONTRACTOR shall provide to the DISTRICT a Certificate of Consent to Self-Insure from the California Department of Industrial Relations. Such self-insurance shall meet the minimum limit requirements and shall waive subrogation rights in favor of the DISTRICT as stated below in section "E."

E. Waiver of Subrogation. Workers' Compensation policies, including any applicable excess and umbrella insurance, must contain a waiver of subrogation endorsement providing that CONTRACTOR and each insurer waive any and all rights of recovery by subrogation, or otherwise, against the DISTRICT, its directors, board, and committee members, officers, officials, employees, agents, and volunteers. CONTRACTOR shall defend and pay any and all damages, fees, and costs, of any kind arising out of, pertaining to, or in any way relating to CONTRACTOR's failure to provide waiver of subrogation from the insurance carrier.

Verification of Workers' Compensation and Employer's Liability Insurance Coverage

☐ **By checking the box and signing below, I hereby verify that the CONTRACTOR is exempt from the State of California's requirement to carry Workers' Compensation insurance.**

As the CONTRACTOR's Insurance Broker/Agent, Officer, or Risk Manager, I hereby verify that I have reviewed and confirmed that the CONTRACTOR carries Workers' Compensation insurance as required by this Agreement, including the relevant provisions applicable to all required insurance.

Self-Insured Retention: Amount: $_____

Policy Limit: $_____

Policy Number: _____

Policy Period: from _____ **to** _____

Insurance Carrier Name: _____

Insurance Broker/Agent or Officer or Risk Manager - Print Name: _____

Insurance Broker/Agent or Officer or Risk Manager's Signature: _____

II. Commercial General Liability Insurance ("CGL") Coverage

A. CONTRACTOR's insurance shall be primary, and any insurance or self-insurance procured or maintained by the DISTRICT shall not be required to contribute to it.

B. The insurance requirements under this Agreement shall be the greater of (1) the minimum coverage and limits specified in this Agreement; or (2) the broader coverage and maximum limits of coverage of any insurance policies or proceeds available to the Named Insured. It is agreed that these insurance requirements shall not in any way act to reduce coverage that is broader or that includes higher limits than the minimums required herein. No representation is made that the minimum insurance requirements of this Agreement are sufficient to cover the obligations of the CONTRACTOR.

C. Minimum Requirements. CGL insurance with minimum per occurrence and aggregate limits as follows:

Bodily Injury and Property Damage $2,000,000 per occurrence & aggregate

Personal Injury/Advertising Injury	$2,000,000 per occurrence & aggregate
Products/Completed Operations	$2,000,000 per occurrence & aggregate

D. Coverage must be on an occurrence basis and be as broad as Insurance Services Office (ISO) form CG 00 01.

E. Coverage for Products, and Completed Operations, and Ongoing Operations must be included in the insurance policies and shall not contain any "prior work" coverage limitation or exclusion applicable to any Services performed by CONTRACTOR and/or contractor/subcontractor under this Agreement.

F. There will be no exclusion for explosions, collapse, or underground liability (XCU).

G. Insurance policies and Additional Insured Endorsement(s) shall not exclude liability and damages to work arising out of, pertaining to, or in any way relating to services performed by contractor/subcontractor on CONTRACTOR's behalf.

H. Contractual liability coverage shall be included and shall not limit, by any modification or endorsement, coverage for liabilities assumed by CONTRACTOR under this Agreement as an "insured contract."

I. Waiver of Subrogation. The policy shall be endorsed to include a Waiver of Subrogation ensuring that the CONTRACTOR and its insurer(s) waive any rights of recovery by subrogation, or otherwise, against the DISTRICT, its directors, board, and committee members, officers, officials, agents, volunteers, and employees. CONTRACTOR shall defend and pay any and all damages, fees, and costs, of any kind, arising out of, pertaining to, or in any way resulting from CONTRACTOR's failure to provide the waiver of subrogation from its insurance carrier(s).

J. Independent Contractor's Liability shall not limit coverage for liability and/or damages arising out of, pertaining to, or in any way resulting from Services provided under this Agreement.

K. To the fullest extent permitted by law, the DISTRICT, its directors, board, and committee members, officers, officials, employees, agents, and volunteers must be covered as Additional Insureds on a primary and noncontributory basis on all underlying, excess and umbrella policies that shall be evidenced in each case by an endorsement. Coverage for the Additional Insureds must be as broad as ISO forms CG 20 10 (ongoing operations) and CG 20 37 (completed operations) for liability arising in whole, or in part, from work performed by or on behalf of CONTRACTOR, or in any way related to Services performed under this Agreement.

L. A severability of interest provision must apply for all the Additional Insureds, ensuring that CONTRACTOR's insurance shall apply separately to each insured against whom a claim is made or suit is brought, except with respect to the policies' limit(s).

Verification of Commercial General Liability (CGL) Insurance Coverage

As the CONTRACTOR'S Insurance Broker/Agent, Officer, or Risk Manager, I hereby verify that I have reviewed and confirmed that the CONTRACTOR carries Commercial General Liability insurance, as required by this Agreement, including the relevant provisions applicable to all required insurance:

Self-Insured Retention: Amount: $_____

Policy Limit: $_____

Policy Number: _____

Policy Period: from _____ **to** _____

Insurance Carrier Name: _____

Insurance Broker/Agent or Officer or Risk Manager - Print Name: _____

Insurance Broker/Agent or Officer or Risk Manager's Signature: _____

III. Business Auto Liability Insurance Coverage

A. CONTRACTOR's insurance shall be primary, and any insurance or self-insurance procured or maintained by the DISTRICT shall not be required to contribute to it.

B. The insurance requirements under this Agreement shall be the greater of (1) the minimum coverage and limits specified in this Agreement; or (2) the broader coverage and maximum limits of coverage of any insurance policies or proceeds available to the Named Insured. It is agreed that these insurance requirements shall not in any way act to reduce coverage that is broader or that includes higher limits than the minimums required herein. No representation is made that the minimum insurance requirements of this Agreement are sufficient to cover the obligations of the CONTRACTOR.

C. Minimum Requirements. Auto insurance with minimum coverage and limits as follows:
   a. Each Occurrence Limit (per accident) and in the Aggregate: 2,000,000
   b. Bodily Injury and Property Damage: $2,000,000

D. Coverage must include either "owned, non-owned, and hired" autos or "any" automobile. This provision ensures the policy covers losses arising out of use of company-owned vehicles ("owned autos"), employee's personal autos ("non-owned autos" meaning not owned by company/insured) or autos that are rented or leased ("hired autos").

E. If CONTRACTOR is transporting hazardous materials or contaminants, evidence of the Motor Carrier Act Endorsement-hazardous materials clean-up (MCS-90, or its equivalent) must be provided.

F. If CONTRACTOR's Scope of Services under this Agreement exposes a potential pollution liability risk related to transport of potential pollutants, seepage, release, escape or discharge of any nature (threatened or actual) of pollutants into the environment arising out of, pertaining to, or in any way related to CONTRACTOR's and/or contractor's/subcontractor's performance under this Agreement, then Auto Liability Insurance policies must be endorsed to include Transportation Pollution Liability insurance. Alternatively, coverage may be provided under the CONTRACTOR's Pollution Liability Policies if such policy has no exclusions that would restrict coverage under this Agreement. Coverage shall also include leakage of fuel or other "pollutants" needed for the normal functioning of covered autos.

G. To the fullest extent permitted by law, the DISTRICT, its directors, board, and committee members, officers, officials, employees, agents, and volunteers must be covered as Additional Insureds on a primary and noncontributory basis on all underlying and excess and umbrella policies.

H. A severability of interest provision must apply for all the Additional Insureds, ensuring that CONTRACTOR's insurance shall apply separately to each insured against whom a claim is made or suit is brought, except with respect to the insurer's limits of liability.

Verification of Business Auto Liability Insurance Coverage

As the CONTRACTOR'S Insurance Broker/Agent, Officer, or Risk Manager, I hereby verify that I have reviewed and confirmed that the CONTRACTOR carries Business Automobile Liability insurance, as required by this Agreement, including the relevant provisions applicable to all required insurance:

Self-Insured Retention: Amount: $_____

Policy Limit: $_____

Policy Number: _____

Policy Period: from _____ **to** _____

Insurance Carrier Name: _____

Insurance Broker/Agent or Officer or Risk Manager – Print Name: _____

Insurance Broker/Agent or Officer or Risk Manager's Signature: _____

EXHIBIT D

IRAN CONTRACTING ACT CERTIFICATION

Pursuant to Public Contract Code (PCC) § 2204, an Iran Contracting Act Certification is required for solicitations of goods or services of $1,000,000 or more.

To submit a bid or proposal to East Bay Municipal Utility District (District), you must complete **ONLY ONE** of the following two paragraphs. To complete paragraph 1, check the corresponding box **and** complete the certification for paragraph 1. To complete paragraph 2, check the corresponding box and attach a copy of the written permission from the District.

☐ 1. We are not on the current list of persons engaged in investment activities in Iran created by the California Department of General Services ("DGS") pursuant to PCC § 2203(b), and we are not a financial institution extending twenty million dollars ($20,000,000) or more in credit to another person, for 45 days or more, if that other person will use the credit to provide goods or services in the energy sector in Iran and is identified on the current list of persons engaged in investment activities in Iran created by DGS.

CERTIFICATION FOR PARAGRAPH 1:

I, the official named below, CERTIFY UNDER PENALTY OF PERJURY, that I am duly authorized to legally bind the BIDDER/bidder to the clause in paragraph 1. This certification is made under the laws of the State of California.

Firm: _____

By: _____ Date: _____
(Signature of Bidder)

Title: _____

Signed at: _____ County, State of: _____

OR

☐ 2. We have received written permission from the District to submit a bid or proposal pursuant to PCC § 2203(c) or (d). *A copy of the written permission from the District is included with our bid or proposal.*

EXHIBIT E – SPECIFICATIONS AND DRAWINGS

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. The requirements of this section apply to all submittals in the Contract Documents.

2. Submit samples, drawings, and data for the Engineer's review which demonstrate fully that the construction, and the materials and equipment to be furnished will comply with the provisions and intent of this Specification. All submittals shall be written in Standard American English and all numerical data, whether in drawings, test reports, engineering calculations, manufacturer's literature, or maintenance manuals, shall be in United States Customary System (USCS) measuring units (foot, pound, gallons, etc). If original design work was completed in metric units, their equivalent USCS dimension and unit shall be indicated. All submittals, in printed or electronic format, shall be original quality and completely legible. Any obfuscation or loss of clarity of original which may result in ambiguous interpretation is not acceptable.

3. Specific items to be covered by the submittals shall include, as a minimum, the following:

a. For structures, submit all shop, setting, equipment, miscellaneous iron and reinforcement drawings and schedules necessary.

b. For equipment which requires electrical service, submit detailed information to show power supply requirements, wiring diagrams, control and protection schematics, shop test data, operation and maintenance procedures, outline drawings, and manufacturer's recommendation of the interface/interlock among the equipment.

c. For mechanical equipment submit all data pertinent to the installation and maintenance of the equipment including shop drawings, manufacturer's recommended installation procedure, detailed installation drawings, test data and curves, maintenance manuals, and other details necessary.

d. Substitutions

4. Additional submittals required: See pertinent sections of this specification.

5. Submit a Schedule of Submittals including monthly updates.

6. For mechanical or electrical equipment that require submittals: provide separate submittals for each piece of equipment to be installed at each site. Title the submittals to denote which site the equipment pertains to.

1.2 PRODUCT HANDLING

A. Submittals shall be accompanied by a cover page and shall be in strict accordance with the provisions of this section.

B. Submit priority of processing when appropriate.

C. Submit materials to the EBMUD Materials Testing Laboratory when so specified. Submit other submittals to Construction Division, EBMUD, in accordance with Article 3.1 unless specified otherwise.

D. Proposals for "or equal" substitutions made prior to bid opening, pursuant to PCC Section 3400 (see Instructions To Bidders, Article 3), shall be delivered after coordinating the delivery with the District. Contractor shall coordinate with the District's Purchasing Division at the following telephone numbers: (510) 287-1253, or (510) 287-2017.

1.3 SUBMITTALS

A. Submittals shall include the following information:

1. A copy of the applicable section(s), with addendum updates included as appropriate, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.

2. A check mark shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Engineer is the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications.

B. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

C. Any deviation from the contract documents not specifically requested and clearly identified, although accepted through oversight, may be rejected at any stage of the Work. The Contractor shall, at its own expense, reconstruct all work affected by the later rejection of a contract deviation that was not specifically called out and explained for review and acceptance by the District as detailed above.

D. Electrical Equipment Requirements

1. Provide manufacturers' descriptive information and shop drawings for all equipment, material, and devices furnished under Division 26 and 33, Electrical including certified outline and arrangement drawings, schematic (elementary) diagrams, interconnection and connection diagrams, in accordance with this section. Device designations and symbols for schematic (elementary) connection or interconnection diagrams shall conform to the latest edition of NEMA ICS l.

2. Manufacturer's standardized elementary diagrams will not be acceptable unless applicable portions of the diagram have been clearly identified and non-applicable portions deleted or crossed out.

3. Layouts indicating conformity with space requirements

4. Assembly drawings in sufficient detail to identify every part of the specified equipment including bills of material

5. General dimension, outline, and panel, cubicle, and structure layout drawings showing the principal dimensions of the equipment, the location of all devices therein, and the size of electrical conduits and connections

6. One-line, three-line, schematic (elementary), connections detailing all internal wiring, and interconnection diagrams detailing all field wiring

7. Control schematics shall use the ladder diagram type format incorporating line number, operation function statement, contact location line number with an underline for a normally closed contact, a description of operation of each device and complete step-by-step written sequence of operation. Wire and terminal numbers shall be clearly shown. Actual device symbols shall be used to represent equipment such as limit switches, time delay relays, etc. Control schematics shall be shown with the electrical system in a de-energized state. Refer to the schematic (elementary) diagrams in the contract drawings for examples.

8. Complete interconnection diagram for each system showing every wire by number, every junction terminal box or device to which it connects from origination to final destination, and boxes, manholes, pull boxes, and cabinets through which it passes. These diagrams shall show wiring installed between items of manufactured, prewired or non-prewired equipment.

9. Furnish schematic (elementary) diagrams for Engineer's approval and record purposes. These wiring diagrams shall indicate point-to-point wire terminations, and wire color identifications with tags per Section 26 05 19.

10. Characteristic curves for all protective devices.

11. Installation drawings for all electrical work showing conduit layout, conduit sizes and locations of equipment foundations, and details accurately dimensioned. Conduits located in foundation slabs or routed through concrete structures shall be

indicated on the installation drawings and submitted for review prior to foundation concrete pour

E. Seismic Requirements

1. Submit anchorage calculations for equipment that weighs 200 pounds or greater.

2. The following electrical equipment shall be designed and seismically anchored to resist Code prescribed seismic forces and shall not undergo loss of their intended function after application of these forces in in accordance with Sections 01 43 11 and 01 81 02:

a. Power Building and Electrical Equipment (Section 26 05 91)

b. Pad-Mounted Liquid-Filled Medium-Voltage Transformers (Section 26 12 19)

c. Medium Voltage Load Interrupter Switchgear (Section 26 13 16.13)

d. 15kV Medium Voltage Sectionalizing Cabinets (Section 26 13 16.14)

e. 15kV Medium Voltage Automatic Delayed Transition Transfer Switch (33 77 01)

PART 2 - PRODUCTS

2.1 SCHEDULE OF SUBMITTALS

A. Schedule of Submittals shall be in the form of a submittal log similar to that shown in Appendix A.

B. Complete columns (a) through (g) showing all submittals required by the specifications.

C. A Schedule of Submittals is not required for proposals for “or equal” substitutions made prior to bid opening pursuant to PCC Section 3400 (see Instructions To Bidders, Article 3).

2.2 SHOP DRAWINGS

A. Scale required:

1. Make all shop drawings accurately to a scale sufficiently large to show all pertinent features of the item and its method of connection to the work.

B. Type of prints required:

1. Make all shop drawing prints in blue or black line on white background. Reproductions of District drawings are not acceptable.

C. Size of drawings required:

1. The overall dimensions of each drawing submitted to the Engineer shall be equal to one of the District's standard sheet sizes as listed below. The title block shall be located in the lower right hand corner of each drawing and shall be clear of all linework, dimensions, details, and notes.

Sheet Sizes
Height x Width

11" x 8-1/2"
11" x 17"
22" x 34"

D. Stamp or permanently print on each drawing “Reference EBMUD Drawing _____” and enter the pertinent drawing number.

2.3 COLORS

A. General:

1. Unless the precise color and pattern are specified elsewhere, submit accurate color charts and pattern charts to the Engineer for his review and selection whenever a choice of color or pattern is available in a specified product. Label each chart naming the source, the proposed location of use on the project, and the project name itself.

2.4 MANUFACTURERS' LITERATURE

A. Where contents of submitted literature from manufacturers include data not pertinent to the submittal, clearly show which portions of the contents are being submitted for review.

B. Clearly mark the literature with the materials and options being provided to illustrate conformance with the specification details.

C. Provide the complete part number and include the legend containing the descriptive details that define the meaning of each digit of the number.

2.5 SUBSTITUTIONS

A. Engineer's approval required:

1. The contract is based on the materials, equipment, and methods described in the Contract Documents. Any Contractor-proposed substitutions are subject to the Engineer's approval.

2. The Engineer will consider proposals for substitution of materials, equipment, and methods only when such proposals are accompanied by full and complete

technical data, and all other information required by the Engineer to evaluate the proposed substitution.

3. Where substitutions are proposed for consideration, Contractor shall submit a written request for the substitution and shall show that it is equal to the specified item. The proposed substitution shall be identified separately and included with the required submittal for the item. When submitting a variation or substitution the Contractor warrants that:

    a. The contract has been reviewed to establish that the substitution, when incorporated, will be compatible with other elements of work.

    b. The Contractor shall perform all necessary work for making substitutions workable and shall bear any additional cost necessary because of the proposed substitution.

4. Substitutions not specifically requested, although accepted through oversight, may be rejected at any stage of the work. The Contractor shall, at its own expense, reconstruct all work affected by the later rejection of a substitution that was not specifically requested.

B. Trade names and "or equal as approved by the Engineer" provision:

1. See Article 4.4 of the General Conditions.

2. See Instructions To Bidders, Article 3, for proposals for “or equal” substitutions made prior to bid opening as permitted pursuant to PCC Section 3400.

2.6 OPERATIONS AND MAINTENANCE MANUALS

A. See “Table 1: O&M Manual Summary” at the end of this section.

B. The provisions of this article are considered minimal requirements and do not supersede any requirements in individual sections of this specification.

C. When O&M manuals are required to be submitted covering items included in this work, prepare all such manuals in approximately 8-1/2" x 11" format in durable, three ring plastic binders. Each manual shall be identical and include at a minimum information identified on the O&M Manual Review Checklist attached in Appendix A. In addition, furnish the following:

1. Binder Cover: Identification on, or readable through, the front cover stating the District’s specification (project) number and project title, District facility or facilities where the equipment will be installed, specification section number, and the system or equipment described in the manual.

2. Binder Spine Label: Include the system or equipment name as shown on the binder cover along with the specification section number.

3. Title page including applicable equipment tag numbers and equipment manufacturer's name, address, telephone number, and the submittal date. In addition, provide name, address and telephone number of the local manufacturer's representative.

4. Table of contents organized and referenced to manual section dividers

5. Complete instructions regarding storage, handling, installation, operation, servicing, and maintenance of all equipment involved

6. Comprehensive replacement parts list, with complete nomenclature of all replaceable parts, their part numbers, current cost, and name and address of nearest vendor of parts

7. Detailed description of handling, replacement, and disposal of all fluids and replacement parts

8. Copies of Safety Data Sheets (SDS) as required

9. Copies of all guarantees and warranties issued including the start and end dates for the warranty period or conditions for the initial start date and the duration

10. Copies of calculations or reports appropriately prepared including sketches, given or known information with the source of the data, equations with each variable defined and applicable units, cross-references, code/standard references, annotations and footnotes

11. All field and factory test data

12. Engineering calculations or reports pertinent to the content of the O&M manual. See Article 2.8 Engineering Calculations or Reports.

13. Provide a separate section with tab divider for documents developed in the field after the O&M manual has been accepted. These documents include, but not limited to the following: manufacturer's certificate of proper installation, field test results, etc.

D. Materials shall be word-processed.

E. For mechanical or electrical equipment that require O&M manuals: provide separate O&M manuals for each piece of equipment installed at each site. Title the O&M manuals to denote which site the equipment pertains to.

F. Manufacturer's literature shall be originals, or original quality copies. Specifically identify all equipment models and features being provided. Delete or cross out any extra information provided in standard manufacturer's literature that does not apply to the equipment furnished.

G. Operating and Testing Procedures, and Diagrams: All manufacturers' standard procedures shall be customized or rewritten as necessary to accurately describe the system as it is installed and operated for the project. Procedures shall include District device tag numbers (as shown on the P&IDs) whenever available. All diagrams illustrating the system shall be customized to show installed conditions, and shall include District device tag numbers whenever available.

H. Three-hole punch shall not obliterate any information. Reduce original material as necessary to provide a suitable margin for three-hole punching or provide three-hole punched clear plastic pockets for inserting single sheet material.

I. O&M Manual Review Checklist:

1. The manufacturer's representative shall fill out a minimum of one O&M Manual Review Checklist form per submittal (See Appendix A) and include a copy in each submitted manual. Provide more than one checklist when specified in the technical specification sections. Clearly identify the location in the O&M Manual for each element in the Technical Content section (O&M tab number and page number). If the content is in multiple locations or on multiple pages, identify each location in the space provided or in the Comments column on the form.

2. All portions of the form shall be completed prior to submittal, or the submittal may be returned unreviewed. Submittals may also be returned unreviewed if the O&M Manual Checklist form contains multiple error and/or omissions.

J. O&M Manual Review Process

1. Preliminary O&M Manuals: Submit preliminary O&M manuals as searchable Portable Document Format (PDF) per Section 01 31 23.10 for review. The District will return the submittals to the Contractor along with comments identifying necessary corrections or additions to the manuals. The District reserves the right to keep possession of all O&M manuals, and have the Contractor arrange to correct the manuals to comply with the reviewer comments.

   a. Preliminary O&M manuals shall be submitted and accepted prior to the delivery of the respective equipment or system.

2. Final O&M Manuals:

   a. The manuals shall not be considered final until the submittal has received a review status of "No Exceptions Taken".

      1) Submit the Final O&M Manuals per the requirements of Paragraph 2.6.C.

      2) Submit requested number of Final O&M Manual hard copies as shown in Table 1 at the end of this section.

3) Final O&M manuals shall be submitted and accepted prior to RFS milestone.

K. Electronic Files:

1. After the District has accepted each O&M Manual, an electronic version shall be supplied in addition to the required number of hard copies.

2. Electronic files shall be created in both searchable Portable Document Format (PDF) compatible with Adobe Acrobat version XI and Word format compatible with Microsoft Word 2010 or later. The security features (e.g. password protection) of all submitted files shall be disabled so that the District can perform future editing without restriction. Custom-developed drawings included in the O&M manuals (i.e. loop diagrams, system interconnection diagrams, etc.) shall also be submitted electronically in both PDF and the native CAD file format for future editing of the drawings by the Engineer. For CAD files, the associated PDF files shall be saved such that all CAD layering is preserved in the PDF file.

3. Electronic versions shall match the hard copy page for page with blank pages deleted. Electronic files shall be converted to PDF directly rather than using optical scanning. For any document not already in electronic format, the documents shall be scanned using optical character recognition to provide searching capability in the document.

4. All electronic files shall be submitted to the Engineer via the CMIS.

L. Maintenance Summary Forms

1. Furnish a completed Maintenance Summary Form (see Appendix A for typical format) as part of the O&M Manual. Include all typical, routine, or preventive maintenance required to ensure satisfactory performance during warranty period and longevity of the equipment. Manufacturer's representative shall sign and date the form certifying accuracy of the information.

2. Briefly summarize each maintenance activity on the form. Specific references to more detailed maintenance information located elsewhere in the O&M manual may be placed in the "Comments" column. However, simply referencing other sections in the O&M manual without a brief description of the maintenance activity is not acceptable.

3. Information on the form shall be word-processed, or typewritten.

4. Maintenance Summary Forms shall be on 8-1/2 inch by 11-inch paper and may be as many pages as required to completely summarize the required maintenance. However, the order and format shall be in accordance with the supplied form. The Maintenance Summary Forms will be provided in electronic format (MS Word) upon request.

2.7 AS-BUILT DRAWINGS

A. Not used.

2.8 ENGINEERING CALCULATIONS OR REPORTS

A. Engineering calculations/reports required by this specification shall be based on well-established engineering theories and principles. Each calculation/report shall be a complete and independent package.

B. The Contractor (or Manufacturer) shall provide the signing Engineer all necessary reference drawings and data required for completion of the calculations.

C. The calculations/reports shall be comprehensive for each structure or item, in that all calculations/reports are contained within the individual structure or item's calculation/report document (i.e., no calculation/report references to other calculation documents).

D. Presentation format shall be similar to that described in Article 2.6 – Operations and Maintenance Manuals. As a minimum, all calculations/reports shall be bound in an appropriately labeled binder, and contain the following elements:

1. Facility title, including substructure number, equipment description, applicable equipment tag number(s), and applicable specification section.

2. Table of Contents

3. Introduction, including description of structure or item, purpose of calculation/report, design assumptions with justification, software utilized for the analysis including the version, and codes/standards used

4. A list of references used to provide the bases for assumptions, equations, or data used in the calculation/report

5. Calculations or reports appropriately prepared, including sketches and reference drawings, given or known information with the source of the data, equations with each variable defined and applicable units, cross-references, code/standard references, annotations and footnotes

6. When spreadsheets are used, provide referenced equations and the formulas used in the calculations.

7. Results shall be clearly identified. Summary tables shall be used for large amounts of data (especially if a software application is used)

8. Final design details, ready for transmittal to design drawings or shop drawings

9. Seal or signature of Professional Engineer registered in the State of California, as appropriate, of the individual(s) who prepared the calculations/reports

10. Appendices, including input and output files from computer design, and photocopies of catalog sheets for any special material or equipment (e.g., manufacturer sheet for equipment, ICBO reports for anchors, etc.), and checker markups

E. When any part of the calculation/report has been prepared by computer software, a copy of the input and output files shall be included as part of the final design calculation.

F. Shop drawings shall not be submitted until all design calculations/reports have been appropriately reviewed, checked and signed. The checker markups and comments shall also be included in an appendix to each calculation.

2.9 CONTRACTOR'S DAILY REPORTS

1. Not Used.

2.10 SUBMITTAL QUANTITIES

A. Submit four (4) copies of all hard-copy (printed) items as identified herein unless specified otherwise.

B. Submit one (1) electronic copy of the scanned data and drawings in searchable PDF (compatible with Adobe Acrobat version XI). Submit scanned copy via the CMIS.

C. Submit three (3) of each sample, unless specified otherwise.

D. Submit five (5) copies of each manual unless specified otherwise.

2.11 ELECTRONIC SUBMITTALS

A. Provide electronic submittals in searchable PDF (compatible with Adobe Acrobat version XI). All portions of the electronic submittals shall be legible and shall be in full color identical to the original material. Provide manufacturer's literature in original electronic file, if available.

B. Provide one electronic submittal file for each submittal except as noted hereinafter. The electronic submittal file name shall use the following format: submittal number – specification section number - description (e.g.: "001.1-01 33 00-Coating of Widgets"). Providing multiple electronic files for a single submittal (except as noted hereinafter) is not acceptable. The Contractor shall merge multiple files into a single electronic file.

C. For larger submittals containing multiple volumes, submit one electronic file for each hardcopy volume and each electronic submittal file name shall include the corresponding hard copy volume number (e.g. "001.1-01 33 00-Coating of Widgets – Volume 3").

D. Upon acceptance of the electronic submittal (marked as “No Exceptions Taken”, “Make Corrections Noted”, or “Acknowledged Receipt”), submit three (3) hardcopy sets of the submittal. The hardcopies shall be edited with highlighting, addressing/incorporating District review comments. A revised electronic file shall accompany the hardcopy submission and shall match the hard copy submittal page for page including cover transmittal forms, title pages, and blank pages.

E. Exceptions requiring hardcopy material initially, are:

1. O&M processing, per Article 2.6

2. When hardcopy material is originally in a form larger than 11" x 17"; the material shall not only be included in the electronic submittal but shall also be submitted in hardcopy form along with the original electronic submittal required in Paragraphs A and B above. Seven (7) submittal copies of the large materials shall be provided.

F. The Contractor is solely responsible for verifying that the hardcopy submittal and accompanying electronic submittal are identical and address/incorporate prior Engineer review comments.

G. All portions of the electronic submittals shall be provided with text searching capabilities whenever possible. For any document not already in electronic format, the documents shall be scanned using optical character recognition to provide text searching capability in the document.

H. Electronic files shall be submitted to the Engineer via the CMIS – See Section 01 31 23.10.

1. Submittals and RFIs shall be linked to at least one drawing within the File Manager application of the CMIS that provides the most relevant details regarding the subject equipment, material, item, or work. Linking shall be accomplished using the CMIS’s “pin” feature. Submittals and RFIs received without at least one linked drawing or with a linked drawing that is not relevant will be Returned Without Review.

2.12 REVIEW CHECKLISTS

A. Review Checklists are required for some specification sections (when specified in the section) and for all O&M manual submittals.

B. Each submittal requiring review checklists shall comply with the following:

1. Each page of the submittal shall include a unique and sequential page number. The page numbers shall be located in the same general location on each page.

2. Page numbering may include “point numbers” (10.1, 10.2, etc.) to facilitate inserting pages without renumbering an entire submittal. However, all pages in the submittal shall be in numerical order.

3. The review checklists shall be completed in its entirety with accurate page number references for each checklist item. Submittals with inaccurate review checklists may be returned without review for correction.

4. The review checklist shall be inserted at the beginning of the submittal.

PART 3 - EXECUTION

3.1 GENERAL

A. Prepare and use a transmittal form for submittals that includes the following information:

1. *Project name and specification number

2. *Date of submittal

3. *“To: Construction Division, MS #62
East Bay Municipal Utility District
P.O. Box 24055
Oakland, CA 94623-1055
ATTN: Office Engineer”

4. *"From:" Name and address of Contractor

5. Name and address of subcontractor

6. Name and address of supplier

7. Name of manufacturer

8. *Spec. Section, Article Number, Paragraph and Subparagraph Number and/or drawing number and detail references

9. Location of use

10. *Submittal number

11. *Signature and title of transmitter

12. *Original submittal or resubmittal

Note: All transmittals shall include asterisked items as a minimum to be acceptable for review.

B. Use the "Item Number" on the Schedule of the Submittal for the corresponding submittal number. On a resubmittal, add a numerical suffix to the original submittal number. For example, 6.1 indicates the first resubmittal of submittal Number 6.

C. Use a separate transmittal form for each specific item or class of material or equipment within a division for which a submittal is required. Transmittal of a submittal of multiple items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or when items are so functionally related that review of the group as a whole is appropriate.

D. If a submittal contains multiple items, then each item shall be clearly labeled throughout the submittal or indexed in a manner eliminating confusion in identifying how each item relates to the whole. When submittal items have been assigned a “District equipment tag number” in the contract documents, each tag number shall be included throughout the submittal to clearly associate the specific submittal information to specific tag numbers.

E. Stamp or permanently print on each submittal the following certification statement.

"I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated into RFP 2503 is in compliance with the Contract drawings and specifications, can be installed in the allocated spaces, and is submitted for District (record/review).

Certified by _____Date _____"

3.2 COORDINATION OF SUBMITTALS

A. General:

1. Prior to submittal for Engineer's review, use all means necessary to fully coordinate all material, including the following procedures:

a. Determine and verify all field dimensions and conditions, materials, catalog numbers, and similar data.

b. Coordinate as required with all trades and with all public agencies involved.

c. Secure all necessary approvals from agencies having jurisdiction and signify with agency stamp, or other means, that approvals have been secured.

d. Clearly indicate all deviations from the Contract Documents.

B. Grouping of submittals:

1. Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items; the Engineer may reject partial submittals as not complying with the provisions of the Contract Documents.

C. Resubmittals:

1. The Contractor shall include a Comment and Response sheet with each resubmittal. The Comment and Response sheet shall be the first item after the

submittal transmittal form. The Comment and Response sheet shall include each review comment (word for word) from the previous submittal cycle, followed by the Contractor's response clarifying how the comment has been addressed in the resubmittal. All responses shall at a minimum have a general description of what new information in the resubmittal addresses the review comment; and where in the resubmittal this new information can be located (tab number, page number, etc).

2. Resubmittals that do not comply with the requirements set forth in subparagraph C.1 above will be returned to the Contractor without review. The Contractor shall resubmit with an appropriate Comment and Response sheet as specified herein.

3.3 TIMING OF SUBMITTALS

A. Article 3.4 – Timing of Submittals, is not applicable for proposals for "or equal" substitutions made prior to bid opening pursuant to PCC Section 3400 (see Instructions to Bidders, Article 3).

B. General:

1. Make all submittals far enough in advance of scheduled dates of installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery.

2. In scheduling, unless otherwise noted, allow at least twenty (20) work days for the Engineer's review. No time extension will be allowed for the Contract due to time loss in the review process.

3. The following sections' submittals will require longer Engineer review periods due to the submittal size and/or complexity. The fabrication schedule shall allow the minimum number of work days shown for each of the sections listed:

Specification Section	**Minimum Work Days for Submittal Review**
26 05 91 – Power Building and Electrical Equipment	30

3.4 REVIEW BY ENGINEER

A. Acceptance of each submittal by the Engineer will be general only and shall not be construed as:

1. Permitting any departures from the contract requirements.

2. Relieving the Contractor of the responsibility for any errors and omissions in details, dimensions, or of other nature that may exist.

3. Approving departures from additional details or instructions previously furnished by the Engineer.

B. Submittals (excluding manuals and as-built drawings) will be returned to the Contractor marked "No Exceptions Taken", "Make Corrections Noted", "Revise and Resubmit", "Acknowledged Receipt", or “Rejected”, except that in some cases, all copies of a submittal may be returned to the Contractor marked "Returned Without Review". See paragraph 3.5.E for proposals for “or equal” substitutions made prior to bid opening pursuant to PCC Section 3400 (see Instructions To Bidders, Article 3).

1. "No Exceptions Taken" indicates that item covered by the submittal may proceed provided it complies with requirements of the specifications. Final acceptance will depend upon that compliance.

2. "Make Corrections Noted" indicates that item covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the specifications. Final acceptance will depend on that compliance.

3. "Revise and Resubmit" indicates that the Contractor shall not proceed with any phase of the item covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations and requirements of the specifications.

4. "Acknowledged Receipt" indicates that the item is required to be submitted to the Engineer primarily for information or record purposes, and is not subject to Engineer’s review.

5. "Returned Without Review" indicates that the submittal was not reviewed by the Engineer due to the submittal being incomplete, illegible, inadequate, or otherwise failing to conform to the requirements of the specification. Contractor shall prepare a new submittal for this item.

6. “Rejected” indicates that the submittal proposes an action of which the Engineer does not approve, makes an assertion with which the Engineer disagrees, appears to show intent to violate the terms of the Contract, or is otherwise objectionable to the Engineer and is returned to the Contractor with prejudice.

C. Resubmit revised drawings or data as indicated unless otherwise specified.

D. Work requiring the Engineer’s review and acceptance shall not begin until the submittals for that work have been returned as "No Exceptions Taken" or "Make Corrections Noted".

E. Proposals for “or equal” substitutions made prior to bid opening pursuant to PCC Section 3400 (see Instructions To Bidders, Article 3) will be evaluated by the Engineer, and if accepted, bidders will be notified by addenda.

3.5 CHANGES TO ACCEPTED SUBMITTALS

A. A resubmittal is required for any proposed change to a submittal that has been marked "No Exceptions Taken" or "Make Corrections Noted". Changes which require resubmittal include, but are not limited to, drawing revisions, changes in materials and equipment, changes to installation procedures and test data. All resubmittals shall include an explanation of the necessity for the change.

B. Minor corrections to an accepted submittal may be accomplished by submitting a "Corrected Copy".

3.6 O&M MANUAL SUMMARY LIST

A. Table 1 is a summary of equipment/systems that require O&M manuals. Additional O&M manuals might be required when specified elsewhere.

Table 1: O&M Manual Summary (Additional O&M manuals might be required in other Sections)		Number of Hard Copy(ies) to Print
Section	System / Equipment, or Facility	
26 12 19	Pad-Mounted Liquid-Filled Medium Voltage Transformers	5
26 13 16.13	Medium Voltage Load Interrupter Switchgear	5
26 13 16.14	15kV Medium Voltage Sectionalizing Cabinets	5
33 77 01	15kV Medium Voltage Automatic Delayed Transition Transfer Switch	5
26 05 91	Power Building and Electrical Equipment	5

END OF SECTION

SECTION 01 42 19

REFERENCE STANDARDS

GENERAL

Referenced Standards:

The standards referred to, except as modified, shall have full force and effect as though printed in this Specification, and shall be the latest edition or revision thereof in effect on the bid opening date, unless a particular edition or issue is indicated. Copies of these standards are not available from the District. Abbreviations and terms, or pronouns in place of them, shall be interpreted as follows:

AASHTO:	American Association of State Highway and Transportation Officials, Standard Specifications
ACI:	American Concrete Institute, Standards
AEIC:	Association of Edison Illuminating Companies
AISC:	American Institute of Steel Construction, Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings, and the AISC Code of Standard Practice
AITC:	American Institute of Timber Construction
AMCA:	Air Movement and Control Association International, Standards
ANSI:	American National Standards Institute
APA:	American Plywood Association
API:	American Petroleum Institute
APWA:	American Public Works Association, Standard Specifications for Public Works Construction
ASA:	Acoustical Society of America
ASCE:	American Society of Civil Engineers
ASHRAE:	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME:	American Society of Mechanical Engineers
ASTM:	ASTM International, Standards

ASNT:	American Society for Nondestructive Testing Standards
ATIS:	Alliance for Telecommunications Industry Solutions
AWPA:	American Wood-Preservers' Association, Standards
AWS:	American Welding Society
AWWA:	American Water Works Association, Standards
CARB:	California Air Resources Board
CBC:	California Building Code
CCR:	California Code of Regulations
CEC:	California Electrical Code, California Energy Commission
CFR:	Code of Federal Regulations
CISPI:	Cast Iron Soil Pipe Institute, Standards
CMAA:	Crane Manufacturers' Association of America
CRSI:	Concrete Reinforcing Steel Institute, Standards
CSA:	Canadian Standards Association
CSS:	CalTrans Standard Specifications, State of California, Department of Transportation
DOSH:	Division of Occupational Safety and Health, State of California, Department of Industrial Relations
EIA	Electronic Industries Alliance
EUSERC	Electric Utility Service Equipment Requirements Committee
FS:	Federal Specification
GSA:	United States General Services Administration
HI:	Hydraulic Institute
IBC:	International Building Code
ICC:	International Code Council
ICEA:	Insulated Cable Engineers Association
IEC:	International Electrotechnical Commission

IEEE:	Institute of Electrical and Electronic Engineers
ISA:	The International Society of Automation
ISO:	International Organization for Standardization
LIA:	Laser Institute of America
MSS:	Manufacturers Standardization Society
NAAMM:	National Association of Architectural Metal Manufacturers
NACE:	NACE International, Standards
NEC:	National Electrical Code
NECA:	National Electrical Contractors Association
NEMA:	National Electrical Manufacturers' Association, Standards
NERC:	North American Electric Reliability Corporation
NESC:	National Electrical Safety Code
NETA:	International Electrical Testing Association
NFPA:	National Fire Protection Association
NSF:	National Sanitation Foundation/NSF International
OSHA	U.S. Department of Labor, Occupational Safety and Health Administration.
PG&E:	Pacific Gas and Electric Company
PUC:	Public Utilities Commission of the State of California
RIS:	Redwood Inspection Service, Standard Specifications
RUS:	United States Department of Agriculture, Rural Utilities Service
SAMA	Scientific Apparatus Makers Association
SDI:	Steel Door Institute
SEI:	Structural Engineering Institute
SMACNA:	Sheet Metal and Air Conditioning Contractors National Association
SSPC:	Society for Protective Coatings

TIA:	Telecommunications Industry Association
UBC:	Uniform Building Code of the International Conference of Building Officials
UL:	Underwriters Laboratories
WCLIB:	West Coast Lumber Inspection Bureau, Standard Grading and Dressing Rules

END OF SECTION

SECTION 01 43 11

SEISMIC QUALIFICATION AND CERTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. All products to be furnished under this contract shall be designed, constructed, and installed in conformance with the seismic requirements contained in the California Building Code (CBC) as modified below and in the related sections.

B. Related Sections:

1. Section 01 33 00 – Submittal Procedures

2. Section 01 42 19 – Reference Standards

3. Section 01 81 02 – Seismic Design Criteria

4. Section 05 05 19 – Mechanical Anchoring to Concrete and Masonry.

1.2 STRUCTURAL INTEGRITY AND ANCHORAGE

A. Structural integrity of the equipment shall be certified by calculations that demonstrate the adequacy of the equipment housing for seismic forces. These calculations may be based on principles of structural analysis and engineering mechanics, or based on approved shake table tests

B. Provide electrical and mechanical equipment and other non-structural components with proper anchorage to the supporting structures designed to resist seismic forces as specified in Section 01 81 02.

1. Provide anchors as specified in Section 05 05 19 for fastening to concrete and masonry.

C. The equipment and all components listed in Section 26 05 91, 26 12 19, 26 13 16.13, and 26 13 16.14 shall not undergo loss of their intended function after application of the Building Code prescribed seismic forces in Section 13.2 of ASCE 7

D. The equipment covered by IEEE Std 693, as well as Power Building and Electrical Equipment – Section 26 05 91, shall meet or exceed IEEE Std 693 “High seismic level” qualification requirements.

1.3 PROOF OF COMPLIANCE

A. For equipment installed in sites or structures designated as seismic design category C, D, E or F, prepare and submit the following:

1. Statement of seismic qualification, or special seismic certification:

    a. "Statement of Seismic Qualification:" Provide manufacturer's statement that the equipment satisfies the seismic design requirements of the building code indicated in Section 01 42 19, including the requirements of ASCE 7, Chapter 13.

        1) Contractor shall submit for review and approval test data or calculations certified by a Civil or Structural Engineer registered in the State of California to show compliance with the requirements of Article 1.2.

    b. "Special Seismic Certification:" Provide manufacturer's certification of compliance when subjected to shake table testing, including both operability and containment of hazardous materials as appropriate for the unit being tested. The certification shall be prepared in accordance with:

        1) IEEE Std. 693, for equipment listed in paragraph 1.2.C above. This equipment shall meet or exceed IEEE Std 693 "High seismic level" qualification requirements.

        2) ICC-ES AC 156, for equipment not covered in paragraph 1.2.C. This equipment shall meet the "Post-Test Functional Compliance Verification" requirements for "Components with Ip=1.5."

2. Substantiating test data: With seismic qualification and special seismic certification statements, submit results of testing in accordance with applicable standards.

B. Exemptions: A "statement of seismic qualification" and a "special seismic certification" are not required for the following equipment:

1. Temporary or moveable equipment.

2. Equipment anchored to the structure and having a total weight of 20 pounds or less.

3. Distribution equipment anchored to the structure and having a total unit weight of 5 pounds per linear foot, or less.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION

SECTION 01 81 02

SEISMIC DESIGN CRITERIA

PART 1 - GENERAL

1.1 REFERENCES:

A. ASCE 7, American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures.

1.2 RELATED SECTIONS:

A. Related sections:

1. Section 01 42 19 – Reference Standards

2. Section 01 43 11 – Seismic Qualification and Certification

3. Section 05 05 19 – Mechanical Anchoring to Concrete and Masonry

4. Section 26 05 91 – Power Building and Electrical Equipment

5. Section 26 12 19 – Pad-Mounted Liquid-Filled Medium-Voltage Transformers

6. Section 26 13 16.13 - Medium Voltage Load Interrupter Switchgear

7. Section 26 13 16.14 - 15kV Medium Voltage Sectionalizing Cabinets

1.1 SYSTEM DESCRIPTION

A. Design Requirements:

1. Architectural elements, mechanical and electrical components, equipment housings and their attachments, supporting structures, and anchorages shall comply with the requirements of ASCE 7, using the following values:

a. Design spectral acceleration at short periods, S_{DS} = 0.377

b. Design spectral acceleration at long periods, S_{D1} =0.289

c. Seismic Design Category, D

d. Component importance Factor, Ip = 1.50

e. Component amplification factor, ap: In accordance with ASCE 7, Tables 13.5-1 and 13.6-1.

f. Component response modification factor, Rp: In accordance with ASCE 7, Tables 13.5-1 and 13.6-1.

g. Overstrength Factor, Ω: In accordance with ASCE 7, Tables 13.5-1 and 13.6-1 for anchorage in concrete.

2. Do not use friction to resist sliding due to seismic forces.

3. Do not use more than 90 percent of the weight of the mechanical and electrical equipment for designing anchors for resisting overturning due to seismic forces.

4. Do not use more than 90 percent of the weight of the tanks for resisting overturning due to seismic forces.

5. Resist seismic forces through direct bearing on anchors and fasteners. Do not design or provide connections that use friction to resist seismic loads.

6. Anchoring and fastening to concrete and masonry.

a. Use cast-in anchors (anchor bolts or welded studs) whenever possible for anchors at connections that resist seismic forces.

b. Do not use concrete anchors, flush shells, sleeve anchors, screw anchors, powder actuated fasteners, or other types of post-installed anchors unless indicated on the Drawings or accepted in writing by the Engineer.

1.2 SEISMIC QUALIFICATION AND CERTIFICATION

B. The equipment and all components listed in this specification shall not undergo loss of their intended function after application of the Code prescribed seismic forces as specified in Section 01 43 11.

1.3 SUBMITTALS

A. Shop drawings and calculations: Complete shop drawings and seismic calculations.

B. Seismic Qualification and Certification shall be verified by an approved calculation that demonstrates the adequacy of the system for seismic forces. This calculation may be based on principles of structural analysis and engineering mechanics, or based on similarity to approved shake table tests as specified in Section 01 43 11.

C. Contractor shall submit for review and approval test data or calculations signed and sealed by a Civil or Structural Engineer registered in the State of California to show compliance with the above requirements.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION

SECTION 01 81 04

WIND DESIGN CRITERIA

PART 1 - GENERAL

1.1 SUMMARY

A. Related sections:

1. Section 01 42 19 – Reference Standards

2. Section 05 05 19 – Mechanical Anchoring and Fastening to Concrete and Masonry

1.2 System Description

A. Design Requirements:

1. Building code criteria: Design for wind in accordance with building code as specified in Section 01 42 19:

a. Risk category: IV

b. Basic wind speed: 105 miles per hour

c. Exposure category: C

d. Topographic factor, Kzt: 1.0

1.2 Wind importance factor, Iw: 1.00

2. Resist wind forces through direct bearing on anchors and fasteners. Do not design or provide connections that use friction to resist wind loads.

3. Anchoring and fastening to concrete and masonry

1.3 Provide anchors specified in Section 05 05 19.

1.4 Use cast-in and built-in anchors (anchor bolts and welded studs) whenever possible for anchors at connections that resist wind forces.

1.5 Do not use concrete anchors, flush shells, sleeve anchors, flush shells, screw anchors, powder actuated fasteners, or other types of post-installed anchors unless indicated on the Drawings or accepted in writing by the Engineer.

1.3 SUBMITTALS

A. Shop drawings and calculations: Complete shop drawings and wind design calculations.

1. Calculations for wind design shall be signed and stamped by a Civil or Structural Engineer licensed in the State of California.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION

SECTION 03 21 17

EPOXY BONDING REINFORCING BARS AND ALL THREAD RODS IN CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Bonding reinforcing bars and all thread rods in concrete using epoxy adhesive.

B. Related sections:

1. Section 01 81 02 – Seismic Design Criteria

1.2 REFERENCES

A. American National Standards Institute (ANSI)

1. B212.15 – Carbide Tipped Masonry Drills and Blanks for Carbide Tipped Masonry Drills

B. ASTM international (ASTM)

1. C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete

C. ICC Evaluation Service, Inc. (ICC-ES)

1. AC308 – Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements

D. Society for Protective Coatings (SSPC)

1. Surface Preparation (SP)

a. SP 1 – Solvent Cleaning

1.3 SUBMITTALS

A. Product Data: Furnish technical data for epoxy adhesives, including:

1. Installation instructions

2. Independent laboratory test results

3. Handling and storage instructions

B. Quality control submittals

1. Epoxy manufacturer's past project experience data on at least 3 similar projects supplied with proposed products within the last 3 years

2. Special inspection: Provide detailed step-by-step instructions for the special inspection procedure in accordance with the building code as specified in Section 01 42 19.

3. ICC Evaluation Service, Inc., Evaluation Services Report in compliance with the AC308-Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements

4. Batch test reports for each batch of product delivered to site. Provide manufacturer's written certification that each batch delivered meets these Specifications, the intended uses on project, including capability to bond to damp concrete surfaces. Certification shall include batch test results for each product.

5. Epoxy manufacturer's written letter of certification identifying Contractor's employees qualified for operation of manufacturer's equipment, certified for installation of products, and trained through jobsite instruction conducted by manufacturer

6. Copy of epoxy manufacturer's equipment service and repair manuals for each type of equipment delivered to project site]

1.4 DELIVERY, STORAGE, AND HANDLING

A. Storage and protection

1. Store epoxy components on pallets or shelving in a covered-storage area.

2. Control temperature above 60 degrees Fahrenheit and dispose of product if shelf life has expired.

3. If stored at temperatures below 60 degrees Fahrenheit, test components prior to use to determine if they still meet specified requirements.

1.5 PROJECT CONDITIONS

A. Seismic design parameters: See Section 01 81 02.

PART 2 - PRODUCTS

2.1 GENERAL

A. Like items of materials: Use end products of one manufacturer in order to achieve structural compatibility and singular responsibility.

2.2 EPOXY ADHESIVE FOR SELF-CONTAINED CARTRIDGE SYSTEM

A. Epoxy adhesive shall have a current ICC Evaluation Service report documenting acceptance under AC308 for use with cracked concrete and for the seismic design categories specified in Section 01 81 02.

B. Materials

1. In accordance with ASTM C881, Type IV, Grade 3, Class B or C depending on site conditions

2. 2-component, 100 percent solids, insensitive to moisture, and gray in color

3. Cure temperature, pot life, and workability: Compatible with intended use and environmental conditions

C. Packaging

1. Furnished in side-by-side cartridges with resin and hardener components isolated until mixing through manufacturer’s static mixing nozzle. Nozzle shall be designed to thoroughly blend the components for injection from the nozzle directly into prepared hole.

2. Container markings: Include manufacturer's name, product name, batch number, mix ratio by volume, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.

D. Manufacturers:

1. Hilti, Inc., Tulsa, OK: HIT-HY 200

2. Simpson Strong-Tie Company, Inc., Pleasanton, CA: SET-3G.

3. Or equal as approved by the Engineer

2.3 ALL THREAD RODS

A. Materials: As specified in Section 05 05 19

PART 3 - EXECUTION

3.1 GENERAL

A. Provide epoxy adhesive packaged as follows:

1. Disposable, self-contained cartridge system capable of dispensing both epoxy components in the proper mixing ratio, and fit into a manually or pneumatically operated caulking gun.

2. Dispense components through a mixing nozzle that thoroughly mixes components.

B. For bulk adhesives dispensed with a mixing and metering pump system:

1. Dispensing, metering, or mixing epoxy adhesive components: Use portable, automatic metering, and mixing device or machine capable of maintaining prescribed mix ratio within deviation of 5 percent or less, by volume.

2. Dispense epoxy components through specially designed static mixing nozzle that thoroughly mixes epoxy components and places mixed epoxy at base of predrilled hole.

3. Mixing nozzles: Disposable and manufactured in several sizes to accommodate different size and depth of holes.

3.2 HOLE SIZING AND INSTALLATION

A. Drilling holes

1. Determine location of reinforcing bars or other obstructions with a non-destructive indicator device, and mark locations with construction crayon on the surface of the concrete.

2. Do not damage or cut existing reinforcing bars, electrical conduits, or other items embedded in the existing concrete without acceptance by Engineer.

B. Hole drilling equipment

1. Electric or pneumatic rotary impact type with medium or light impact

2. Drill bits: Carbide-tipped in accordance with ANSI B212-15 unless otherwise recommended by the manufacturer or required as a “condition of use” in the ICC Evaluation Report submitted

3. Hollow drill bits with flushing air systems are preferred. Air supplied to hollow drill bits shall be free of oil, water, or other contaminants that will reduce bond.

4. Where edge distances are less than 2 inches, use lighter impact equipment to prevent microcracking and concrete spalling during drilling process.

C. Hole diameter: Reinforcing bar diameter or all thread rod diameter plus 1/8-inch

D. Obstructions in drill path

1. If an existing reinforcing bar or other obstruction is hit while drilling hole, stop drilling hole and fill the hole with drypack mortar. Relocate the hole to miss the obstruction and drill another hole. Repeat the above until the hole has been drilled to the required depth.

2. Avoid drilling an excessive number of holes in an area of a structural member, which would excessively weaken the structural member and endanger the stability of the structure. Drypack holes which hit obstructions and allow drypack to reach strength equal to the existing concrete before drilling adjacent holes. Epoxy grout may be substituted for drypack when acceptable to Engineer.

3. When existing reinforcing steel is encountered during drilling and when acceptable to Engineer, enlarge the hole by 1/8-inch, core through the existing reinforcing steel at the larger diameter, and resume drilling at original hole diameter.

4. Bent bar reinforcing bars: Where edge distances are critical, and striking reinforcing steel is likely, and if acceptable to Engineer, drill hole at 10-degree angle or less from axis of reinforcing bar or all thread rod being installed.

E. Install reinforcing bars and all thread rods to depth, spacings, and locations as indicated on the Drawings.

1. Do not install epoxy bonded all-thread rods or reinforcing bars in overhead applications.

F. Cleaning holes

1. Insert long air nozzle into hole and blow out loose dust. Use compressed air that is free of oil, water, or other contaminants that will reduce bond.

2. Use a stiff bristle brush to vigorously brush hole to dislodge compacted drilling dust.

3. Repeat step 1.

4. Repeat above steps as required to remove drilling dust or other material that will reduce bond. The hole shall be clean and dry.

G. Cleaning reinforcing bars and all thread rods

1. Solvent clean reinforcing bar and all thread rods over the embedment length in accordance with SSPC SP 1 Solvent Cleaning. Provide an oil and grease free surface to promote bonding of adhesive to steel.

2. Clean reinforcing bars and all thread rods over embedment length to bare metal. The reinforcing bars and all thread rods shall be free of oil, grease, paint, dirt, mill scale, rust, or other coatings that will reduce bond.

H. Filling hole with epoxy

1. Fill hole with epoxy before inserting the reinforcing bar or all thread rod. Fill hole with epoxy starting from bottom of hole. Fill hole without creating air voids.

2. Fill hole with sufficient epoxy so that excess epoxy is extruded out of the hole when the reinforcing bar or all thread rod is inserted into the hole.

3. Do not install epoxy prior to receiving epoxy manufacturer's onsite training.

3.3 MANUFACTURERS' SERVICES

A. Furnish manufacturer's representative to conduct jobsite training for proper installation, handling, and storage of epoxy, for personnel who will perform actual installation. Engineer may attend training sessions.

3.4 FIELD QUALITY CONTROL

A. The District reserves the right to hire a testing laboratory to test the capacities of the anchors. Testing laboratory hired by the District will:

1. Review epoxy manufacturer’s recommended special inspection procedures.

2. Periodically inspect hole-drilling operations for conformance with Contract Documents and manufacturer’s recommendations.

3. Certify in writing to the Engineer that depth and location of holes conform to the requirements in the Contract Documents prior to placement of epoxy.

4. Continuously inspect placement of epoxy and reinforcing bars installation.

B. Testing laboratory will proof test reinforcing bars in tension after curing:

1. Test locations will be at laboratory’s discretion, unless otherwise directed by the Engineer, subject to the following minimum requirements:

a. For each reinforcing bar type, perform the minimum number of proof tests indicated on the Drawings.

b. Proof test each reinforcing bar type to failure.

c. Perform proof tests at locations similar to where reinforcing bars will be installed.

2. Load at failure shall be greater than proof test load, indicated on the Drawings, for each reinforcing bar type.

3. No further placement of reinforcing bar type shall occur until proof tests are passed.

4. Should any reinforcing bar type fail to meet these criteria, notify the Engineer immediately. Retest additional reinforcing bars at the direction of the Engineer.

C. Quality control testing: Testing Laboratory will provide a quality control testing program for reinforcing bars bonded in holes drilled in concrete using epoxy:

1. Test locations and frequency will be at laboratory's discretion, unless otherwise directed by the Engineer, subject to the following minimum requirements:

a. Perform at least the minimum percentage of quality control tests specified in Table A for each reinforcing bar type.

b. Test a minimum of 3 reinforcing bars for each reinforcing bar type.

c. Perform tests at different locations and conditions to obtain a representative sample for each reinforcing bar type.

2. Quality control tests shall be tension tests:

a. Test in tension to quality control test loads specified in Table A.

b. Quality control test loads may be modified by the Engineer based on the proof test load tests.

c. Maintain quality control test load for a minimum of 5 minutes.

d. There shall be no loosening or movement of the reinforcing bar out of the hole and no cracking or spalling of the concrete in which the reinforcing bar is set.

3. For reinforcing bar failing to meet these criteria, increase quantity of quality control testing of similar reinforcing bars by 100 percent. If other failures occur during additional testing, test all similar reinforcing bars.

TABLE A

SAMPLE TESTING SCHEDULE

Group No.	Bar Size	Bar Spacing (inch)	Bar Embed Depth (inch)	Quality Control Test Load (kips)	Freq. of Quality Control Tests	No. of Proof Tests	Section or Detail	Sheet No.	Comments
1									
2									
3									
4									
5									

D. The Contractor shall replace failed reinforcing bars at the direction of the Engineer at no additional cost.

E. The Contractor shall pay for increased quality control testing and reinforcing bar replacement caused by reinforcing bar failure.

F. For reinforcing bars that break off above the surface of the concrete or less than 2 inches below the surface of the concrete, cut off 2 inches below the surface of the concrete and repair concrete.

G. The concrete shall be repaired by the Contractor where the bars pull out of the hole or break below the surface of the concrete and spall the concrete at no additional cost.

END OF SECTION

SECTION 05 05 19

MECHANICAL ANCHORING TO CONCRETE AND MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Cast-in anchors:

a. Anchor bolts

b. Anchor rods

2. Post-installed anchors – Adhesive

3. Post-installed anchors – Mechanical

a. Concrete anchors

b. Screw anchors

4. Undercut concrete anchors.

B. Appurtenances for anchoring and fastening

1. Anchor bolt sleeves

2. Isolating sleeves and washers

C. Thread coating for threaded stainless steel fasteners

D. Related sections:

1. Section 01 33 00 – Submittals

2. Section 01 42 19 – Reference Standards

3. Section 01 81 02 – Seismic Design Criteria

4. Section 01 81 04 – Wind Design Criteria

1.2 REFERENCES

A. American Concrete Institute (ACI)

1. 355.2 – Qualification of Post-Installed Mechanical Anchors in Concrete & Commentary

B. American National Standards Institute (ANSI)

1. B212.15 – Cutting Tools - Carbide-tipped Masonry Drills and Blanks for Carbide-tipped Masonry Drills

C. American Welding Society (AWS)

1. D1.1 – Structural Welding Code - Steel

2. D1.6 – Structural Welding Code - Stainless Steel

D. ASTM International (ASTM)

1. A29 – Standard Specification for Steel Bars, Carbon and Alloy, Hot-Wrought

2. A36 – Standard Specification for Carbon Structural Steel

3. A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

4. A108 – Standard Specification for Steel Bars, Carbon and Alloy, Cold Finished

5. A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

6. A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

7. A193 – Standard Specification for Alloy Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications

8. A194 – Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both

9. A240 – Standard Specification for Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

10. A308 – Standard Specification for Steel Sheet, Terne (Lead-Tin Alloy) Coated by the Hot-Dip Process

11. A496 – Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement

12. A563 – Standard Specification for Carbon and Alloy Steel Nuts

13. B633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel

14. B695 – Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

15. E488 – Standard Test Methods for Strength of Anchors in Concrete Elements

16. F436 – Standard Specification for Hardened Steel Washers

17. F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength

E. International Code Council Evaluation Service, Inc. (ICC-ES):

1. AC01 – Acceptance Criteria for Expansion Anchors in Masonry Elements

2. AC106 – Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry

3. AC193 – Acceptance Criteria for Mechanical Anchors in Concrete Elements

1.3 DEFINITIONS

A. Built-in anchor: Headed bolt or assembly installed in position before filling surrounding masonry units with grout.

B. Cast-in anchor: Headed bolt or assembly installed in position before placing plastic concrete around.

C. Overhead installations: Fasteners installed on overhead surfaces where the longitudinal axis of the fastener is more than 60-degrees above a horizontal line so that the fastener resists sustained tension loads.

D. Passivation: Chemical treatment of stainless steel with a mild oxidant for the purpose of enhancing the spontaneous formation of the steel's protective passive film.

E. Post-installed anchor: Fastener or assembly installed in hardened concrete or finished masonry construction, typically by drilling into the structure and inserting a steel anchor assembly.

F. Terms relating to structures or building environments as used with reference to anchors and fasteners:

1. Corrosive locations: Describes interior and exterior locations as follows:

a. Locations used for delivery, storage, transfer, or containment (including spill containment) of chemicals used for plant treatment processes.

2. Wet and moist locations: Describes locations, other than "corrosive locations," that are continuously or periodically submerged, are immediately above liquid

containment structures, or are subject to frequent wetting, splashing, or wash down. Includes:

a. Exterior portions of buildings and structures.

b. Liquid-containing structures:

1) Locations at and below the maximum operating liquid surface elevation.

2) Locations above the maximum operating liquid surface elevation and:

a) Below the top of the walls containing the liquid;

b) At the inside faces and underside surfaces of a structure enclosing or spanning over the liquid (including walls, roofs, slabs, beams or walkways enclosing the open top of the structure).

c. Liquid handling equipment:

1) Bases of pumps and other equipment that handles liquids.

d. Indoor locations exposed to moisture, splashing or routine wash down during normal operations, including floors with slopes toward drains or gutters.

e. Other locations indicated on the Drawings.

3. Other locations:

a. Interior dry areas where the surfaces are not exposed to moisture or humidity in excess of typical local environmental conditions.

1.4 SUBMITTALS

A. General:

1. Submit as specified in Section 01 33 00

2. Submit information listed for each type of anchor or fastener to be used.

B. Submittals:

1. Product data:

a. Cast-in anchors

1) Manufacturer's data including catalog cuts showing anchor sizes and configuration, materials, and finishes.

b. Post-installed anchors

1) For each anchor type, manufacturer's data including catalog cuts showing anchor sizes and construction, materials and finishes, and load ratings.

2. Samples:

a. Samples of each type of anchor, including representative diameters and lengths, if requested by the Engineer.

3. Certificates:

a. Cast-in anchors:

1) Mill certificates for steel anchors that will be supplied to the site.

b. Post-installed anchors:

1) Manufacturer's statement or certified test reports demonstrating that anchors that will be supplied to the site comply with the materials properties specified.

4. Test reports:

a. Post-installed anchors: For each anchor type used for the Work:

1) Current ICC-ES Report (ESR), or equivalent acceptable to the Engineer demonstrating:

a) Acceptance of that anchor for use under the building code specified in Section 01 42 19.

b) That testing of the concrete anchor included the simulated seismic tension and shear tests of AC193, and that the anchor is accepted for use in Seismic Design Categories C, D, E, or F and with cracked concrete.

5. Manufacturer's instructions.

a. Requirements for storage and handling.

b. Recommended installation procedures including details on drilling, hole size (diameter and depth), hole cleaning and preparation procedures, anchor insertion, and anchor tightening.

c. Requirements for inspection or observation during installation.

6. Qualification statements.

a. Post-installed anchors: Installer qualifications:

1) Submit list of personnel performing installations and include date of manufacturer's training for each.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Post installed anchors shall be in accordance with building code specified in Section 01 42 19.

B. Special inspection of cast-in anchor and post-installed anchors shall be performed as required per California Building Code and specified this Section.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver post-installed anchors in manufacturer's standard packaging with labels visible and intact. Include manufacturer's installation instructions.

B. Handle and store anchors and fasteners in accordance with manufacturer's recommendations and as required to prevent damage.

C. Protect anchors from weather and moisture until installation.

1.7 PROJECT CONDITIONS

A. As specified in Section 01 81 02.

B. Post-installed anchors shall be installed in concrete having a minimum age of 21 days at time of anchor installation

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. General:

1. Furnish threaded fasteners with flat washers and hex nuts fabricated from materials corresponding to the material used for threaded portion of the anchor.

a. Cast-in anchors: Provide flat washers and nuts as listed in the ASTM standard for the anchor materials specified.

b. Post-installed anchors: Provide flat washers and nuts supplied for that product by the manufacturer of each anchor.

2. Size of anchors and fasteners, including diameter and length or minimum effective embedment depth: As indicated on the Drawings or as specified in this Section. In the event of conflicts, contact Engineer for clarification.

3. Where anchors and connections are not specifically indicated on the Drawings or specified, their material, size and form shall be equivalent in quality and workmanship to items specified.

B. Materials

1. Provide and install anchors of materials as in this Section.

2.2 CAST-IN ANCHORS

A. Anchor bolts:

1. Description:

a. Straight steel rod having one end with integrally forged head, and one threaded end. Embedded into concrete with the headed end cast into concrete at the effective embedment depth indicated on the Drawings or specified, and with the threaded end left to project clear of concrete face as required for the connection to be made.

b. Furnish anchor bolts with heavy hex forged head or equivalent acceptable to Engineer.

1) Rods or bars with angle bend for embedment in concrete (i.e.: "L" or "J" shaped anchor bolts) are not permitted in the Work.

2. Materials:

a. Type 316 stainless steel

1) Surfaces descaled, pickled, and passivated in accordance with ASTM A308

2) Bolts: ASTM A193, Grade B8M, Class 1, heavy hex

3) Nuts: ASTM A194, Grade 8M, heavy hex

4) Washers: Type 316 stainless steel

b. Type 304 stainless steel.

1) Surfaces descaled, pickled, and passivated in accordance with ASTM A308.

2) Bolts: ASTM A193, Grade B8, Class 1, heavy hex.

3) Nuts: ASTM A194, Grade 8, heavy hex.

4) Washers: Type 304 stainless steel.

c. Galvanized steel:

1) Hot-dip galvanized coating in accordance with ASTM A153.

2) Bolt: ASTM F1554, Grade 36, heavy hex

3) Nuts: ASTM A563, Grade A, heavy hex

4) Washers: ASTM F436

B. Anchor rods:

1. Description: Straight steel rod having threads on each end [or continuously threaded from end to end]. One threaded end is fitted with nuts or plates and embedded in concrete to the effective depth indicated on the Drawings, leaving the opposite threaded end to project clear of the concrete face as required for the connection to be made at that location.

2. Materials:

a. Stainless steel: Type 316

1) Surfaces descaled, pickled, and passivated in accordance with ASTM A308.

2) Rod: ASTM A193, Grade B8M, Class 1

3) Nuts: ASTM A194, Grade 8M

4) Washers: Type 316 stainless steel

5) Plates (embedded): ASTM A240

b. Stainless steel: Type 304.

1) Surfaces descaled, pickled, and passivated in accordance with ASTM A308

2) Rod: ASTM A193, Grade B8, Class 1

3) Nuts: ASTM A194, Grade 8

4) Washers: Type 304 stainless steel

5) Plates (embedded): ASTM A240]

c. Galvanized steel

1) Hot-dip galvanized with coating in accordance with ASTM A153

2) Rod: ASTM F1554, [Grade 36]

3) Nuts: ASTM A563, [Grade A]

4) Washers: ASTM F436

5) Plates (embedded): ASTM A36]

C. Concrete insert: Ductile embed.

1. Description: 1-piece, integrally hot forged sleeve for embedment in concrete. Provided with flange for nailing to forms and female threaded coupler at the exposed concrete face, and washer-faced hex headed foot to resist pullout from concrete at the embedded end.

2. Manufacturers:

a. Dayton Superior: F-54 Ductile Embed Insert

b. Or equal as approved by the Engineer

3. Materials:

a. Galvanized steel:

1) Hot-dip galvanized coating in accordance with ASTM A123 or A153 [where indicated on the Drawings]

b. Steel: ASTM A29 hot rolled, Grade 1045

D. Steel plates or shapes for fabrications including assemblies with welded studs or deformed bar anchors:

1. Stainless steel: Type 316L or Type 304L

a. Plates (embedded): ASTM A240

2. Galvanized steel:

a. Hot dip galvanized in accordance with Section 05 05 14

b. Steel: ASTM A36

2.3 POST-INSTALLED ANCHORS – ADHESIVE

A. Description: Adhesive Anchors or Epoxy Anchors Anchor consisting of all-thread rods embedded in concrete and bonded using an epoxy on one end and bolted to steel members or plates to provide anchorage or steel connections to concrete.

B. Epoxy bonding of reinforcing bars, all thread rods, and threaded inserts in concrete: As specified in Section 03 21 17.

2.4 POST-INSTALLED ANCHORS – MECHANICAL

A. General:

1. Post-installed anchors used for the Work shall hold a current ICC Evaluation Service Report demonstrating acceptance for use under the building code specified in Section 01 42 19. Reports prepared by other recognized evaluation agencies may be submitted for consideration if acceptable to the Engineer.

a. Conditions of use: The acceptance report shall indicate acceptance of the product for use under the following conditions:

1) In regions of concrete where cracking has occurred or may occur.

2) To resist short-term loads due to wind forces.

3) To resist short-term loading due to seismic forces for the Seismic Design Category of the structure where the product will be used.

2. Substitutions: When requesting product substitutions, submit calculations, indicating the diameter, effective embedment depth and spacing of the proposed anchors, and demonstrating that the substituted product will provide load resistance that is equal to or greater than that provided by the anchors listed in this Section.

a. Calculations shall be prepared by and shall bear the signature and sealed of a Civil or Structural Engineer licensed in the State of California.

b. Decisions regarding the acceptability of proposed substitutions shall be at the discretion of the Engineer.

B. Concrete anchors:

1. Description. Concrete Anchor or Expansion Anchor or Wedge Anchor is a post-installed anchor assembly consisting of a threaded stud and a surrounding wedge expansion sleeve that is forced outward by torquing the center stud to transfer loads from the stud to the concrete through bearing, friction, or both. (Sometimes referred to as “expansion anchors” or “wedge anchors.”)

a. Do not use slug-in, lead cinch, and similar systems relying on deformation of lead alloy or similar materials to develop holding power.

2. Concrete anchors for anchorage to concrete:

    a. Acceptance criteria. Concrete anchors shall have a current ICC-ES Report demonstrating that the anchors have been tested and qualified for performance in both cracked and un-cracked concrete, and for short-term loading due to wind and seismic forces for Seismic Design Categories A through F in accordance with ACI 355.2 and with ICC-ES AC193 (including all mandatory tests and optional tests for seismic tension and shear in cracked concrete).

    b. Acceptable manufacturers:

        1) Hilti: Kwik Bolt TZ2 Expansion Anchor

        2) DeWalt: PowerStud+ SD2

        3) Simpson Strong-Tie®: Strong Bolt 2 Wedge Anchor

        4) Or equal as approved by the Engineer

    c. Materials. Integrally threaded stud, wedge, washer and nut:

        1) Stainless steel: Type 316

            a) Type 304 stainless steel acceptable for use at wet and moist locations when accepted in writing by the Engineer

C. Screw anchors:

1. Description: Post-installed concrete anchor that develops tensile strength from mechanical interlock provided by creating a helical “key” that is larger than the diameter of the bolt itself along the length of the anchor shaft.

2. Screw anchors for anchorage to concrete:

    a. Acceptance criteria: Screw anchors shall have a current ICC-ES Report demonstrating that the anchors have been tested and qualified for performance in both cracked and un-cracked concrete, and for short term loading due to wind and seismic forces for Seismic Design Categories A through F in accordance with ACI 355.2 and ICC ES AC193 (including all mandatory tests and optional tests for seismic tension and shear in cracked concrete).

    b. Acceptable manufacturers:

        1) Hilti: Hex head: HUS-EZ Screw Anchor

            a) With internally threaded head: HUS-EZ I Hanger Anchor

        2) Dewalt: Wedge-Bolt+

a) With internally threaded head: Vertigo+ Rod Hanging System

3) Simpson strong-tie: Titen HD Screw Anchor

a) With internally threaded head: Titen HD Rod Hanger

4) Or equal as approved by the Engineer

c. Materials:

1) Galvanized steel: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5); or equal

2.5 APPURTENANCES FOR ANCHORING AND FASTENING

A. Thread coating. For use with threaded stainless steel fasteners.

1. Acceptable manufacturers:

a. Never Seez Compound Corporation, Never-Seez

b. Oil Research, Inc., WLR No. 111

c. Or equal as approved by the Engineer

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine work in place to verify that it is satisfactory to receive the work of this Section. If unsatisfactory conditions exist, do not begin this work until such conditions have been corrected.

3.2 INSTALLATION: GENERAL

A. Where anchors and fasteners are not specifically indicated on the Drawings or specified, make attachments with materials specified in this Section.

B. Substitution of anchor types:

1. Post-installed anchors may not be used as an alternative to cast-in/built-in anchors at locations where the latter are indicated on the Drawings.

2. Cast-in/built-in anchors may be used as an alternative to post-installed mechanical anchors at locations where the latter are indicated on the Drawings.

C. Protect products from damage during installation. Take special care to protect threads and threaded ends.

D. Accurately locate and position anchors and fasteners.

1. Unless otherwise indicated on the Drawings, install anchors perpendicular to the surfaces from which they project.

2. Install anchors so that at least 2 threads, but not more than 1/2-inch of threaded rod, projects past the top nut.

E. Interface with other products:

1. Prior to installing nuts, coat threads of stainless steel fasteners with thread coating to prevent galling of threads.

3.3 INSTALLATION: CAST-IN ANCHORS

A. General

1. Accurately locate cast-in and built-in anchors.

a. Provide anchor setting templates to locate anchor bolts and anchor rods. Secure templates to formwork.

b. Brace or tie off embedments as necessary to prevent displacement during placement of plastic concrete or of surrounding masonry construction.

c. Position and tie cast-in and built-in anchors in place before beginning placement of concrete or grout. Do not “stab” anchors into plastic concrete, mortar, or grout.

d. Do not allow cast-in anchors to touch reinforcing steel. Where cast-in anchors are within 1/4-inch of reinforcing steel, isolate the metals by wrapping the anchors with a minimum of 4 wraps of 10-mil polyvinyl chloride tape in area adjacent to reinforcing steel.

2. For anchoring at machinery bases subject to vibration, use 2 nuts, with 1 serving as a locknut.

3. Where anchor bolts or anchor rods are indicated on the Drawings as being for future use, thoroughly coat exposed surfaces that project from concrete or masonry with non-oxidizing wax. Turn nuts down full length of the threads, and neatly wrap the exposed thread and nut with a minimum of 4 wraps of 10-mil waterproof polyvinyl tape.

B. Anchor bolts:

1. Minimum effective embedment: 10-bolt diameters, unless a longer embedment is indicated on the Drawings.

C. Anchor rods

1. Install as specified for anchor bolts.

3.4 INSTALLATION: POST-INSTALLED ADHESIVE ANCHORS.

A. Epoxy and acrylic adhesive bonding of reinforcing bars, all thread rods, and internally threaded inserts in concrete: As specified in Section 03 21 17.

3.5 INSTALLATION: POST-INSTALLED MECHANICAL ANCHORS.

A. General:

1. Install anchors in accordance with the manufacturer's instructions, ACI 355.2, the anchor's ICC-ES Report. Where conflict exists between the ICC-ES Report and the requirements in this Section, the requirements of the ICC-ES Report shall control.

2. Where anchor manufacturer recommends the use of special tools and/or specific drill bits for installation, provide and use such tools.

3. After anchors have been positioned and inserted into concrete or masonry, do not:

a. Remove and reuse/reinstall anchors.

b. Loosen or remove bolts or studs.

B. Holes drilled into concrete and masonry.

1. Do not drill holes in concrete or masonry until the material has achieved its minimum specified compression strength (f 'c or f 'm).

2. Accurately locate holes.

a. Before drilling holes, use a reinforcing bar locator to identify the position of all reinforcing steel, conduit, and other embedded items within a 6 - inch radius of each proposed hole.

b. If the hole depth exceeds the range of detection for the rebar locator, the Engineer may require radiographs of the area designated for investigation before drilling commences.

3. Exercise care to avoid damaging existing reinforcement and other items embedded in concrete and masonry.

a. If embedments are encountered during drilling, immediately stop work and notify the Engineer. Await Engineer's instructions before proceeding.

4. Unless otherwise indicated on the Drawings, drill holes perpendicular to the concrete surface into which they are placed.

5. Drill using anchor manufacturer's recommended equipment and procedures.

a. Unless otherwise recommended by the manufacturer, drill in accordance with the following:

1) Drilling equipment: Electric or pneumatic rotary type with light or medium impact. Where edge distances are less than 2 inches, use lighter impact equipment to prevent micro-cracking and concrete spalling during drilling process.

2) Drill bits: Carbide-tipped in accordance with ANSI B212-15. Hollow drills with flushing air systems are preferred.

6. Drill holes at manufacture's recommended diameter and to depth required to provide the effective embedment indicated.

7. Clean and prepare holes as recommended by the manufacturer and as required by the ICC-ES Report for that anchor.

a. Unless otherwise recommended by anchor manufacturer, remove dust and debris using brushes and clean compressed air.

b. Repeat cleaning process as required by the manufacturer's installation instructions.

c. When cleaning holes for stainless steel anchors, use only stainless steel or non-metallic brushes.

C. Insert and tighten (or torque) anchors in full compliance with the manufacturer's installation instructions.

1. Once anchor is tightened (torque), do not attempt to loosen or remove its bolt or stud.

D. Concrete anchors: Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Concrete Anchors			
Nominal Diameter	Minimum Effective Embedment Length		Minimum required member thickness
	In concrete	In grouted masonry	
3/8 inch	2-1/2 inch	2-5/8 inch	8 inch
1/2 inch	3-1/2 inch	3-1/2 inch	8 inch
5/8 inch	4-1/2 inch	4-1/2 inch	10 inch
3/4 inch	5 inch	5-1/4 inch	12 inch

E. Screw anchors:

1. Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Screw Anchors			
Nominal Diameter	Minimum Effective Embedment Length		Minimum Member Thickness
	In concrete	In grouted masonry	
3/8 inch	2-1/2 inch	3-1/4 inch	8 inch
1/2 inch	3-1/4 inch	4-1/2 inch	8 inch
5/8 inch	4 inch	5 inch	10 inch
3/4 inch	5-1/2 inch	6-1/4 inch	12 inch

2. Install screw anchors using equipment and methods recommended by the manufacturer. Continue driving into hole until the washer head is flush against the item being fastened.

3.6 FIELD QUALITY CONTROL

A. Contractor shall provide quality control over the Work of this Section as specified herein.

1. Expenses associated with work described by the following paragraphs shall be paid by the Contractor.

B. Post-installed anchors:

1. Review anchor manufacturer's installation instructions and requirements of the Evaluation Service Report (hereafter referred to as "installation documents") for each anchor type and material.

2. Observe hole-drilling and cleaning operations for conformance with the installation documents.

3. Certify in writing to the Engineer that the depth and location of anchor holes, and the torque applied for setting the anchors conforms to the requirements of the installation documents.

C. Field-testing Load tests on installed anchors.

1. In addition to special inspections for field quality assurance, the Engineer may select up to 25 percent of each type and size of cast-in anchor, built-in anchor, and post-installed mechanical anchor for proof-load testing (pullout or shear). Tests will be non-destructive whenever possible.

2. Testing procedures and acceptance criteria are described under Field Quality Assurance.

3. Cooperate in providing access and anchors for testing.

3.7 FIELD QUALITY ASSURANCE

A. The Engineer will provide on-site observation and field quality assurance for the Work of this Section.

1. Expenses associated with work described by the following paragraphs will be paid for by the District.

B. Field inspections and special inspections:

1. Work will be observed during construction for conformance to the approved Contract Documents, the accepted submittals, and manufacturer's installation instructions for the products used.

C. Special inspections: Anchors cast into concrete and built into masonry.

1. Special inspection will be performed during positioning of anchors and placement of concrete or masonry (including mortar and grout) around the following anchors:

a. Anchor rods

2. During placement, continuous special inspection will be performed at each anchor location to verify that the following elements of the installation conform to the requirements of the Contract Documents.

a. Anchor:

1) Type and dimensions

2) Material: Galvanized steel, Type 304 stainless steel, or Type 316 stainless steel as specified in this Section or indicated on the Drawings

3) Positioning: Spacing, edge distances, effective embedment, and projection beyond the surface of the construction

4) Reinforcement at anchor: Presence, positioning, and size of additional reinforcement at anchors indicated on the Drawings

3. Following hardening and curing of the concrete or masonry surrounding the anchors, periodic special inspection will be performed to observe and confirm the following:

a. Base material (concrete or grouted masonry):

1) Solid and dense concrete or grouted masonry material within required distances surrounding anchor.

2) Material encapsulating embedment is dense and well-consolidated.

D. Special Inspections: Post-installed mechanical anchors placed in hardened concrete and in grouted masonry.

1. Special inspection will be performed during installation of the following anchors:

a. Concrete anchors

b. Screw anchors

2. Unless otherwise noted, periodic special inspection will be performed during positioning, drilling, placing, and torquing of anchors.

a. Continuous special inspection will be performed for post-installed anchors in “overhead installations” as defined in this Section.

3. Periodic special inspection:

a. Items listed in the following paragraphs will be verified for conformance to the requirements of the Contract Documents and the Evaluation Report for the anchor being used. The special inspector will observe the initial installation of each type and size of anchor, and subsequent installation of the same anchor at intervals of not more than 4 hours.

1) Any change in the anchors used, in the personnel performing the installation, or in procedures used to install a given type of anchor, shall require a new “initial inspection.”

b. Substrate: Concrete or masonry surfaces receiving the anchor are sound and of a condition that will develop the anchor’s rated strength.

c. Anchor:

1) Manufacturer, type, and dimensions (diameter and length).

2) Material (galvanized, Type 304 stainless steel, or Type 316 stainless steel).

d. Hole:

1) Positioning: Spacing and edge distances

2) Drill bit type and diameter

3) Diameter, and depth

4) Hole cleaned in accordance with manufacturer's required procedures. Confirm multiple repetitions of cleaning when recommended by the manufacturer

5) Anchor's minimum effective embedment

6) Anchor tightening/installation torque

4. Continuous special inspection:

a. The Special Inspector will observe all aspects of anchor installation, except that holes may be drilled in their absence provided that they confirm the use of acceptable drill bits before drilling, and later confirms the diameter, depth, and cleaning of drilled holes.

E. Field tests:

1. The Engineer may, at any time, request testing to confirm that materials being delivered and installed conform to the requirements of the Specifications.

a. If such additional testing shows that the materials do not conform to the specified requirements, the Contractor shall pay the costs of these tests.

b. If such additional testing shows that the materials do conform to the specified requirements, the District will pay the costs of these tests.

2. Field testing: Post-Installed Anchors

a. Proof load testing

1) In addition to performing special inspections, the Engineer may select up to 25 percent of each type and size of post-installed mechanical anchor for proof-load testing for pullout or shear. Tests will be non-destructive whenever possible.

2) Tension testing will be performed in accordance with ASTM E488.

b. Torque load testing

1) A calibrated torque wrench will be used to apply manufacturer's recommended installation torque.

c. Acceptance criteria

1) Minimum anchor embedment, proof load for pullout and shear, and torque shall be as specified in this Section.

2) Anchors that fail to resist their designated proof load or installation torque requirements shall be regarded as non-performing.

3) If more than 20 percent of the tested anchors fail to achieve their specified torque or proof load, all anchors of the same diameter and type as the failed anchors shall be tested.

4) Remediate non-performing anchors as specified in "Non-Conforming Work."

3.8 NON-CONFORMING WORK

A. Remove misaligned or non-performing anchors.

B. Fill empty anchor holes and repair failed anchor locations using high-strength, non-shrink, non-metallic grout.

C. If more than 20 percent of all tested anchors of a given diameter and type fail to achieve their specified torque or proof load, the Engineer will provide directions for required modifications. Make such modifications, up to and including replacement of all anchors, at no additional cost to the District.

3.9 SCHEDULES

A. Stainless steel: Provide and install stainless steel anchors at the following locations.

1. "Corrosive locations" as defined in this Section: Type 316 stainless steel

2. "Wet and moist locations" as defined in this Section: Type 316 stainless steel

3. "Other locations:"

a. For connecting[stainless steel] members to concrete or masonry: Type 304 stainless steel.

b. For connecting aluminum members to concrete or masonry

c. For connecting fiber-reinforced plastic (FRP) members to concrete or masonry.

4. At locations indicated on the Drawings

B. Galvanized: Provide and install galvanized carbon steel anchors at the following locations:

1. Locations not requiring stainless steel

2. At locations indicated on the Drawings

END OF SECTION

SECTION 26 05 13

MEDIUM VOLTAGE CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. This section covers the work necessary to furnish and install complete and operable medium voltage cable systems as specified herein.

B. Related sections: Refer to other divisions and sections of the contract documents to determine the extent and character of related electrical work specified elsewhere, but which shall be done under this section.

1. Section 01 33 00 – Submittal Procedures

2. Section 01 75 17 – Field Testing and Startup

3. Section 26 05 26 – Grounding and Bonding for Electrical Systems

4. Section 26 05 53 – Identification of Electrical Systems

1.2 QUALITY ASSURANCE

A. The manufacture of the cables shall provide written evidence of demonstrating a minimum of 15 years of United States production experience in triple extrusion of EPR insulation in medium voltage cable construction, and shall in-house formulate and mix all insulating and semi-conducting compounds used in the cable construction.

1.3 REFERENCES

A. Cable shall be designed, constructed, and tested in accordance with the latest version of the following standards:

1. ASTM International (ASTM):

a. B496 – Standard Specification for Compact Round Concentric-Lay-Stranded Copper Conductors.

2. Insulated Cable Engineers Association (ICEA)/National Electrical Manufacturers Association (NEMA):

a. ICEA S-93-639/NEMA WC 74 – 5-46kV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy.

3. California Electrical Code (CEC):

a. Article 328 – Medium Voltage Cable: Type MV

4. Underwriters Laboratory (UL):

a. UL 1072 – Medium-Voltage Power Cables

5. Institute of Electronic and Electrical Engineers (IEEE):

a. IEEE 48 – IEEE Standard for Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV

b. IEEE 383 – IEEE Standard for Qualifying Class 1E Electric Cables and Field Splices for Nuclear Power Generating Stations

c. IEEE 1202 – IEEE Standard for Flame-Propagation Testing of Wire and Cable

1.4 SUBMITTALS

A. Submittals shall be made in accordance with Section 01 33 00 – Submittals

B. Submit a certified factory test report which includes the following:

1. Result of the AC hipot test, including applied voltage level and test duration

2. Minimum insulation resistance and reference temperature

3. Maximum DC resistance and reference temperature

4. Conductor continuity check

5. Shield continuity check

6. X-Y plots showing partial discharge versus applied voltage recorded during the corona discharge test performed per AEIC requirements on the conductors supplied.

C. Record of maximum pulling tension for each cable pull

1.5 DELIVERY, STORAGE AND HANDLING

A. Cables shall be packaged on spools or reels. Each package shall contain only one continuous length of cable measuring 5000 feet. The packaging shall be constructed so as to prevent damage to the cable during shipping and handling.

B. The Contractor shall inspect the reels as they are unloaded from the delivery truck. If the reel arrives on its side (one flange on the truck; the other in the air), notify the Engineer and the cable manufacturer before accepting shipment.

C. Cable reels shall remain upright at all times. Do not handle or store reels pushed over on their flange.

D. All conductor ends shall be sealed at the factory, and these seals shall be intact when the conductors are delivered. When delivered, provide the Engineer with the original certified factory test reports attached to the cable reels verifying that the supplied conductors passed applicable AEIC CS6 and ICEA tests.

E. Cables shall be stored in a weather-protected, clean, dry location not exposed to sunlight.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. 15 kV 1/C (Type 9) Conductors:

1. Newly manufactured (not more than 12 months old) of soft drawn copper with not less than 97 percent conductivity, with size, grade of insulation, voltage, UL listing, date of manufacture, and manufacturer's name permanently marked on outer covering at not more than 2 feet 0 inch intervals.

2. Identify and mark conductors in accordance with CEC Article 310.

3. Cable shall meet requirements of ICEA, NEMA, and AEIC.

4. Suitable for use in partially submerged, non-metallic or metallic underground duct

5. Rated for 105 degree C continuous operation, 140 degree C emergency, and 250 degree C short-circuit

6. Flame, corona, treeing, moisture, oil, acid, and alkali resistant

7. Single-conductor, annealed uncoated copper compact stranded per ASTM B496.

8. Covered with an extruded semiconducting EPR strand screen, 220 mil ethylene propylene rubber insulation for 15kV rated cable, extruded EPR

semiconducting insulation screen, 5 mil coated copper tape helically applied with 25 percent minimum overlap, and 80 mil (minimum) vulcanized chlorinated polyethylene (CPE) jacket.

9. Cable UL listed as Type MV-105, sunlight resistant and for use in cable tray per UL 1072.

10. 133 percent insulation level

11. 1/3 concentric neutral

B. Acceptable Manufacturers:

1. Okonite, Okoguard – Okolon TS-CPE Type MV-105

2. Southwire SIMpull Type MV-105

3. Kerite, PermaShield Type MV-105

4. Or equal as approved by the Engineer.

2.2 MEDIUM VOLTAGE TERMINATION KITS

A. Provide terminators rated in accordance with IEEE 48, Class 1.

1. Use terminations consisting of a high dielectric constant stress control tube insulated with a nontracking silicone rubber insulator, prestretched and loaded together onto a removable core.

2. Use heat shrinkable cable terminations in factory engineered kit form, capable of properly terminating cable specified in this Section. Kits must be compatible with MV-105 cable rated for 105 degrees C normal operating temperature and 140 degrees C emergency overload temperature. Provide skirted EPDM type or preassembled porcelain slip-on type for outdoor terminations.

3. For all terminations provide proper shield termination and grounding suitable for single conductor, EPR insulated and shielded cable of the size indicated on the drawings. Provide all necessary mounting hardware, covers, and connectors.

4. For cable to bus connection kits, use heat-shrinkable insulating tubing and sealant strips for insulating and environmentally sealing medium-voltage in-line cable to busbar connections.

5. Acceptable Manufacturers:

a. Single Conductor Termination Kit

1) Tyco Electronics, HVT-Z

2) Or equal as approved by the Engineer

b. Cable to Bus Connection Kit

1) Tyco Electronics, HVBC

2) Or equal as approved by the Engineer

2.3 MEDIUM VOLTAGE CONDUCTOR ARC AND FIREPROOFING MATERIALS

A. Arc and fireproofing tape: Arc and fireproofing tape shall consist of a flexible conformable unsupported elastomer. The tape shall be not less than 30 mils (0.030 inches) thick and be capable of over 100 percent elongation. The tape shall be non-corrosive to metallic cable sheaths and compatible with synthetic cable jackets such as CPE and PVC. The tape shall be self-extinguishing and shall not support combustion. The tape shall not deteriorate when subjected to water, salt water, gases, and sewage.

1. Acceptable Manufacturers:

a. 3M Scotch 77 Fire and Arc Proofing Tape

b. Plymouth Rubber Company 53 Plyarc Arc and Fire Proofing Tape

c. Or equal as approved by the Engineer.

B. Glass Cloth Electrical Tape: Glass cloth electrical tape shall consist of a woven glass fabric tape with a thermosetting rubber based pressure sensitive adhesive. The tape shall be not less than 7-mils (0.007 inches) thick, and shall have high tensile strength.

1. Acceptable Manufacturers:

a. 3M Scotch 69 Glass Cloth Electrical Tape

b. Plymouth Rubber Company 77 Plyglas Pressure Sensitive Glass Cloth Tape

c. Or equal as approved by the Engineer.

C. Cable Support Grip for General Use

1. Provide strain relief cable support grip for exposed flexible cord and power cable where cables enter electrical panels and enclosures. Cord grip shall be heavy-duty, stainless steel, single eye, closed mesh, unless noted otherwise

2. Acceptable Manufacturers:

a. Hubbell Wiring Systems (Kellems)

b. Woodhead

c. Or equal as approved by the Engineer.

D. Cable Support Grip Inside Dam Gallery

1. Power cable support at top of dam gallery stairway inside junction box: double-eye, all stainless steel, closed mesh, cable support grip shall have a minimum breaking strength of 20,000 pounds and minimum working load of 2000 pounds. The selected support cable support grip loading is based on three (3) 15kv, 4/0, 1/c cu., 133% MV-105, 1/3 concentric neutral cable, each with an outer diameter of xx" and weight of xxxx lbs/1000'. If the cable outer diameter and weight of each cable are greater than what is listed, the contractor shall contact the engineer on record and not proceed with the rough-in.

2. Fiber cable support at top of dam gallery stairway inside junction box: single-eye, closed mesh, single weave, tin-coated bronze, cable support grip shall have a minimum breaking strength of 300 pounds and minimum working load of 30 pounds. The selected cable support grip is based on a single mode fiber cable with 12 fibers (6 pairs) with a outer diameter of 0.41" and weight of 0.05 lbs/1'. If the fiber optic cable outer diameter and weight are greater than what is listed, the contractor shall contact the engineer on record and not proceed with the rough-in.

3. Acceptable Manufacturers:

a. Hubbell Wiring Systems (Kellems)

1) Kellems heavy duty support grip model 02406006

2) Kellems heavy duty support grip model 022291003

b. Woodhead

c. Or equal as approved by the Engineer

E. Electrical Tape for Color Coding:

1. Electrical tape shall be premium grade, not less than 7 mils thick, rated for 90 degree C minimum, flame-retardant, weather resistant, and available in suitable colors for color coding. The tape shall be resistant to abrasion, ultraviolet rays, moisture, alkalis, solvents, acids, and suitable for indoor and weather-protected outdoor use. The tape shall be suitable for use with PVC and polyethylene jacketed cables, and meet or exceed the requirements of UL 510.

2. Acceptable Manufacturers:

a. 3M 35 Scotch Vinyl Electrical Tape for Color Coding

b. Plymouth Rubber Company Premium 37 Color Coding Tape

c. Or equal as approved by the Engineer.

F. Pulling Lubricant

1. Cable pulling lubricant shall be a water-based gel and be compatible with all cable jacket types. The lubricant shall be UL listed and contain no waxes, greases, silicones, or polyalkylene glycol oils or waxes.

2. The lubricant shall be specification-grade that does not promote flame propagation when used with fire-retardant cables.

3. Acceptable Manufacturers:

a. Polywater Front End Packs (Lubricant J filled bag) and regular Lubricant J (hand applied)

b. Or equal as approved by the Engineer

PART 3 - EXECUTION

3.1 GENERAL

A. Do not exceed cable manufacturer's recommendations for maximum pulling tensions, maximum sidewall pressure, and minimum bending radii.

B. Use the Polywater Front End Packs to lubricate ahead of the cable during the pull. For 3" conduits and smaller, use the one-quart packs. For conduits larger than 3", use the half-gallon packs. Number of packs shall be as follows: N (number of packs) = 0.003 X T (1 for one-quart bags; 2 for half-gallon bags) X L (length of conduit in feet) X D (internal diameter of conduit in inches). Supplement the Front End Packs with hand applied lubricant onto the cable as it enters the conduit. The minimum hand-applied lubricant quantity per conduit shall be: Q (quantity in gallons) = 0.0015 X L (length of conduit in feet) X D (internal diameter of conduit in inches).

C. Monitor pulling tensions using a dynamometer and record the maximum tensions used.

D. Pulling of cable shall be performed in such a manner that the cable outer jacket does not scrape against the edge of the conduit, at both the inlet and outlet ends of the conduit. Cable shall be free of sandy or gritty material during pulling. If cable is laid on ground during pulling, cable shall be wiped free of sandy or gritty material prior to entry of cable into conduit and prior to application of any pulling compound.

E. Where single conductors and cables in manholes, handholes, vaults, and other indicated locations are not wrapped together by some other means such as arc and fireproofing tapes, bundle throughout their exposed length all conductors entering

from each conduit with nylon, self-locking, releasable, cable ties placed at intervals not exceeding 18 inches on centers.

F. Splices will not be permitted except as accepted in writing by the Engineer, and as indicated on the Contract Drawings.

G. Cable terminations and splices shall be made by qualified personnel trained to accomplish high voltage equipment installations.

H. Ends of cable shall not be exposed to environment more than 24 hours after pulling or splicing. After 24 hours the cable shall be purged with nitrogen and sealed with tape.

I. Insulate and seal each cable-to-bus termination with heat shrinkable bus connector kits.

J. Shielded cables shall have the shields connected to the enclosure ground bus at both endpoints.

K. In manholes, underground raceways, and other outdoor locations:

1. Seal the cable ends prior to pulling them in to prevent the entry of moisture.

2. Use bags of epoxy resin which are not less than 6 mm (1/4 inch) larger in diameter than the overall diameter of the cable. Clean each end of each cable before installing the epoxy resin over it.

L. Electrical Identification: As specified in Section 26 05 53. Position the tags so they will be easy to read after the fireproofing is installed. Provide identification at end points and in all intermediate manholes.

M. Make all terminations with high voltage termination kits in accordance with manufacturer's instructions.

N. Install cable support grips for vertical conduit risers greater than 6’-0” length.

3.2 CONDUCTOR COLOR CODING

A. Provide color coding to indicate phase A, B or C by wrapping the conductor at each end and at all accessible locations with at least six full overlapping turns of vinyl tape covering an area 1-1/2 to 2 inches wide.

B. Phase A, B, C implies a positive sequence connection (i.e., counterclockwise electrical phasor rotation and clockwise motor rotation).

C. Use the following colors:

System	Conductor	Color
15kV	Cable Phasing	Identify by tagging each phase after taping has been completed
	Phase A	Brown
	Phase B	Orange
	Phase C	Yellow

3.3 LACING OF WIRES AND CABLES

A. Cables shall be laced so that the phases of the individual circuits are laced together by circuit. The laced together circuit shall be identified with the cable number specified on the drawings.

3.4 ARC AND FIREPROOFING TAPES

A. Use arc and fireproofing tapes on all 15kV cables at all terminations, splices, manholes, handholes and junction boxes.

B. Wrap cables on an individual, per-phase basis. Do not wrap all three phases together as a single cable.

C. Apply the tape in a single layer, one-half lapped, or as recommended by the manufacture. Install the tape with the coated side towards the cable and extend it not less than 25mm (1 inch) into each duct. Secure the tape in place by a random wrap of glass cloth tape.

D. Follow tape manufacturer's installation instructions. Secure the arc and fireproofing tape at frequent intervals with bands of the specified glass cloth electrical tape. Make each band of at least two wraps of tape directly over each other.

END OF SECTION

SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Work necessary to provide a complete and operable low voltage cable system as specified herein.

B. Related sections: Refer to other divisions and sections of the contract documents to determine the extent and character of related electrical work specified elsewhere, but which shall be done under this section.

1. Section 01 33 00 – Submittal Procedures

2. Section 26 05 26 – Grounding and Bonding for Electrical Systems

3. Section 26 05 33 – Raceway and Boxes for Electrical Systems

4. Section 26 05 53 – Identification of Electrical Systems

5. Section 26 05 91 – Power Building and Electrical Equipment

1.2 REFERENCES

A. Low-Voltage cables shall be installed in accordance with the latest editions and revisions of the following:

1. ASTM International (ASTM)

a. B3 – Standard Specification for Soft or Annealed Copper Wire

b. B8 – Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

c. B33 – Standard Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes

2. Insulated Cable Engineers Association (ICEA)

a. S-73-532 – Standard for Control, Thermocouple Extension and Instrumentation Cables

b. S-95-658 – Standard for Power Cables rated 2000 Volts or less for the Distribution of Electrical Energy

3. National Fire Protection Association (NFPA)

a. NFPA 70 – National Electrical Code

4. National Electrical Manufacturers Association (NEMA)

5. Underwriters Laboratory (UL)

a. Standard 44 – Thermoset Insulated Wires and Cables

b. Standard 83 – Thermoplastic Insulated Wires and Cables

c. Standard 1063 – Machine Tool Wires and Cables

d. Standard 1277 – Standard for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members

e. Standard 1581 – Reference Standard for Electrical Wires, Cables and Flexible Cords

1.3 SUBMITTALS

1. Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

2. Provide a record of the maximum pulling tension for each cable pulled through an underground conduit duct bank.

1.4 QUALITY ASSURANCE

A. Electrical Safety

1. On-site personnel shall meet all project safety requirements specified in the Contract Documents.

2. Contractor personnel energizing equipment shall have documented and current training for the specific type of equipment that will be energized as required by the latest edition of NFPA 70E, Article 110.5.

1.5 DELIVERY, STORAGE AND HANDLING

A. Storage of cable after pulling or splicing shall include purging of entire cable with nitrogen or otherwise seal with tape at both ends.

B. The Contractor shall inspect the reels as they are unloaded from the delivery truck. If the reel arrives on its side (one flange on the truck; the other in the air), notify the Engineer and the cable manufacturer before accepting shipment.

C. Provide a crane, special lift truck or forklift to unload the cable reels.

D. Cables shall be packaged on spools or reels. Each package shall contain only one continuous length of cable. Construct the packaging so as to prevent damage to the cable during shipping and handling.

E. All conductor ends shall be sealed at the factory, and these seals shall be intact when the conductors are delivered.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Provide cables as specified under the type number in this section (Type 1, Type 2, etc.). Conduits shown on the drawings have been sized to accommodate the outside diameter for each type.

B. Type 11 (Power and control cables 600 Volts and less)

1. Unless otherwise indicated, provide stranded copper conductors with size as indicated on the drawings.

2. Provide the following types of insulation:

a. Type XHHW-2 insulation for conductors No.14 and larger having cross linked polyethylene insulation rated at 90 degrees C in wet and dry locations.

b. Insulation shall be self-lubricating for sizes #8 AWG and larger.

3. Single conductor control wiring shall be No.14 AWG and shall have insulation type XHHW-2.

4. Acceptable Manufacturers:

a. Southwire, SIMpull Type XHHW-2

b. Cerrowire, SLiPWire XHHW-2

c. Or equal as approved by the Engineer

C. Type 28 (VFD Cable 600V and Less)

1. For installation between VFD and motor

2. Three stranded XLPE insulated circuit conductors with one full sized insulated PVC ground

3. Jacket shall be oil resistant PVC type.

4. 100 percent overall shield and 85 percent braid coverage

5. Provide cable that is UL listed and conforms to the requirements of UL 1277 Type TC per CEC Article 336.

6. Acceptable Manufacturers:

   a. Belden No. 29502

   b. Or equal as approved by the Engineer

D. Multi-conductor Power, Control, and Instrumentation Cable 600 Volts and Less:

1. Provide cable that is UL listed and conforms to the requirements of UL 1277 and CEC Article 340, or UL listed Power Limited Circuit Cable that conforms to the requirements of Article 725 of the National Electrical Code. Provide cables permanently and legibly marked with the manufacturer's name, the nominal voltage, the type of cable, and the UL label (or submit evidence of UL listing).

2. Type 10 (600-Volt, Twisted, Shielded Pair or Triad Instrumentation Cable):

   a. General: Type TC, single pair or triad instrumentation cable designed for noise rejection for process control, computer, or data log applications. Suitable for installation in conduit, cable tray, or other approved raceways. Minimum cable temperature rating shall be 90 degrees C dry locations, 75 degrees C wet locations.

   b. Individual Conductors: No.18 AWG stranded bare soft annealed copper, Class B, 7-strand concentric per ASTM B8, size as indicated on the drawings; 7-strand tinned copper drain wire.

   c. Insulation and Jacket: Each conductor 15mil nominal PVC/nylon insulation. Pair conductors pigmented black and white; triad conductors pigmented black, white, and red. Jacket flame retardant and sunlight and oil resistant PVC with 45 mil nominal thickness. Aluminum/polyester shield overlapped to provide 100 percent coverage.

      1) Acceptable Manufacturers:

         a) Belden No. 3088A (pairs);

         b) Okonite Okoseal-N Type P-OS (triads)

         c) Or equal as approved by the Engineer

3. Type 14 (600-Volt Individually Shielded Pairs with a Common Overall Shield Instrumentation Cable):

1) General: Type TC, twisted, shielded pairs of instrument cables, grouped in a single cable, designed for use for instrumentation, process control, and computer applications. Suitable for installation in conduit, wireway, or other approved raceways. Minimum cable temperature rating shall be 90 degrees C dry locations and 75 degrees C wet locations.

2) Conductors: No. 18 stranded bare annealed copper, Class B, 7-strand, concentric per ASTM B8. Tinned copper drain wires sized as shown on the Drawings, one for each pair and one for the overall group.

3) Insulation and Jacket: Each conductor 15mil PVC and 4mil nylon insulation. Pair conductors pigmented black and red or black and white, with red or white conductor numerically printed for group identification. Outer jacket flame retardant and sunlight and oil resistant PVC with 45 mil minimum thickness. Individual pair shield aluminum/polyester. Group shield aluminum/polyester, overlapped for 100 percent coverage.

4) Acceptable Manufacturers:

a) Belden No. 1048A (2 pairs), 1049A (4 pairs), 1050A (8 pairs)

b) Okonite Okoseal-N Type P-OS

c) Or equal as approved by the Engineer

4. Type 19 (600-Volt Multi-Conductor Control Cable):

1) General: UL listed, Type TC-ER, 600V multi-conductor copper control cable with Class B stranding per ASTM B8, #10 AWG unless noted otherwise on the drawings. Suitable for installation in conduit, cable tray, or other approved raceways. Minimum cable temperature rating of 90 degrees C for dry and wet locations.

2) Insulation and jacket: Provide conductors having 30-mil ethylene-propylene rubber (EPR) insulation and 60-mil chlorinated polyethylene (CPE) jacket. Color-code the conductor group in accordance with ICEA S-61-402, Appendix K, Method 1, Table E-2.

3) Acceptable Manufacturers:

a) The Okonite Company, Okonite-FRM Okolon TS-CPE Type TC-ER Cable

b) Allied Wire and Cable, FR-EPR/CPE Unshielded Control Cable (E-2 Color Code)

c) Or equal as approved by the Engineer.

5. Type 27 (600-Volt, Individually Shielded Triads with a Common Overall Shield Instrumentation Cable):

1) General: Twisted, shielded triads of instrument cables, grouped in a single cable, designed for use for instrumentation, process control, and computer applications. Suitable for installation in conduit, wireway, or other approved raceways. Minimum cable temperature rating shall be 90 degrees C dry locations and 75 degrees C wet locations.

2) Conductors: No. 18 AWG stranded bare annealed copper, Class B, 7-strand, concentric per ASTM B8, size as indicated on the drawings. Tinned copper drain wires, one for each triad and one for the overall group.

3) Insulation and Jacket: Each conductor 15-mil PVC and 4-mil nylon insulation. Triad conductors pigmented black, red, and blue, or black, white, and red, with red or white conductor numerically printed for group identification. Outer jacket flame-retardant and sunlight- and oil-resistant PVC with 60 mil minimum thickness. Individual triad shield 1.35-mil aluminum/polyester. Group shield 2.35-mil aluminum/polyester, overlapped for 100 percent coverage.

4) Conductors shall be numerically printed for group identification.

5) Acceptable Manufacturers:

a) Belden No. 1094A (8 triads)

b) Okonite Okoseal-N Type P-OS(multiple triads)

c) Or equal as approved by the Engineer

E. Type 15 (RS-485):

1. General: Industrial low-capacitance shielded cables for EIA RS-485 applications, including security access card readers, suitable for outdoor use and installation in conduit and other approved raceways.

2. Conductors:

a. One (1) Pair of 22 AWG, 7x30 strand tinned copper

b. One (1) Conductor of 22 AWG, 7x30 strand tinned copper

3. Conductor Insulation:

a. Pair(s) shall be insulated with foam high density polyethylene and color coded in White w/ Orange Stripe & Orange w/White Stripe.

b. Conductor(s) shall be insulated with Polyvinyl Chloride and color coded in Blue w/ White Stripe.

4. Shield:

a. Pair(s) shall be individually shielded via aluminum foil polyester tape providing 100% coverage.

b. Overall shield shall be aluminum foil polyester tape providing 100% coverage and a tinned copper braid providing 65% percent coverage and, 7x30 strand tinned copper 22 AWG drain wire.

5. Jacket: UV and oil resistant PVC, 0.300 inch overall nominal diameter, 300 volt, -20 degrees C to +60 degrees C operating temperature.

6. Characteristic Impedance: 120 Ohms per pair

7. Applicable Standards: CEC/UL CM and PLTC OIL RES II, UL 1685 Flame Test, UL 1581 Sunlight Resistance Test.

8. Acceptable Manufacturers:

a. Belden No. 3106A (for one pair RS-485 applications)

b. Belden No. 3107A (for two pair RS-485 applications)

c. Or equal as approved by the Engineer

F. Flexible Cord and Cable Sealing Fittings:

1. Provide liquid-tight strain relief connectors for exposed flexible cord and power cable where cables enter electrical panels and enclosures.

2. Acceptable manufacturers:

a. OZ Gedney

b. Hubbell

c. Appleton

d. Or equal as approved by the Engineer

G. Electrical Tape for Color Coding:

1. Electrical tape shall be premium grade, not less than 7 mils thick, rated for 90 degree C minimum, flame-retardant, weather resistant, and available in suitable

colors for color coding. The tape shall be resistant to abrasion, ultraviolet rays, moisture, alkalis, solvents, acids, and suitable for indoor and weather-protected outdoor use. The tape shall be suitable for use with PVC and polyethylene jacketed cables, and meet or exceed the requirements of UL 510.

2. Acceptable manufacturers:

   a. 3M 35 Scotch Vinyl Electrical Tape for Color Coding

   b. Plymouth Rubber Company Premium 37 Color Coding Tape

   c. Or equal as approved by the Engineer

H. Low Voltage Splices, 600 volts and below:

1. General: Provide low voltage splices consisting of 600 volt compression type connectors and connector insulators, suitable for indoor and outdoor field installations.

2. Long Barrel compression connectors

   a. Acceptable manufacturers:

      1) Burndy

      2) Thomas and Betts

      3) Panduit

      4) Or equal as approved by the Engineer

   b. Provide two-way, un-insulated, compression connectors, long barrel type, suitable for use with stranded copper conductors. Provide UL listed connectors rated 600 volts minimum.

3. Connector Insulation

   a. Connector insulators shall be cold shrink type factory expanded and assembled tubular EPDM rubber sleeves, suitable for field installation. Insulators shall shrink over in-line connections, forming a water-proof seal. Provide insulators rated for 1000 volts, minimum.

   b. Acceptable manufacturers:

      1) 3M

      2) Or equal as approved by the Engineer

PART 3 - EXECUTION

3.1 GENERAL

A. Do not exceed cable manufacturer's recommendations for maximum pulling tensions and minimum bending radius. Where pulling compound is used, use only UL listed compound compatible with the cable outer jacket, voltage rating, and with the raceway involved.

B. Submit a schedule of cable pulls 2 weeks prior to installation.

C. Monitor pulling tensions while pulling on runs between manholes and handholes and record the maximum tensions used. Advise the Engineer of cases exceeding the manufacturer's recommendations and remove and replace cables subjected to tensions in excess of those recommended.

D. Perform pulling of cable in such a manner that the cable outer jacket does not scrape against the edge of the conduit, at both the inlet and outlet ends of the conduit. Cable shall be free of sandy or gritty material during pulling. If cable is laid on ground during pulling, cable shall be wiped free of sandy or gritty material prior to entry of cable into conduit and prior to application of any pulling compound.

E. Tighten all screws and terminal bolts using torque type wrenches and/or drivers to tighten to the inch pound requirements of the CEC and UL.

F. Where single conductors and cables in manholes, handholes, vaults, and other indicated locations are not wrapped together by some other means such as arc and fireproofing tapes, bundle throughout their exposed length all conductors entering from each conduit with nylon, self locking, releasable, cable ties placed at intervals not exceeding 18 inches on centers.

G. Terminate no more than two control conductors per terminal point. Terminate all spare conductors on terminal blocks.

H. Low voltage power and control conductors shall be in separate conduits.

I. Only combine conductors with no more than two wire sizes difference to prevent possible installation damage to the smaller conductors; otherwise use separate conduits.

3.2 CONDUCTOR 600 VOLTS AND BELOW

A. Provide conductor sizes indicated on drawings with no splices except as accepted in writing by the Engineer.

B. Wire nuts may be used on 120-volt lighting and 120-volt receptacle circuits only. Place no more than one conductor in any single-barrel pressure connection. Use crimp connectors with tools by same manufacturer and/or UL listed for connectors of all stranded conductors.

C. Soldered mechanical joints insulated with tape will not be acceptable.

D. Color coding on wire sizes larger than No. 6 AWG shall be by taping the individual conductors with the appropriate colored self-adhesive vinyl electrical tape. Vinyl plastic insulating tape for wire and cable splices and terminations shall be flame retardant, 7-mil thick minimum, rated for 90 degrees C minimum meeting the requirements of UL 510.

E. Provide terminals and connectors acceptable for the type of material used.

F. Arrange wiring inside control panels, motor starters, switchgear, etc., neatly cut to proper length, remove surplus wire, and bridle and secure in an acceptable manner. Identify all circuits entering switchgear, motor starters, control panels, etc., in accordance with the cable schedules on the drawings. Terminate cable conductors on the same side of the terminal blocks as shown on the drawings.

G. Terminate control and instrumentation wiring with methods consistent with terminals provided, and in accordance with terminal manufacturer's instructions. Where terminals provided will accept such lugs, terminate all control and instrumentation wiring with insulated, ring terminal compression lugs. Control panel incoming field wireway sizes indicated on the drawings are considered minimum. Contractor shall adjust wireway sizes to meet CEC percentage fill requirements.

H. For control and instrumentation wire terminals designed to accept only bare wire compression terminations, use insulated wire ferrules on ends of wire. Tighten all terminal screws with torque screwdriver to recommended torque values.

I. Attach compression lugs with a tool specifically designed for that purpose which provides a complete, controlled crimp where the tool will not release until the crimp is complete. Use of plier type crimpers is not acceptable.

J. Cap spare conductors and conductors not terminated with UL listed end caps.

K. Where conductors pass through holes or over edges in sheet metal, remove all burrs, chamfer all edges, and install bushings and protective strips of insulating material to protect the conductors.

L. For conductors that will be connected by others, provide at least 6 feet spare conductor in freestanding panels and at least 2 feet spare in other assemblies. Provide additional spare conductor length in any particular assembly where it is obvious that more conductor length will be needed to reach the termination point.

M. Train cables passing through manholes and handholes along the walls on cable racks. Allow 2 feet of slack in each run in a "drip loop" at least once along a wall. Loops and cables shall be organized, trained, and neatly installed.

N. Do not strip cables more than eight inches from the nearest termination point of that cable.

O. Bundle and label all spare pairs with the cable designation. Tag all individual pairs to enable identification of spare pairs when making future terminations.

P. Splices will not be permitted except as accepted in writing by the Engineer.

Q. Ends of cable shall not be exposed to environment more than 24 hours after pulling or splicing. After 24 hours, purge the cable with nitrogen and seal with tape.

3.3 MULTI-CONDUCTOR POWER, CONTROL, AND INSTRUMENTATION CABLES 600 VOLTS AND LESS

A. Splices will not be permitted except as accepted in writing by the Engineer.

B. Where connections of cables installed under this section are to be made under Div. 40, Process Integration, leave pigtails of adequate length for neat bundled type connections.

C. Maintaining the integrity of shielding of instrumentation cables is essential to the operation of the control systems. Take special care in cable installation to ensure that grounds do not occur because of damage to the jacket over the shield. Shields shall be grounded at one location only as shown on the drawings.

3.4 CONDUCTOR COLOR CODING

A. Color coding of multiconductor control and instrumentation cable is specified in the individual cable type specification.

B. For power conductors, provide all single conductors and individual conductors of multiconductor power cables with integral insulation pigmentation of the designated colors, except conductors larger than No. 6 AWG may be provided with color coding by wrapping the conductor at each end and at all accessible locations with vinyl tape. Where this method of color coding is used, wrap at least six full overlapping turns of tape around the conductor covering an area 1-1/2 to 2 inches wide at a visible location at all conductor termination and pulling points.

C. Phase A, B, C implies a positive sequence connection (i.e., counterclockwise electrical phasor rotation and clockwise motor rotation).

D. Use the following colors:

System	Conductor	Color
All Systems	Equipment Grounding	Green
240/120V	Grounded Neutral	White
1-Phase, 3-Wire	Phase A	Black
	Phase B	Red

208Y/120 Volts, 3-Phase, 4-Wire	Grounded Neutral	White
	Phase A	Black
	Phase B	Red
	Phase C	Blue
480Y/277 Volts, 3-Phase, 4-Wire	Grounded Neutral (if used)	White, Black Tracer
	Phase A	Brown
	Phase B	Orange
	Phase C	Yellow
48V DC Positive		Red
48V DC Negative		Black
Single Conductor, AC		Red
Multiple Conductor Control Cables		ICEA Method 1 Table K-2
Multiple Conductor Power Cables		ICEA Method 1, Option D
Twisted shield pair	Positive	White
	Return	Black
Twisted shield triad (for RTDs)	Positive	Red
	Compensation	White
	Return	Black
24V DC Positive		Blue
24V DC Negative		Gray
Single-Conductor, DC Alarm, Annunciator, Instrumentation, and Telemetering (if not shielded)		Purple

E. All conductors carrying AC foreign voltage over 100 VAC into control panels, switchboards, and other enclosures shall be yellow. Multi-conductor cables carrying such foreign voltage shall be marked with yellow tape at each termination point.

3.5 LACING OF WIRES AND CABLES

A. Lace all wires and cables in pull or junction boxes, manholes, handholes, wireways, and at each termination. Lace wires and cables so that the wires of the individual circuits are laced together by circuit and the laced together circuit or cable shall be tagged with the cable number. Bundle all wiring entering and exiting the control panels into groups. Bundle and lace power, lighting, control, alarm, annunciator, and instrumentation wiring as specified herein.

3.6 PRE-ENERGIZATION CHECKOUT

A. Conduct a complete inspection of the cable installation, including checking that all installation all accessible connections for tightness and correct torque, visually checking insulators for cracks and supports for damages, verifying that all shipping and packing material has been removed, and that all relay, meter, instrumentation, and other accessory wiring is correct.

B. Check that all raceways and conductors are identified and tagged in accordance with the contract drawings and the Contractor's approved interconnection diagrams. Do this before replacing all covers.

C. Verify that all cable shields are bonded at the equipment endpoints.

3.7 ENERGIZATION

A. Energizing of low-voltage cables shall comply with the requirements specified in Article 1.4 - Quality Assurance.

B. There shall be no load on the Type 11 power cables while they are being energized. Turn off all downstream loads.

C. Prior to energizing any circuit that supplies rotating machinery, measure the phase sequence and verify that it is correct.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Furnish all labor, materials, equipment and incidentals required and install a complete grounding system in strict accordance with Article 250 of the California Electrical Code (CEC), as shown on the drawings and as specified herein.

2. All raceways, conduits and ducts shall contain equipment grounding conductors. If a size is not shown on the drawings, size in accordance with the CEC. Minimum sizes shall be No. 12 AWG.

a. Conduits with 15kV medium voltage 1/C cables shall have their 1/3 neutrals tied together at both ends of the circuit to form the equipment grounding conductor.

3. Provide ground test stations where shown on the drawings.

B. Related Sections

1. Section 01 33 00 – Submittal Procedures

2. Section 01 75 17 – Field Testing and Startup

3. Section 26 05 13 – Medium Voltage Cables

4. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables

5. Section 26 05 33 – Raceways and Boxes for Electrical Systems

6. Section 26 05 53 – Identification of Electrical Systems

7. Section 26 05 91 – Power Building and Electrical Equipment

8. Section 26 12 19 – Pad-Mounted Liquid-Filled Medium-Voltage Transformers

9. Section 26 13 16.13 - Medium Voltage Load Interrupter Switchgear

10. Section 26 13 16.14 - 15kV Medium Voltage Sectionalizing Cabinets

1.2 REFERENCES

A. Grounding systems shall be designed, built, tested, and installed in accordance with the latest editions and revisions of the following:

1. ASTM International (ASTM)

a. B2 – Standard Specification for Medium-Hard Copper Wire

b. B187 – Standard Specification for Copper Bar, Bus Bar, Rod, and Shapes

c. B8 – Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

d. B418-95a Type II – Standard Specification for Cast and Wrought Galvanic Zinc Anodes

2. California Code of Regulations (CCR)

a. Title 24, Part 3 – California Electrical Code (CEC), Article 250 (Grounding)

3. Institute of Electrical and Electronics Engineers (IEEE)

a. IEEE Std 80 – IEEE Guide for Safety in AC Substation Grounding

b. IEEE Std 837 – IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding

c. IEEE Std 142 – IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems

4. Underwriters Laboratories (UL)

a. 467 – UL Standard for Grounding and Bonding Equipment

b. 224 – UL Standard for Extruded Insulating Tubing

5. Canadian Standards Association (CSA)

a. CAN/CSA-C22.3 No. 6-M91 – Principles and Practices of Electrical Coordination Between Pipelines and Electric Supply Lines

6. InterNational Electrical Testing Association (NETA)

a. ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems

7. National Association of Corrosion Engineers (NACE)

a. RP0177 – Mitigation of Alternating Current & Lightning Effects on Metallic Structures and Corrosion Control Systems

8. National Electrical Contractors Association (NECA)

a. NECA 331, Standard for Building and Service Entrance Grounding and Bonding

1.3 SYSTEM DESCRIPTION

A. Design requirements

1. Equipment grounding conductor sizing

a. Include a Type 11 insulated copper ground wire in every power conduit unless otherwise noted. If a size is not shown on the drawings, the ground wire shall be the same size as the power cable up to size 2 AWG. For cables larger than 2 AWG, the ground wire may be reduced to half the size of the power cable as long as 2 AWG is the smallest size selected when the ground cable is smaller than the power cable.

1.4 SUBMITTALS

A. Submittals shall be made in accordance with Section 01 33 00 – Submittal Procedures. In addition to these requirements, provide the following:

1. Shop drawings

a. As-built drawings of the grounding system installation.

b. As-built drawings shall be dimensioned and include GPS reference points for each buried ground rod using California grid NAD83 northing/easting coordinates. Include all information necessary to locate buried and/or concealed grounding system infrastructure in the future.

1.5 QUALITY ASSURANCE

A. All grounding and bonding products shall be UL listed.

B. All exothermically welded-type terminal lugs for buried or embedded connections shall use materials qualified in accordance with IEEE 837.

1.6 EXTRA MATERIALS

A. Provide two complete grounding sets, each set with the following features:

1. Three-phase, clear jacketed #1/0 AWG copper cable, with six-feet long phase leads and six-feet long ground lead.

2. All three phase leads and the ground lead shall have bronze ball-stud clamps designed to attach to a 1" diameter grounding ball. Clamps shall have an eyescrew for hot stick operation and shall be drilled to accept a 5/8-11 UNC threaded ferrule on #1/0 AWG copper grounding cable.

3. Provide an unshrouded copper cable ferrule with translucent shrink tubing for stress relief and inspection of cable strands between the ferrule and jacket.

4. Provide a storage bag for temporary grounding clamps and cable sets. Bag shall be made of yellow, vinyl-laminated, nylon cloth, with plywood bottom and metal skids on bottom of bag.

5. Acceptable manufacturers:

   a. Hubbell-Chance assembly part number G3C10606HCB1B1 with catalog number T6000865 grounding storage bag

   b. Or equal as approved by the Engineer

B. Provide one insulated "shotgun" style hot stick for installing temporary grounds with the following features:

1. Single-piece style, with operating mechanism that opens a hook to grasp a clamp eyescrew on temporary grounding clamps and retract it into the tool head. The operating mechanism shall have a thumb latch which must be depressed to release the hook. Complete with a factory-installed universal fitting on end opposite the clampstick head. Overall length shall be 6'-6".

2. Yellow vinyl-impregnated fabric storage bag.

3. One box of 50 packets of silicone wipes for hot line tools.

   a. Hubbell-Chance Grip-All Clampstick, catalog number C4030292A with P6436 storage bag and C4002568 box of silicone wipes

   b. Or equal as approved by the Engineer

C. Provide one high-voltage detection kit for use in applications for voltages from 240 VAC to 69kVAC. The voltage detector shall be a proximity type instrument, making it unnecessary to make physical contact with the equipment being tested. The voltage detector shall be battery powered, made of non-conductive materials, be suitable for use with a hot stick using a splined universal end fitting, be provided with an accessory adapter to allow use with shotgun-style hotsticks, and shall have both audible and visual indication of voltage.

1. Acceptable manufacturers:

   a. Salisbury 4769 High Voltage 69kV Self-Testing Voltage Detector Kit

   b. Or equal as approved by the Engineer

PART 2 - PRODUCTS

2.1 GENERAL

A. Direct-buried, concrete encased, and exposed grounding conductors

1. Bare copper stranded conductors conforming to ASTM B2 (medium hard drawn) with Class B stranding, size as indicated on the drawings.

2. Acceptable manufacturers:

a. Southwire

b. General Cable

c. Or equal as approved by the Engineer

B. Ground rods

1. 3/4-in by 12-ft copper clad steel constructed in accordance with UL 467. The copper thickness shall be 10 mil minimum. Provide UL mark on ground rod.

2. Acceptable manufacturers:

a. Eritech (Erico), part number 613412

b. Harger, part number 3412

c. Or equal as approved by the Engineer

C. Conduit grounding bushings

1. Insulated, 150 degree Celsius, malleable iron type with a solderless set-screw lug.

2. Acceptable manufacturers:

a. Appleton, GIB-L-BC Series with bronze lay-in-lug for copper conductors

b. Hubbell Electrical Products (Raco)

c. Or equal as approved by the Engineer

D. Waterpipe ground clamps

1. Electroplated tinned bronze U-bolt style pipe clamp, sized as required for the pipe diameter and ground wire size specified.

2. Acceptable manufacturers:

a. Harger

b. Blackburn (Thomas & Betts)

c. Or equal as approved by the Engineer

E. Grounding system connections:

1. Buried or inaccessible connections

a. Make buried or inaccessible grounding connections with exothermic welds. Molds, cartridge materials, and accessories shall be as recommended by the manufacturer of the molds for the items to be welded. Molds and powder shall be furnished by the same manufacturer.

b. Acceptable manufacturers:

1) Exothermic welded connections

a) Erico (Cadweld)

b) Harger (Ultraweld)

c) Or equal as approved by the Engineer

2. Accessible connections to equipment or connections to structural steel

a. Make connections to equipment, structural steel, and other accessible connections using one- or two-hole welded copper lugs as required for the cable size specified. An acceptable alternative to exothermically welded connections is a compression radial swage connection.

b. Acceptable manufacturers:

1) Exothermic welded connections

a) Erico (Cadweld)

b) Harger (Ultraweld)

c) Or equal as approved by the Engineer

3. Connections to reinforcing steel

a. Make mechanical connections to reinforcing steel using UL 467 listed irreversible crimp compression copper connectors with the “run” and “tap” sizes as required for the reinforcing steel and cable size, respectively, specified. Connectors shall be factory prefilled with moisture inhibiting compound.

b. Acceptable manufacturers:

1) Burndy HYTAP, Type YGHP

2) Thomas & Betts (Blackburn), Figure 6 Compression Ground Tap Connector

3) Or equal as approved by the Engineer

F. Pre-cast concrete boxes for ground-rod installation

1. Provide where shown on the drawings. Provide H-20 traffic rated lids inscribed “Ground Rod” on the top.

2. Acceptable manufacturers:

a. Christy

b. Jensen Concrete Products

c. Or equal as approved by the Engineer

G. Fasteners

1. Use silicon bronze alloy hardware for all grounding connections to structures or equipment.

2. Acceptable manufacturers:

a. Burndy, “Durium” hardware

b. AFL Global, “Everdur” hardware

c. Or equal as approved by the Engineer

H. Electrical joint inhibitor compound

1. Used for all bolted grounding connections as a moisture and oxidizing seal.

2. Acceptable manufacturers:

a. Sanchem Inc., NO-OX-ID (A-Special Electrical Grade)

b. Or equal as approved by the Engineer

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare and clean piping, rods, and conductors prior to exothermic welding in conformance with the specific requirements of the welding system.

3.2 INSTALLATION

A. General

1. Bond all steel building columns in new structures together and connect to the ground test station as shown on the drawings.

2. Metal conduits stubbed into power distribution equipment, control panels, or other enclosure shall be terminated with insulated grounding bushings and bonded to the enclosure's ground bus. Size the bonding wire in accordance with the CEC, except that a minimum No. 12 AWG shall be used.

3. All equipment enclosures and transformer frames, conduits systems, cable armor, exposed structural steel and all other equipment and materials required by the CEC to be grounded, shall be grounded and bonded in accordance with the CEC.

4. For manholes/pullboxes with ground test stations, connect the ground test station to the site ground grid with two connections.

5. Care shall be taken to ensure good ground continuity, in particular between the conduit system and equipment frames and enclosures. Where necessary, jumper wires shall be installed.

6. Liquid tight flexible metal conduit shall have bonding jumpers. Bonding jumpers shall be external, run parallel (not spiraled) and fastened with Type 316 stainless steel tie wraps.

7. Run grounding electrode conductors in the building concrete slab/wall or in slab/wall-embedded PVC Schedule 40 conduits unless otherwise shown on the drawings. Stub-ups at ground test stations and conduit runs underneath structures out to the perimeter ground ring shall be in PVC Schedule 80 conduit.

8. Ground cable penetrations through building exterior walls shall enter within 3 feet below finish grade and shall be prepared with a water stop. Unless otherwise indicated, the water stop shall include filling the space between stands with solder and soldering a 12-inch copper disc over the cable.

9. Install equipment grounding conductors with all feeders and branch circuits. Each circuit shall have a dedicated equipment grounding conductor from source to load without splicing or "tee tapping" (e.g., three different receptacle circuits in a common home-run conduit back to a lighting panelboard shall have three separate equipment grounding conductors back to the lighting panelboard).

B. Ground connections

1. Ground transformer neutrals, UPS neutrals, and other separately derived sources to the nearest Grounding Electrode System (GES). Size the grounding electrode conductor in accordance with the CEC unless otherwise specified on the drawings.

2. Ground all grounding type receptacles to the outlet boxes with a No. 12 THWN/THHN/MTW green conductor connected to the ground terminal of the receptacle and fastened to the outlet box by means of a grounding screw.

3. Ground medium voltage power cable metallic shielding at each end of the cable and at each splice. Maintain shield continuity around splices.

4. Single-point ground instrumentation cable shields at the signal ground bus at the control panel end of the circuit.

5. Mechanically connect grounding electrode conductors to the foundation reinforcing steel where shown on the drawings.

6. Seal exposed connections between different metals with electrical joint inhibitor compound. Clean and coat all buried connections with electrical joint inhibitor compound before backfilling.

7. Do not bury or embed bolted connections. For compression-type connectors, the tool for crimping shall emboss the die index number into the connector as the crimp is completed. Each compression-type connector shall have an inspection port for use in checking proper conductor insertion.

8. Molds used for exothermic welding shall be new. The number of welds made per mold shall not exceed the manufacturer's recommendations.

9. Pipeline coating shall be repaired as shown on the project drawings.

C. Ground rods

1. Drive grounding electrodes at locations shown on the drawings. Provide a ground rod inside every underground pullbox and manhole. Connect the detectable pull tape wire (specified in Section 26 05 33) to the ground rod.

2. Bury ground rods to the depth shown on the drawings. Interconnect ground rods with the wire size shown on the drawings.

D. Grounding wires

1. Unless otherwise specified, provide continuous, unspliced equipment grounding conductors.

2. Lay all underground grounding conductors slack and, where exposed to mechanical injury, protect by pipes or other substantial guards. If guards are steel pipe, or other magnetic material, electrically connect conductors to both ends of the guard. Make connections as specified in this Section.

3. Where grounding conductors extend beyond the perimeter of the building to site structures, the grounding electrode system shall be continuous with no splices.

E. Fasteners

1. Clean the connector and conductor surfaces with a wire brush or emery cloth to a shiny, bright surface. For plated surfaces, use compatible solvent cleaning in order not to remove any portion of the plating.

2. Apply electrical joint inhibitor compound immediately after cleaning.

3. All fasteners shall engage a minimum of four full threads for electrical connections and equipment mounting.

4. Coat all bolts with electrical joint inhibitor compound.

5. Torque fasteners to equipment manufacturer's specifications. If not specified by the manufacturer, torque fasteners to NETA specifications.

F. Wire identification

1. Tag and lace all wires in test stations, pull or junction boxes, vaults, at each termination. Wire identification text shall be as shown on the drawing. Reference Section 26 05 53 for identification products.

END OF SECTION

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. The work necessary to furnish and install complete raceways and boxes for electrical systems

B. Related sections:

1. Section 01 33 00 – Submittal Procedures

2. Section 01 43 11 – Seismic Qualification and Certification

3. Section 01 81 02 – Seismic Design Criteria

4. Section 26 05 53 – Identification for Electrical Systems

1.2 REFERENCES

A. Raceway and boxes for electrical systems shall be designed, built, tested, and installed in accordance with the latest edition and revisions of the following:

1. California Code of Regulations (CCR)

a. Title 24, Part 3 – California Electrical Code (CEC)

2. National Electrical Contractors Association (NECA)

a. ANSI/NECA 1, Standard Practices for Good Workmanship in Electrical Construction

b. ANSI/NECA 101, Standard for installing Steel Conduits (Rigid,IMC, EMT)

c. ANSI/NECA 102, Standard for installing Aluminum Rigid Metal Conduit

3. National Electrical Manufacturers Association (NEMA)

a. ANSI/NEMA C80.1 American National Standard for Electrical Rigid Steel Conduit (ERSC)

b. ANSI/NEMA FB-1, Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cables

c. RN 1, Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit

d. TC 2, Polyvinyl-Chloride (PVC) Conduit

e. TC 3, Polyvinyl-Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing

4. Underwriters Laboratories (UL)

a. UL 6 Electrical Rigid Metal Conduit

b. UL 360, Standard for Liquid –Tight Flexible Metal Conduit

c. UL 651, Standard for Schedule 40, 80, Type EB, and a Rigid PVC Conduit and Fittings

1.3 QUALITY ASSURANCE

A. Seismic design requirements for conduit hangers and supports:

1. All raceway systems to be furnished under this Section shall be designed and constructed to meet the seismic requirements of Sections 01 43 11 – Seismic Qualification and Certification and 01 81 02 – Seismic Design Criteria.

1.4 SUBMITTALS

A. Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.1 GENERAL

A. Rigid Steel Conduit

1. Hot-dipped galvanized rigid steel conduit, including threaded type couplings, elbows, nipples, and other fittings, shall meet the requirements of ANSI C80.1, UL-6 and the CEC. Do not use setscrew or threadless type couplings, bushings, elbows, nipples, and other fittings, except when approved in writing by the Engineer.

2. Acceptable manufacturers:

a. Allied Tube and Conduit

b. Western Tube and Conduit

c. Or equal as approved by the Engineer

B. PVC Schedule 40 and Schedule 80 Conduits

1. PVC conduit shall be Schedule 40 or Schedule 80 as designated on the drawings, UL listed for concrete encased, underground direct burial, concealed and direct-sunlight-exposed use, and UL listed and marked for use with conductors having 90 degree C insulation. Conduits, couplings, elbows, nipples, and other fittings shall meet the requirements of NEMA TC 2 AND TC 3, Federal Specification W-C-1094, UL, CEC, and ASTM specified tests for the intended use. Use only conduit with a factory formed bell on one end. Conduit that requires the use of couplings for straight runs will not be acceptable.

2. Acceptable manufacturers:

a. Carlon Plus 40 or Plus 80 Rigid PVC Nonmetallic Conduit

b. JM Eagle

c. Or equal as approved by the Engineer

C. PVC-coated rigid steel conduit

1. PVC-coated rigid steel conduit shall be hot-dipped galvanized rigid steel conduit meeting the requirements of NEMA RN 1, ETL PVC-001, UL and the CEC. Conduit shall have a factory installed PVC coating 40 mils nominal thickness, and applied over and permanently bonded to the galvanized surface, with an interior 2 mil urethane coating. All male threads on conduit, elbows, and nipples shall be protected by an application of a urethane coating. Couplings, elbows, nipples and other fittings shall be threaded and galvanized and shall have integral plastic sleeves which overlap the plastic-coated conduit with pressure sealing sleeves. Use PVC coated conduit suitable for conductors with 75 degrees C insulation.

2. Acceptable manufacturers:

a. Robroy Plasti-Bond Red

b. Perma-Cote Industries Supreme Conduit System

c. Or equal as approved by the Engineer

D. Flexible Metal Conduit, Liquid-Tight

1. Flexible metal conduit shall be UL listed, liquid-tight, consisting of galvanized steel flexible conduit covered with an extruded gray PVC jacket and terminated with nylon bushings or bushings with steel or malleable iron body and insulated throat and sealing O-ring.

2. Acceptable manufacturers:

    a. Anaconda Sealtite Type UA

    b. Electri-Flex Liquatite Type LA

    c. Or equal as approved by the Engineer

E. Pulling Tape – pulling conductors into conduits

1. Flat, woven, polyester tape used for installing fiber optic, copper, and coaxial cables in underground conduit. Tape shall have the following characteristics:

    a. Lubricated for easy installation and reduced friction

    b. Printed with sequential footage markings

    c. 2,500 pound tensile strength

2. Acceptable manufacturers:

    a. NEPTCO, Polyester MULETAPE, WP Series

    b. Or equal as approved by the Engineer

F. Pulling Tape – empty spare conduits

1. Flat, woven, polyester tape with insulated 22 gauge conductor metallic conductor to enable detection of empty, spare conduits. Tape shall have the following characteristics:

    a. Lubricated for easy installation and reduced friction.

    b. Printed with sequential footage markings.

    c. 2,500 pound tensile strengths.

2. Acceptable manufacturers:

    a. NEPTCO, Detectable MULETAPE, DT Series

    b. Or equal as approved by the Engineer

G. Raceway Fittings

1. Fittings for Rigid Steel:

a. Watertight hubs for rigid steel conduit shall be male thread type zinc-plated malleable iron with recessed "O" ring seal, insulated throat, and locking screw.

1) Acceptable manufacturers:

a) OZ Gedney, Type CHM-T

b) Cooper Crouse-Hinds, Raintight Malleable Iron “MHUB”

c) Or equal as approved by the Engineer

b. Provide all malleable iron conduit bodies and covers with captive stainless steel screws and neoprene gaskets.

1) Acceptable manufacturers:

a) Appleton, Form 35 Threaded Unilets

b) Killark, Duraloy 5 Series Malleable Iron

c) Or equal as approved by the Engineer

c. Provide EYS and EZS conduit sealing fittings for use in Class I, Division I and Division 2 locations shown on the Drawings. Provide with Chico sealing compound.

1) Acceptable manufacturers:

a) Emerson/Appleton

b) Cooper Crouse-Hinds

c) Or equal as approved by the Engineer

2. Fittings for Liquid-Tight Flexible Metal Conduit:

a. Straight, 45 degree angle, or 90 degree angle connectors with malleable iron gland nut, polyethylene compression ring, steel ferrule, malleable iron conduit assembly with insulated throat, steel lock nut, and copper grounding lug.

1) Acceptable manufacturers:

a) Cooper Crouse-Hinds, Liquidator Series

b) Steel Electric Products

c) Or equal as approved by the Engineer

3. Fittings for PVC-Coated Rigid Steel Conduit:

a. Watertight and corrosion resistant hubs for PVC Coated Rigid Steel conduit shall have a minimum 40 mil PVC exterior coating, a urethane interior coating, and pressure sealing sleeves.

1) Acceptable Manufacturers:

a) Robroy Plasti-Bond Red Type ST Hub

b) Perma-Cote Industries Supreme Type ST Hub

c) Or equal as approved by the Engineer

b. For corrosion resistant conduit bodies for use with PVC Coated Rigid Steel conduit sized as required by the CEC, use cast iron conduit bodies and covers with captive stainless steel screws, a 40 mil minimum PVC exterior coating and nominal 2 mil internal urethane coating, and pressure sealing sleeves on all conduit openings.

1) Acceptable manufacturers:

a) Robroy Plasti-Bond Red Conduit Bodies

b) Perma-Cote Industries Supreme Conduit Bodies

c) Or equal as approved by the Engineer

c. In NEMA 4X areas, provide zinc-plated malleable iron or galvanized steel insulated throat connectors for liquid-tight flexible metal conduit, suitable for use in wet locations, with a minimum 40 mil PVC exterior coating and pressure sealing sleeves.

1) Acceptable manufacturers:

a) Robroy Plasti-Bond Red Liquid Tight Connectors

b) Perma-Cote Industries Supreme Liquidtight Connectors

c) Or equal as approved by the Engineer

H. Expansion/Deflection Couplings

1. Provide expansion/deflection couplings for use where shown on the Drawings and wherever conduit crosses an expansion joint. The couplings shall alleviate longitudinal, angular, and shear conduit stress caused by differential settlement.

2. Acceptable manufacturers:

    a. Appleton/O-Z Gedney Type DX

    b. Cooper/Crouse-Hinds Type XD

    c. Or equal as approved by the Engineer

I. Expansion Couplings

1. Provide expansion couplings for use where shown on the Drawings. The couplings shall allow for expansion and contraction up to a maximum of 8” (4” in either direction) in a run of rigid metal conduit.

2. Acceptable Manufacturers:

    a. Appleton/O-Z Gedney Type AX-8

    b. Cooper/Crouse-Hinds Type XJG

    c. Or equal as approved by the Engineer

J. Supports and Fittings

1. For areas not designated as NEMA 4X on the drawings, supports and fittings for support systems for electrical equipment and raceways shall be channel supports sized to meet seismic requirements. Finish shall be hot-dipped galvanized steel for strut, pipe straps, clamp back spacers, hanger rod, strut nuts, U-bolts, beam clamps, and other supports and fittings.

    a. Acceptable manufacturers:

        1) Unistrut, B-Line

        2) Power Strut

        3) Or equal as approved by the Engineer

2. For areas designated as NEMA 4X on the drawings; supports and fittings for support systems for electrical equipment and raceways shall be channel supports sized to meet seismic requirements. Materials of construction shall be 40 mil PVC coated hot-dipped stainless steel, or self-extinguishing fiberglass which meets UL-94V-0 flammability tests, for strut, pipe straps, clamp back

spacers, hanger rod, strut nuts, U-bolts, beam clamps, and other supports and fittings.

a. Acceptable Manufacturers:

1) Robroy Plastibond-Red PVC Coated Steel Strut and accessories

2) Fiberglass Strut and accessories

3) Perma-Cote Supreme PVC Coated Steel Channel and accessories

4) Or equal as approved by the Engineer

K. Wireways

1. For areas designated NEMA 1 or NEMA 12 on the Drawings, provide UL listed, hinged cover, NEMA 12 wireway bodies and covers fabricated from 16 gauge steel minimum, with an enamel or epoxy finish.

a. Acceptable Manufacturers:

1) Square D Square-Duct Wireway

2) Hoffman

3) Or equal as approved by the Engineer

2. For all other areas or where NEMA 3R, NEMA 4, or NEMA 4X is shown on the drawings, provide UL listed, raintight, hinged cover NEMA 4X wireway bodies and covers fabricated from stainless steel.

a. Acceptable Manufacturers:

1) Square D

2) Hoffman

3) Or equal as approved by the Engineer

L. Boxes and Fittings

1. Pressed steel switch and outlet boxes shall be hot-dipped galvanized.

a. Acceptable Manufacturers:

1) Raco Manufacturing Co.

2) OZ Gedney

3) Or equal as approved by the Engineer

2. NEMA 12 terminal boxes, junction boxes, pull boxes, etc., shall be sheet steel unless otherwise shown on the drawings. Boxes shall have continuous welded seams and mounting feet. Welds shall be ground smooth. Boxes shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14 gauge metal and covers shall not be less than 14 gauge metal. Covers shall be gasketed with rolled lip and fastened with stainless steel clamps. Condulets shall be Form 7 wedge nut condulets with integral gaskets. Condulet covers that attach to the condulet body via threaded holes in the condulet body are not acceptable. Furnish boxes with continuous hinged doors, terminal mounting straps, and brackets. Terminal blocks shall be NEMA type, not less than 20A, 600V.

   a. Acceptable Manufacturers:

      1) Hoffman Engineering Co.

      2) Lee Products Co.

      3) Keystone/Rees, Inc.

      4) Or equal as approved by the Engineer

3. For NEMA 4 and NEMA 4X locations, terminal boxes, junction boxes, pull boxes etc., shall be Type 304 stainless steel (NEMA 4 locations) or Type 316L stainless steel (NEMA 4X locations) unless otherwise shown on the drawings. Boxes shall have continuous welded seams and mounting feet. Welds shall be ground smooth. Boxes shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14 gauge metal and covers shall not be less than 12 gauge metal. Covers shall be gasketed and fastened with stainless steel clamps. Condulets shall be Form 7 wedge nut condulets with integral gaskets. Condulet covers that attach to the condulet body via threaded holes in the condulet body are not acceptable. Furnish terminal boxes with hinged doors, terminal mounting straps and brackets. Terminal blocks shall be NEMA type, not less than 20A, 600V.

   a. Acceptable Manufacturers:

      1) Hoffman Engineering Co.

      2) Lee Products Co.

      3) Keystone/Rees, Inc.

      4) Or equal as approved by the Engineer

4. All boxes and fittings used with PVC coated conduit shall be furnished with a PVC coating bonded to the metal, the same thickness as used on the coated steel conduit. The ends of couplings and fittings shall have a minimum of one pipe diameter PVC overlap to cover threads and provide a seal.

5. Device boxes shall be malleable iron with zinc electroplate and epoxy powder coat finish, malleable iron covers, and stainless steel screws. Provide the "deep" configuration for all devices boxes.

    a. Acceptable Manufacturers:

        1) Appleton, UNILETS Malleable Iron, Type FD

        2) Steel Electric Products, Type FD

        3) Or equal as approved by the Engineer

6. All terminal boxes, junction boxes, and metallic pull boxes shall have two conduit drain fittings installed in the bottom of the box to permit water to drain from the box continuously. Drain fittings shall be stainless steel, designed for use with 1/2" hubs or 1/2" drilled and tapped conduit openings.

    a. Acceptable manufacturers:

        1) Killark, KDB-1

        2) OZ Gedney, DB-50

        3) Or equal as approved by the Engineer

M. Conduit Penetration Seals and Sleeves

1. Conduit penetration seals shall be modular, mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the conduit and the opening. The elastomeric element shall be sized and selected per the manufacturer's recommendations and shall be suitable for use in standard service applications (-40 degree F to 250 degrees F).

2. Sleeves shall be the thermoplastic type with water stops, suitable for poured wall construction.

3. Conduit penetration seals and sleeves shall be complete assemblies supplied by a single manufacturer.

4. Acceptable manufacturers:

    1) GPT Link-Seal and Plastic Sleeves

2) Calpico Inc. Pipe Linx and Plastic Sleeves

3) Or equal as approved by the Engineer

N. Duct Seal

1. Duct seal shall be a non-hardening compound designed as a waterstop and moisture barrier for sealing the annular space between conduit and electrical conductors and cables.

2. Acceptable manufacturers:

a. O-Z Gedney DUX

b. Thomas & Betts, Type DX

c. Or equal as approved by the Engineer

O. Firestopping

1. Sealant

a. UL certified, one-part, two stage intumescent latex compound that, when exposed to high heat or flame, expands to close off voids left by the burning or melting of combustible materials. The sealant shall be capable of caulking or troweling onto vertical surfaces or overhead.

b. Acceptable Manufacturers

1) Specified Technologies, Inc. SSS Intumescent Firestop Sealant

2) Or equal as approved by the Engineer

2. Mortar

a. UL classified, lightweight, fast drying, Portland cement-based firestop mortar

b. Acceptable Manufacturers

1) Specified Technologies, Inc. SSM Firestop Mortar

2) Or equal as approved by the Engineer

PART 3 - EXECUTION

3.1 GENERAL

A. Material and equipment installation:

1. Follow manufacturer's installation instructions explicitly, unless otherwise indicated. Wherever any conflict arises between manufacturer's installation instructions, codes and regulations, and these contract documents, follow Engineer's decision. Keep copy of manufacturer's installation instructions on the jobsite available for review at all times.

3.2 INSTALLATION

A. Install raceways and boxes in a neat and workmanlike manner as described by ANSI/NECA 1 – Standard Practices for Good Workmanship in Electrical Construction and ANSI/NECA 101 – Installing Steel Conduits (Rigid, IMC, EMT).

B. Use no circular raceway less than 3/4-inch unless otherwise approved by the Engineer.

C. Raceway type for location and installation method unless noted otherwise on the drawings.

1. Exterior, Exposed (higher than 6-inches above grade), all locations except those designated as NEMA 4X or NEMA 6P:

a. Rigid steel conduit

2. Interior, Exposed or Concealed (Not Embedded in Concrete), all locations except those designated as NEMA 4X or NEMA 6P:

a. Rigid steel conduit

3. Embedded within Concrete Walls, Slabs, Ductbank or Floors:

a. PVC Schedule 40

4. Risers from concealed nonmetallic conduit, floor stub-ups, wall, or ceiling penetrations; also, all locations designated NEMA 4X or NEMA 6P:

a. PVC Coated rigid steel conduit

5. Direct buried

a. PVC Schedule 40

D. Location, Routing, and Grouping:

1. Conceal or expose raceways as indicated on the drawings. Group raceways in same area together. Locate raceways at least 12 inches away from parallel runs of heated piping for other utility systems.

2. Run exposed raceways parallel or perpendicular to walls, structural members, or intersections of vertical planes to provide a neat appearance. Follow surface contours as much as possible.

3. Avoid obstruction of passageways. Run concealed raceways with the minimum of bends in the shortest practical distance considering the building construction and other systems.

4. Paint all threads of galvanized conduits with zinc-rich paint or liquid galvanizing compound before assembling. Touch up after assembly to cover nicks or scars.

5. Do not notch or penetrate structural members for passage of raceways except with prior approval of the Engineer.

6. Conduits must be kept within the furring lines of building walls and ceilings unless specifically noted to be exposed.

7. Provide all necessary sleeves and chases required where conduits pass through floors or walls; seal all openings and finish to match adjacent surfaces.

8. Where conduit runs change from concrete embedded within floors, slabs, or equipment pads to exposed, maintain a minimum separation of 6-inches between the closest wall, pad, or structure face and the outer edge of the exposed conduit.

E. Special Locations:

1. Final Connection to Equipment:

a. Make final connection to motors, wall or ceiling mounted fans and unit heaters, dry type transformers, valves, local instrumentation, and other equipment where flexible connection is required to facilitate removal or adjustment of equipment with 18-inch minimum, 60-inch maximum lengths unless otherwise approved by the Engineer, of liquid-tight, PVC-jacketed flexible conduit where the required conduit size is 4 inches or less. For larger sizes, use rigid steel conduit as specified.

b. The flexible conduit shall be long enough to allow the item to which is connected to be withdrawn or moved off its base. Use liquid-tight flexible metal conduit in outside areas, process areas exposed to moisture, and areas required to be oil-tight and dust-tight.

F. Support:

1. Support raceways at intervals not exceeding CEC requirements unless otherwise indicated. Support multiple raceways adjacent to each other by ceiling trapeze. Support individual raceways by wall brackets, strap hangers, or ceiling trapeze, fastened by toggle bolts on hollow masonry units, expansion shields on concrete or brick, and machine screws or welded thread studs on steelwork.

2. Threaded studs driven in by a powder charge and provided with lock washers and nuts may be used in lieu of expansion shields.

3. Support all raceways from structural members only. Do not support from pipe hangers or rods, cable tray, or other conduit.

4. Do not use nails anywhere or wooden plugs inserted in concrete or masonry as a base for raceway or box fastenings. Do not weld raceways or pipe straps to steel structures. Do not use wire in lieu of straps or hangers.

5. Support flexible metal conduit with conduit clamps, except where the flexible metal conduit is fished and where sections less than 4 feet in length are used in concealed areas to supply lighting fixtures in accordance with the CEC.

G. Bends:

1. Make changes in direction of runs with symmetrical bends or cast metal fittings. Make bends and offsets of the longest practical radius. Avoid field made bends and offsets where possible, but where necessary, make with an acceptable hickey or conduit bending machine. Do not heat metal raceways to facilitate bending.

2. Make bends in parallel or banked runs of raceways from the same center or centerline so that bends are parallel and of neat appearance. Factory elbows may be used in parallel or banked raceways if there is a change in the plane of the run and the raceways are of the same size. Otherwise, make field bends in parallel runs.

3. For PVC Schedule 40 conduits, use factory made elbows for all bends 30 degrees or larger. Use acceptable heating methods for forming smaller bends.

4. Make no bends in flexible conduit that exceed allowable bending radius of the cable to be installed or that significantly restricts the conduits flexibility.

H. Threaded Joints:

1. Paint all field cut threads with zinc rich paint or liquid galvanizing compound for rigid steel conduit and for PVC coated rigid steel conduit after removal of

chips and cleaning with solvent. Use approved, highly conductive jointing compound on all joints

a. Acceptable Manufacturers:

1) Appleton Type TLC

2) Or equal as approved by the Engineer

I. Bushing and Insulating Sleeves:

1. Where rigid steel conduit, PVC coated rigid steel conduit, or liquid-tight flexible metal conduit enters metal enclosures, install an insulated throat grounding bushing on the end of each conduit. Install a bonding jumper from the bushing to any equipment ground bus or ground pad. Interconnection of bonding jumpers from each conduit grounding bushing to the equipment ground bus or ground pad is acceptable.

2. If neither a ground bus or ground pad exists, connect the bonding jumper to the metallic enclosure with a bolted-lug connection.

3. Make conduit connections to NEMA 3R, NEMA 4, or NEMA 4X enclosures, junction boxes, terminal junction boxes, or device outlet boxes with watertight, corrosion resistant hubs. The conduit connections shall maintain the integrity of the enclosure NEMA rating.

J. Expansion Joints:

1. Provide expansion/deflection fittings for raceways crossing expansion joints in structures, between structures and walkways or concrete slabs to compensate for expansion, contraction, and deflection. Provide expansion only fittings in every 200 feet of exposed, straight, rigid steel conduit runs.

K. PVC Coated Rigid Steel Conduit:

1. Install in strict accordance with the manufacturer's instructions. Touch up any damage to the coating with conduit manufacturer acceptable patching compound. PVC boot shall cover all threads. Where belled conduits are used, bevel the unbelled end of the joint before joining. Leave no metallic threads uncovered. Clean field threads with solvent and coat with urethane touch-up. Keep two cans of urethane touch-up at each threading station.

L. Penetrations:

1. Seal the interior of all raceways entering structures or buildings at the first box or outlet with duct seal to prevent the entrance into or exit from the structure of gases, liquids, or rodents.

2. Where conduit enters a new structure above ground or below grade through a concrete roof or wall, install a watertight conduit penetration seal and sleeve. Install the sealing assembly such that it may be tightened at any time from the interior side. For wall and roof penetrations, dry pack with non-shrink grout around the conduit and the sealing assembly on the exterior side. Where conduit enters a new structure below grade through a concrete floor, cast the conduit directly into the concrete floor slab.

3. Where raceways penetrate fire rated walls, floors, or ceilings, provide firestop material specified herein in openings around electrical penetrations to maintain the fire resistance rating.

4. All connections between conduits and NEMA 1, 1A, and 12 enclosures shall be made with hubs outside and bushings on the inside. All NEMA 3R, 4, and 4X enclosures without integral watertight hubs shall have watertight, threaded, rigid, conduit hubs.

M. Wireways

1. Mount wireways securely in accordance with the CEC and manufacturer's instructions. Locate removable cover on accessible vertical face of wireway unless otherwise indicated.

N. Preparation for Pulling in Conductors

1. Do not install crushed or deformed raceways. Avoid traps in raceways. Take care to prevent the lodging of plaster, concrete, dirt, or trash in raceways, boxes, fittings, and equipment during the course of construction. Make raceways entirely free of obstructions or replace them. Ream all raceways, remove burrs, and clean raceway interior before introducing conductors or pull tape.

2. For underground concrete-encased and direct-buried raceways, prove the integrity of the raceway system as specified in Section 26 05 43 before pulling in conductors.

3. Immediately after installation, plug or cap all raceway ends with watertight and dust-tight seals until the time for pulling in conductors.

O. Empty Raceways

1. Certain raceways will have no conductors pulled in as part of this Contract. Identify with conduit tags at each end and at any intermediate pull point of each such empty raceway. Provide a removable cap over each end of empty raceways. Provide a detectable pull tape with a minimum of 3-feet of slack at each end in each empty raceway. Provide cap with eyelet for attaching the pull tape.

2. Strip insulation from the jacket of the detectable pull tape wire and attach to the ground rod in each manhole or pullbox, to the frame of metallic pullboxes, to switchgear ground busses, to switchboard ground busses, and to control panel ground busses.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. All electrical equipment and systems shall include identification tags or nameplates as shown on the drawings and as specified herein.

2. The Contractor shall develop a tagging system in accordance with the information shown on the Drawings and the procedure specified in this Section.

B. Related Sections:

1. Section 01 33 00 – Submittal Procedures

1.2 SUBMITTALS

A. Submittals shall be made in accordance with Section 01 33 00

B. In addition to the requirements of Section 01 33 00:

1. A tagging system scheme or schedule shall be submitted to the Engineer for review and approval prior to tagging of equipment.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Conduit Identification Tags

1. Conduit tags shall be of the reusable labeling type so that changing of the labels can occur without removing the tag from the conduit. Construct the label holder so that the labels can slide on and off when they need to be changed or replaced. The conduit tags shall be suitable for industrial use.

a. Outdoor or indoor (below grade) locations:

1) Provide an aluminum tag holder of sufficient size to hold the alphanumeric conduit tag designations specified in the conduit schedule on the drawings.

2) Provide screen printed aluminum tags with black letters on yellow background. Provide horizontal orientation with nominal 1" letter height using Helvetica Black Condensed font.

b. Indoor locations (above grade) locations:

1) Provide a polyethylene tag holder of sufficient size to hold the alphanumeric conduit tag designations specified in the conduit schedule on the drawings.

2) Provide hot stamped polyethylene tags with black letters on yellow background. Provide horizontal orientation with nominal 1" letter height using Helvetica Black Condensed font.

2. Attach the conduit tag holder to the conduit using #18 AWG 316 tie wire.

3. Provide equipment and tools to make the labels and connect the tags to the conduits.

4. In addition to the conduit number tags, provide separate "Caution Fiber Optic Cable" labels where fiber optic conduits are shown on the Drawings.

5. Acceptable Manufacturers:

a. Almetek ID Marking Systems, Mini-Tag or E-Z Tags

1) Outdoor tag holder: TH-0X-A/SL, where X is the number of characters

2) Outdoor tags: H300

3) Indoor tag holder: TC-CP, where X is the number of characters

4) Indoor tags: H900

5) Fiber Optic Cable tag: FO250

b. Or equal as approved by the Engineer

B. Wire labels for #1 AWG and smaller

1. Wire labels relying on adhesives or taped on markers are not acceptable.

2. Individual wires #1 AWG and smaller in each cable or wire bundle shall be identified with legible permanent sleeve of white heat-shrink polyolefin with machine printed weatherproof black marking.

3. Meet UL Standard 224 for flammability

4. Provide necessary tools and accessories to print labels and shrink labels.

5. Acceptable Manufacturers:

   a. Brady Model B-342 Brady PermaSleeve 1.5” width one-sided thermal transfer labels

   b. Panduit

   c. Or equal as approved by the Engineer

C. Wire labels for #1/0 and larger sizes and cable identification tags

1. Cable tags shall be of the reusable labeling type so that changing of the labels can occur without removing the tag from the cable. Construct the label holder so that the labels can slide on and off when they need to be changed or replaced. The tags shall be suitable for industrial use.

2. Tag holders shall be PVC for horizontal orientation sized to hold the alphanumeric conduit tag designations specified in the cable schedule on the drawings.

3. Tags shall be black letters on yellow background.

4. Attach the cable tag holder to the cable or wire bundle using UV protected, self-locking black nylon cable ties.

5. Acceptable Manufacturers:

   a. Almetek ID Marking Systems, Mini Tags

   b. Tyco Electronics, K-Type cable Markers

   c. Or equal as approved by the Engineer

D. Equipment Nameplates

1. Reference Section 01 91.13.10 for nameplate product and installation requirements, Reference Drawing 9492-G-007 for nameplate letter and background color requirements. Note that per Drawing 9492-G-007, all cabinet nameplates shall have white background and black lettering. For hanging tag applications, use the color schedule shown on the Drawing.

E. Steel electrical utility poles

1. Crossarm and pole marking

a. “HIGH VOLTAGE” crossarm marker shall be polyethylene and shall have 3” high black letters on yellow background. Overall length of sign shall be 3.5” x 14”.

b. Acceptable manufacturers:

1) Electromark

2) Or equal as approved by the Engineer

2. Pole identification

a. 3” high embossed metal digits that are held in an aluminum panel slide-in marker holder. Digits shall be black on a yellow background. The digits shall slide into the marker holder from the back and once in place, the edges of the marker holder shall be crimped so that the digits cannot be pried out from the front.

b. Pole identification shall have a vertical orientation with the following tag format:

$$\frac{01}{14}$$

where “01” is the mile number, “14” is the pole number in the reference mile number, and a horizontal bar is between the upper mile number and lower pole number. Numbering shall always use two digits and leading zeroes shall be added to numbers 1-9 as required so that a two digit number is obtained.

c. Acceptable manufacturers:

1) Electromark – StrongHolds

2) Or equal as approved by the Engineer

3. Ownership identification

a. Provide 3" square property ID label for each pole as shown below:

EBMUD

OWNED POLE

b. ID label shall have a screen printed color graphic over a white background on a 20-mil anodized aluminum plate suitable for nailing on a wood pole. Protect the graphic with a clear anodized layer that resists heat and sunlight.

c. Acceptable manufacturers:

1) Electromark – E-Guard

2) Or equal as approved by the Engineer

4. Dating disc

a. Provide a 2" circular dating disc as shown below:

b. The dating disc shall use the actual year that the pole was set (“2008” is simply an example for illustrative purposes).

c. The dating disc shall have black text made from silver particles over a white background on a 20-mil anodized aluminum plate suitable for nailing on a wood pole. Protect the graphic with a clear anodized layer that resists heat and sunlight.

d. Acceptable manufacturers:

1) Electromark – E-Guard

2) Or equal as approved by the Engineer

5. Dating nail

a. Used to attach the dating disc to the pole. Dating nail shall be hot-dip galvanized with the year that the pole is set on the nail head.

b. Acceptable manufacturers:

1) Hubbell Power Systems (Chance)

2) Or equal as approved by the Engineer

6. Rigid phase markers

a. 3" x 3" marker with white background and red letters. Provide markers with “A”, “B”, and “C” engraving. Providing rigid phase markers at the following locations:

1) Each low and high rigid bus support

2) Each disconnect switch platform

3) Each metering unit, CCVT, and wavetrap

b. Acceptable manufacturers:

1) Electromark – Phaz/Fixed

2) Or equal as approved by the Engineer

F. Phase rotation markers.

1. 2" X 2" yellow polyester marker with black lettering. Markers are required for the following power distribution equipment:

a. High- or medium-voltage switchboards

b. Medium-voltage switchgear at the incoming line compartment

c. All 480Y/277 VAC and 208Y/120 VAC panelboards

2. Acceptable manufacturers:

a. Electromark – Phaze/Order

b. Or equal approved by the Engineer

G. Cable route markers

1. Galvanized screw anchor with 6” diameter copper alloy identification top plate that indicates a buried cable or ductbank routing. Custom engrave the following information in the top plate insert:

a. EBMUD

b. Number of feet to the next pullbox, manhole, or connection, along with the pullbox/manhole/connection designation.

2. Acceptable manufacturers:

a. Hubbell Power Systems (Chance)

b. Or equal as approved by the Engineer

H. Warning tape

1. Provide underground detectable warning tape. The tape shall be constructed of solid aluminum core that is laminated with a protective clear film on both sides, sealing and protecting the graphics from underground moisture, acids and alkalis. Tape color shall be red and be 6-inch minimum width, with black lettering, for use in trenches containing electric circuits. Use tape with printed warning “CAUTION-BURIED ELECTRIC LINE BELOW”.

2. Acceptable Manufacturers:

a. Stanco, Inc. Underground Tape No. PUWT-604D

b. Panduit Corp. Hazard Tape Part No. HTDU6R-E

c. Or equal as approved by the Engineer

I. Pushbutton Legend Plates

1. Provide legend plates for pushbuttons, selector switches and pilot lights with inscription as shown on the drawings. Provide adapter ring as necessary to fit devices with legend plates. Legend plates shall be made by same manufacturer as pushbutton device, selector switch and pilot light.

2. Acceptable Manufacturers:

a. Eaton HT800 Series

b. General Electric CR104P Series

c. Allen Bradley Bulletin 800T

d. Or equal as approved by the Engineer

J. Circuit Label for Receptacle and Light Switches

1. Provide phenolic nameplate with black letter on white background located on or directly above the receptacle or light switch faceplate indicating source of power (panelboard name and circuit number(s)).

PART 3 - EXECUTION

3.1 GENERAL

1.

B. Conductor Identification:

1. Identify conductors at each termination and in all accessible locations such as manholes, handholes, control panels, panelboards, pull boxes, junction boxes, wireways, junction terminal boxes, switchgear, motor starters, disconnect switches, etc. For identification, use type of conductor and cable tags specified herein. A typical circuit will have the following identification: conduit tag, overall cable tag, and individual wire labels.

C. Legend Plates and Nameplates

1. Install nameplates on devices or equipment as specified in Equipment Asset Tag list shown in drawing 101.00-E-305.

2. Provide legend plate engraving for pilot devices as shown on the drawings; if not shown, Contractor shall submit a schedule showing proposed legend plate text for the Engineer's approval.

3.2 TAGGING OF WIRES AND CABLES

A. All wires and cables shall be tagged and laced in pull or junction boxes, manholes, handholes, wireways, and at each termination. Each wire and cable shall be tagged at least once as it passes through each pull or junction box, manhole, handhole, and at each termination. Each wire and cable shall be tagged at least once as it passes through wireways. Wires and cables shall be laced so that the wires of the individual circuits are laced together by circuit and the laced together circuit or cable shall be tagged with the cable number. Power, lighting, control, alarm, annunciator, and instrumentation wiring shall be bundled, laced, and tagged, as specified herein.

B. All wires and cables within control panels, switchgear, motor control centers, mechanical mounting panels, terminal junction boxes, etc., shall be tagged at each termination with conductor tags as specified. All circuit identification tags shall be readily accessible for inspection at the locations cited above.

C. Label wires with cable numbers as shown on the drawings. Cable labels shall be placed within one inch of the ends of the cable jacket.

D. All spare pairs shall be bundled and labeled with the cable designation. All individual pairs shall be tagged to enable identification of spare pairs when making future terminations.

B. Identify multi-circuit control cables and individual instrumentation and control circuits as indicated on the Drawings. Multicircuit cable shall be tagged with the cable name around the entire cable assembly and shall have the individual circuits tagged as well. Tag twisted, shielded pairs and where exposed, multipair cable twisted pairs around each pair separately.

E. Identify each individual conductor at each termination. This includes such locations as switchgear, switchboards, motor control centers, variable frequency drives,

control panels, junction/terminal boxes, all field devices, security panels and junction boxes, and all other locations where conductors are terminated. Identify the termination of these conductors in accordance with the accepted shop drawings. Tag conductors with sleeve type labels.

F. Where more than 1 nominal voltage system exists, identify each ungrounded system conductor by phase and system. Permanently post means of identification at each branch-circuit panelboard, switchboard, switchgear, motor control center, or other type of power distribution equipment.

G. Include the following minimum information for wire and cable identification:

1. Circuit number or load identification tag number

2. Origin (from source)

3. Destination (to load)

H. Wire Numbers:

1. The Contractor shall coordinate the wire numbering system with all vendors of equipment so that each and every field wire has a unique wire number associated with it for the entire system.

a. Wire numbers for field instrumentation and circuits shall correspond to the designation shown in the cable schedule and the E-200 or E-400 series drawings. Generally, the instrument tag is the wire number, with appropriate suffix modifiers to give each wire a unique name. Examples:

1) Control circuit C1C1 (from the cable schedule) connecting a temperature switch with tag number TSH-001 to a process control panel would have wire numbers specified in the E-200 or E-400 series drawings as TSH001+, TSH001-, and TSH001SH, assuming a twisted shield pair.

2) Control circuit C9J1 (from the cable schedule) connecting a thermostat to an air handling unit with tag number TE-075 would have wire numbers TE075+, TE075-, TE075RTN, and TE075SH, assuming a twisted shield triad.

3) Control circuit A1C1 does not have any specific wire numbers shown on the E-200 or E-400 drawings. Therefore, use A1C1-1, -2, -3, etc., assuming a multiconductor cable.

b. Wire numbers for field power circuits shall correspond to the designation shown in the cable schedule on the drawings, with appropriate suffix modifiers to give each wire a unique name. Examples:

1) Power circuit M1P1 on the cable schedule going to a three-phase motor: use suffix modifiers -1, -2, -3, and -G for the individual three-phase and ground conductors).

2) Power circuits for receptacles and lighting: use the panelboard circuit number(s) where the branch circuit originates (for example, L5P16 with suffix modifiers -L, -N, and -G for a 120VAC lighting circuit originating at panelboard 5, circuit 16).

c. For telecommunication and specialty control circuits, provide the cable designation shown on the cable schedule. Unless otherwise specified on the Drawings, it is not necessary to provide individual wire numbers for these applications.

END OF SECTION

SECTION 26 05 91

POWER BUILDING AND ELECTRICAL EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes

1. Prefabricated power building, complete with building heating, ventilation, and air conditioning (HVAC), lighting, 15 kV medium-voltage metal-clad switchgear, 48 VDC liquid NiCad station battery systems, low-voltage alternating current (AC) and direct current (DC) power distribution equipment, protection, and control (PAC) equipment, extra materials, related accessories, and manufacturer's field services as required.

2. Develop custom maintenance job plans for all equipment types listed in the Asset List Templates after "END OF SECTION".

3. Extra materials

4. Manufacturer's field services

5. Owner's instruction

B. Related sections

1. Section 01 33 00 – Submittal Procedures

2. Section 01 43 11 – Seismic Qualification and Certification

3. Section 01 81 02 – Seismic Design Criteria

4. Section 01 81 04 – Wind Design Criteria

5. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables

6. Section 26 05 26 – Grounding and Bonding for Electrical Systems

7. Section 26 05 33 – Raceway and Boxes for Electrical Systems

8. Section 26 05 53 – Identification of Electrical Systems

9. Section 26 22 13 – Low-Voltage Distribution Transformers

10. Section 26 24 16 – Panelboards

11. Section 26 27 26 – Wiring Devices

12. Section 26 28 13 – Fuses

13. Section 26 53 00 – Exit Signs

14. Section 33 77 01 – 15kV Medium Voltage Automatic Delayed Transition Transfer Switch

1.2 REFERENCES

A. All materials, equipment and labor supplied by the manufacturer shall be in strict compliance with the statutes, codes and standards listed below:

1. American Institute of Steel Construction (AISC)

2. American National Standard Institute (ANSI)

a. ANSI C37.50 – Test Procedures for Low-Voltage AC Power Circuit Breakers Used in Enclosures

b. ANSI C37.51 – Standard for Conformance Testing of Metal-Enclosed Low-Voltage AC Power Circuit Breaker Switchgear Assemblies

c. ANSI/IEEE C37.04 – IEEE Standard Rating Structure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis (includes supplements C37.04C, C37.04G, C3704H, C37.04I)

d. ANSI C37.06, Switchgear – AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis - Preferred Ratings and Related Required Capabilities (includes supplement ANSI C37.06a)

e. ANSI/IEEE C37.09 – IEEE Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis

f. ANSI/IEEE C37.010 – IEEE Application Guide for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis

g. ANSI/IEEE C37.11 – IEEE Standard Requirements for Electrical Control for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis

h. ANSI/IEEE C37.13.1a – Standard for Low-Voltage AC Power Circuit Breakers Used in Enclosures

i. ANSI/IEEE C37.16 – Preferred Rating for Low-Voltage Power Circuit Breakers

j. ANSI/IEEE C37.17 – Standard for Trip Devices for AC and General Purpose DC Low Voltage Power Circuit Breakers

k. ANSI/IEEE C37.20.1 – Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear

l. ANSI/IEEE C37.20.2 – IEEE Standard for Metal-Clad and Station-Type Cubicle Switchgear

m. ANSI/IEEE C37.90.1 – IEEE Standard Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus

n. ANSI/IEEE C57.13 – IEEE Standard Requirements for Instrument Transformers

o. ANSI/IEEE C62.11 – IEEE Standard for Metal-Oxide Surge Arresters for AC Power Circuits (> 1kV)

p. ANSI/IEEE 450, IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications

q. ANSI/NEMA C12.20 – Electricity Meters 0.2 and 0.5 Accuracy Classes

r. ANSI/NETA ATS – Latest edition of ANSI/NETA Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

3. ASCE 7 – Latest Edition, American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures

4. ASTM International (ASTM)

   a. B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus

   b. D3363 – Standard Test Method for Film Hardness by Pencil Test

5. American Welding Society (AWS)

   a. AWSD1.1 Structural Welding Code – Steel

6. California Electrical Code (CEC)

7. California Building Code (CBC)

8. Code of Federal Regulations (CFR)

9. Institute of Electrical and Electronics Engineers (IEEE)

a. IEEE 693, IEEE Recommended Practice for Seismic Design of Substations

b. IEEE C37.90, IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus

c. IEEE C57.12.01, General Requirements for Dry-Type Distribution and Power Transformers Including Those with Solid Cast and/or Resin-Encapsulated Windings

d. IEEE C57.12.91, Test Code for Dry-Type Distribution and Power Transformers

e. ANSI/IEEE C57.96, Distribution and Power Transformers, Guide for Loading Dry-Type appendix to ANSI C57.12 standards

10. National Electrical Code (NEC)

11. National Electrical Manufacturers Association (NEMA)

12. National Fire Protection Association (NFPA)

    a. Latest edition of NFPA 70E, Standard for Electrical Safety in the Workplace

13. NEMA PB 2.2 – Application Guide for Ground-Fault Protective Devices for Equipment

14. NEMA SG 2, High Voltage Fuses

15. NEMA SG 4, Alternating-Current High Voltage Circuit Breaker

16. NEMA SG 5, Power Switchgear Assemblies

17. NEMA ST-20 – Dry Type Transformers for General Applications

18. North American Electric Reliability Corporation (NERC) Standard PRC 005 2 – Protection System Maintenance

19. Occupational Safety and Health Administration (OSHA)

20. Underwriters Laboratories (UL)

1.3 SYSTEM DESCRIPTION

A. Design criteria

1. Wind loading per Section 01 81 04.

2. Seismic criteria per Section 01 81 02.

1) Qualification:

a) For equipment covered by IEEE Std 693, an acceptable (and preferred) certification of seismic qualification is a seismic report prepared by the equipment manufacturer in accordance with IEEE Std 693. This report shall certify that the equipment meets or exceeds IEEE Std 693 high seismic qualification level requirements

b) For equipment not covered by IEEE Std 693, provide certification that the equipment is seismically qualified by an approved shake table testing report following the requirements in Section 13.2 of ASCE 7-16

2) Anchorage for the building to the concrete foundation is the responsibility of the Supplier. Anchorage structural calculations shall be submitted to the District for review and approval. Calculations shall be stamped and signed by a civil or structural engineer registered in the state of California.

2) Special Inspection

Provide special inspection of building anchorage as required per California Building Code

3. Live loads

a. Roof: 30 psf

b. Floor: 250 psf

4. Building base deflection: Maximum deflection shall be limited to L/240, where L is the length of a structural member.

5. Lighting

a. Normal lighting: 30 foot-candles at 3′-0″ above finish floor

1) Parameters:

a) Light Loss Factor = 0.7 or per manufacturer recommendations

b. Emergency lighting: 1 foot-candle at the egress walking surface

B. HVAC criteria

1. Provide a HVAC system sized for the ambient site conditions in Calaveras County, California, USA, including the dimensions of the building, the solar heating of the building, and the interior heat load.

2. The system shall be designed such that the sensible (not total) cooling capacity, will maintain an ambient temperature inside the building between 55°F (minimum) and 80°F (maximum).

3. Assume exterior design temperatures between 10°F (minimum) and 110°F (maximum).

4. Coordinate cooling air volume, air velocity, and size of air inlets and outlets in the power building with the heat loss expected for the electrical equipment.

1.4 SUBMITTALS

A. General

1. Make submittals in accordance with Section 01 33 00

2. Provide a fabrication schedule, including anticipated delivery date.

3. Provide shipping dimensions and shipping weights.

4. Provide building anchorage submittal that outlines the Supplier's recommended anchorage for the building to the concrete pad at the mounting location. The submittal shall include the following :

   a. Anchorage calculations stamped and signed by a civil or structural engineer registered in the state of California for review and approval by the District.

   b. The recommended anchors for the building to the concrete pad

   c. Any coordination required with the site installation Contractor in layout and construction of the concrete pad to accommodate the building

   d. Supplier's proposed means and methods for installation, including proposed crane placement on-site, duration of crane placement, any temporary lay-down areas required for off-loading, plating and other protective measures for protecting existing underground utilities, temporary setting for marking bolt hole locations drilling, etc.

   e. Any required logistical coordination required with the site installation Contractor

5. Provide contact information for the manufacturer's representatives that will be conducting manufacturer's field services.

6. Product data

7. Itemized bill of material

B. Calculations

1. Structural and seismic calculations of the building shall be stamped and signed by a registered Civil or Structural Engineer registered in the state of California. See Sections 01 81 02 and 01 81 04 for design criteria and calculation requirements.

2. Certified HVAC calculations

C. Power building

1. Building shop drawings showing interior elevation, exterior elevation, plan, base skid, base skid top plate, and ceiling views

2. Floor base cutout drawing

3. Framing, wall, roof, and base skid details

4. Exterior finish paint color samples

a. Submit three samples, each 8" x 10" size, that illustrate each color and texture for each surface finish scheduled, made from the actual paint to be used. Lighting, receptacle, and grounding plan, conduit layout and support details, conduit entrances, nameplate data, bus arrangement, dimensions, weight, shipping splits, and control and protection layouts

5. HVAC details and sequence of operation

6. Lifting diagram

7. Detailed excel spreadsheet listing all wiring removed for shipping and requiring reinstallation at the building site.

D. Medium-voltage metal-clad switchgear

1. Product data for all switchgear assembly components

2. Data sheets

a. Breaker summary and nameplate data sheet

b. Ground and test device summary and nameplate data sheet

c. Nameplate schedule for all components

d. Switchgear lineup section summary data sheet, including nameplate data and UL stack labeling

e. Summary data sheet of all switchgear options provided, including certifications, electrical options, and mechanical options

f. Equipment summary data sheet of all special requirements required by this specification section

3. Drawings

a. Title sheet

b. Front view, floor plan and side view of each vertical section

c. Panel layout for each section

d. Breaker internal schematic diagram

e. Contact developments of control and selector switches, protective relays, test switches, DC and AC auxiliary relays, and similar items

f. Three-line AC and DC elementary diagrams for metering, relay, and control circuits. Three lines shall include both switchgear compartment three lines and an overall three line encompassing all three phase PAC components . DC elementaries shall incorporate PAC components.

g. Point-to-point compartment wiring diagrams showing all wire and terminal numbers

h. High seismic installation details

i. Handling, lifting, rigging, and jacking details

j. Control wiring installation details

k. Cable taping instructions and details

4. DC current requirements

a. Trip, close, and charging motor for the circuit breaker

b. All other DC-powered equipment

5. Itemized bill of material for all switchgear assembly components and spare parts

6. IEEE Std 693 “High” seismic qualification certification

7. Seismic anchorage calculations

8. Certification of equipment by Underwriters Laboratory (UL) or other equivalent nationally recognized independent testing laboratory

9. California code certification

10. Factory test procedures

11. Certified factory test reports including the punch list developed during factory testing. Describe point-by-point how each punch list comment was addressed

12. Field commissioning reports

E. PAC Equipment

1. PAC Components

a. Product data for all PAC system components

b. Itemized bill of material for all PAC system components and spare parts

c. Plan, elevation, and section drawings, including arrangement, dimensions, and mounting details

d. Internal schematics (elementary diagrams), wiring diagrams, and point-to-point system interconnection diagrams. In addition, provide interconnection diagrams in Microsoft Excel format.

e. Show contact developments of control and selector switches, protective relays, test switches, DC and AC auxiliary relays, timers, and similar items.

f. Show relative physical arrangement and terminal locations of devices and terminal blocks.

g. Use a terminal address system at origins and destinations of actual wiring. Tabular format wiring lists are not acceptable.

h. Wire numbers assigned on schematic diagrams shall exactly correspond to wire numbers on wiring diagrams.

i. IEEE Std 693 “High” seismic qualification certification

j. Seismic anchorage calculations, see Section 01 81 02.

k. Training schedule

l. Instruction manuals

m. Field acceptance testing reports

F. Panelboard schedules

G. Nameplate schedule

H. Itemized list of extra materials furnished specifically for this project, including quantities, description, and part numbers

I. Equipment seismic qualifications, seismic calculations, and anchorage details as specified

J. Detailed list of factory tests to be performed

K. Certified production test reports for:

1. Automatic transfer switch

2. Battery charger

3. Medium-voltage metal-clad switchgear

a. Switchgear: IEEE C37.20.2 – Chapter 6.3 production test reports

b. Power Circuit Breakers: IEEE C37.09 – Chapter 5 production test reports

4. Serialized metering and relaying CT test reports for all current transformers on this project from the original equipment manufacturer

5. Serialized VT test report for all voltage transformers on this project from the original equipment manufacturer

L. Manufacturer's installation, operating, and maintenance instructions

M. Manufacturer’s renewal parts literature and cost quotation for one year’s recommended spare parts for all equipment

N. As-built documents, including all drawings in Bentley MicroStation or .DXF AutoCAD format

O. As-built documents and Operation and Maintenance (O&M) manuals

P. Training plan and schedule

1.5 QUALITY ASSURANCE

A. Pre-fabrication meeting

1. The equipment requires fast-track fabrication and delivery due to the time sensitivity of the project. With the goal of entering into fabrication of this equipment as quickly as possible, a submittal review meeting is required between the Supplier and the District once Supplier shop drawings are complete.

2. The meeting shall take place at the Supplier's facility where the equipment will be assembled. The Supplier shall invite all of the manufacturer's representatives for each of the different items of electrical equipment to be integrated in the power building. At the meeting, the District, the Supplier, and equipment manufacturer's representatives shall jointly review the shop drawings, equipment, bill of materials, and proposed scope of manufacturer's field services for conformance with this document.

3. Assuming that any issues discovered can be quickly resolved, the District's goal will be to release the power building for fabrication at the conclusion of this meeting, with the understanding that any issues will be documented, corrected by the Supplier, and otherwise resolved prior to fabrication.

4. The District will send three (3) engineers and two (2) electrical technicians to the Supplier's manufacturing facility for this meeting. Include all travel costs in the proposal as described in Article 2.11 – SOURCE QUALITY CONTROL.

B. Medium-voltage metal-clad switchgear

1. To the maximum extent possible, switchgear shall be listed or labeled by Underwriters Laboratories or other equivalent nationally recognized testing laboratory.

2. Switchgear shall be certified to meet the applicable requirements of the California Code of Regulations Title 24, Part 2 (California Building Code) and Part 3 (California Electrical Code).

C. Seismic qualification

1. The following equipment shall be qualified for use in high seismic loading as defined in IEEE Std 693 (i.e., "IEEE-693 High"), for in-service installation anchored in accordance with the anchor design provided in the seismic anchorage calculation submittal specified in this section:

a. 48 VDC battery rack

b. AC and DC panelboards

c. Automatic transfer switch

d. Low-voltage dry-type distribution transformers

e. Medium-voltage metal-clad switchgear

f. PAC Components

g. Battery chargers

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery address

1. Pardee Chemical Plant

a. 3535 Sandretto Road, Valley Springs, CA 95252

B. Buildings shall not be shipped to the site until:

1. Certified factory test reports, including the punchlist developed during the factory demonstration test, have been approved

Or

2. The District inspector authorizes release for shipping at the factory demonstration test

C. For a building that must be shipped in multiple shipping sections, provide junction terminal boxes at the shipping splits for easy breakdown of the building wiring for shipment and reconnection at the job site. Prior to shipment, the open end/sides of each shipping section shall be crated (weatherproofed) for transit to the job site.

D. The Supplier shall protect and securely pack equipment for the environmental conditions during transit to the jobsite.

E. An air ride, open trailer truck directly to the work site is required. One impact indicator ("go/no-go" type, 2g, 4g, 6g indicators) shall be installed on each section of the shipment.

F. All interconnection cables between shipping splits shall be disconnected, coiled, and protected for transit.

G. All components removed from the power building for shipment shall be clearly marked for easy reassembly at the jobsite.

H. A copy of the latest revision of the bill of material shall be shipped with the equipment.

I. Maintain factory protection of equipment and cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. Heat enclosures to prevent condensation. Connect space heaters to temporary power upon delivery of the equipment to the site or interim storage facility. Space heaters shall be energized at all times.

1.7 PROJECT CONDITIONS

A. The prefabricated power building and the electrical equipment shall be located in outdoor areas, on a concrete pad. The ambient temperature in the area will be

between 10 degrees and 110 degrees Fahrenheit. Indoor locations shall be protected to prevent moisture from entering enclosure.

B. Humidity: 0 – 95 percent RH, non-condensing.

1.8 WARRANTY

A. Power building supplier shall provide a warranty for all equipment provided by the supplier in the Contract Documents as follows:

1. Expressly warrants that all goods and services to be furnished shall confirm to the descriptions and specifications contained herein and in supplier catalogs, product brochures and other representations, depictions or models, and will be free from defects, of merchantable quality, good material, and workmanship.

2. Expressly warrants that all goods and services to be furnished shall be fit and sufficient for the purpose(s) intended. This warranty shall survive any inspections delivery, acceptance, payment, or contract termination for any reason, by District.

3. Unless otherwise specified, supplier warrants that all work and services furnished hereunder shall be guaranteed for a period of two years from the date of delivery.

1.9 OWNER'S INSTRUCTIONS

A. Provide operating and maintenance training to District personnel for the power building, medium-voltage metal-clad switchgear, PAC components, battery systems, automatic transfer switches, and building auxiliary systems. Customize the training program specifically for the equipment supplied on this project.

B. The proposal shall include 1 day/8 hours of training time and 1 round trips for training services described in this Section for a field service engineer employed by the Supplier.

C. Each training session will have 12 attendees.

D. The session will be scheduled at a mutually convenient time for all parties.

E. The training session shall be organized as follows:

1. Power building auxiliary equipment

a. Review the O&M manual for the HVAC equipment

1) General review of binder sections in the O&M manual

2) Review of all drawings

a) HVAC equipment plan and details

b) HVAC sequence of operation

3) Renewal parts and ordering procedures

4) Procedures for initiating warranty work

5) Manufacturer contact information

b. Assembly

1) Components and their functions

2) Safety practices

3) Operation

4) Inspection and maintenance

5) Lubrication

6) Testing

c. Hands-on exercises

1) Visually identify HVAC system components and understand their functions

2) Demonstrate cleaning/replacement of air filters

3) Demonstrate adjustment of supply and return air registers

4) Demonstrate cleaning of the outdoor coil

5) Demonstrate digital thermostat operation and navigation through all menu levels

6) Demonstrate the process for making setting changes to parameters using the digital thermostat

2. Medium-voltage metal-clad switchgear

a. Single-line diagram overview to familiarize participants with the facility's electrical distribution system

b. O&M manual review

1) General review of binder sections in the O&M manual

2) Review of all drawings

a) Switchgear layout and power flow

b) Three-line diagrams

c) Circuit breaker and control schematics

3) Renewal parts and ordering procedures

4) Procedures for initiating warranty work

5) Manufacturer contact information

c. Switchgear assembly

1) Components and their functions

2) Safety practices

3) Operation

4) Inspection and maintenance

5) Lubrication

6) Testing

7) Using the circuit breaker lift truck

d. Circuit breakers

1) Components and their functions

2) Safety features and interlocks

3) Operation

4) Inspection and maintenance

5) Lubrication

6) Testing

7) Using the remote racking device

8) Renewal parts

e. Hands-on exercises

1) Visually identify switchgear components and understand their functions

2) Demonstrate operation of interlocks between the switchgear and circuit breakers, including stationary auxiliary and position switches

3) Demonstrate proper use of the circuit breaker lift truck

4) Demonstrate manual and electrical operation of the circuit breakers

5) Demonstrate manual racking of the circuit breaker to the test, closed, and disconnect positions, including use of the secondary coupler and test cabinet

6) Demonstrate remote racking operator.

7) Demonstrate closed door circuit breaker racking using the remote racking device

8) Demonstrate circuit breaker slow closing

9) Demonstrate how to check the circuit breaker contact erosion, wipe, and gap

10) Demonstrate how to check and test the circuit breaker vacuum bottle integrity

11) Demonstrate the application of temporary grounds with a shotgun-style hot stick to the grounding ball studs

12) Demonstrate the manufacturer's recommended insulation resistance testing procedure, including the required disconnection of devices prior to testing

13) Demonstrate the correct technique for conducting an infrared (IR) survey using the IR sight glass windows

3. PAC system training

   a. The Project bid shall include 1 day/8 hours of training time and 1 round trip for training services described in this Section, conducted by a field service engineer employed by the PAC System Integrator.

4. Provide SEL University-tailored training on the SEL-751 product specified in this Section. Training session shall be organized as follows:

   a. Review of common relay interface tasks such as serial port communication, metering, and analyzing event reports.

b. SEL 751 relay overview including protection elements, operation, setting the relay, and testing; discussion of single breaker single bus operation, bus protection and breaker failure operation; discussion of the equivalence of breaker failure operation for a line fault to a bus fault as the rationale for combining these functions.

c. Each training session shall have up to 12 attendees.

d. The session shall be scheduled at a mutually convenient time for all parties.

5. Automatic transfer switch

a. Single-line diagram overview to familiarize participants with the facility's electrical distribution system.

b. O&M manual review

1) General review of binder sections in the O&M manual

2) Review of all drawings:

a) ATS enclosure drawing, with plan, front, and side views

b) Legend, operation, and accessory drawing

c) ATS sequence of operation

d) ATS power circuit and layout

e) ATS controller and related panels

3) Renewal parts and ordering procedures

4) Procedures for initiating warranty work

5) Manufacturer contact information

c. Assembly

1) Components and their functions

2) Safety practices

3) Operation

4) Inspection and maintenance

5) Lubrication

6) Testing

d. Hands-on exercises

1) Visually identify ATS components and understand their functions.

2) Demonstrate operation of interlocks in the ATS

3) Demonstrate keypad operation and navigation through all menu levels

4) Demonstrate the process for making user setting changes to parameters using the keypad

5) Demonstrate the procedure for initiating a transfer test

6) Demonstrate manual operation of the switch

7) Demonstrate the manufacturer's recommended insulation resistance testing procedure, including the required disconnection of devices prior to testing

1.10 MAINTENANCE

A. Extra materials

1. Extra materials shall be boxed or packaged for long-term storage.

2. Medium-voltage metal-clad switchgear extra materials. Provide one complete set of the following materials:.

a. One complete spare set of three primary and three secondary voltage transformer fuses

b. One complete spare set of two primary control power transformer fuses

c. One spare secondary molded case circuit breaker for the control power transformer

d. Six spare control power fuses of each size used

e. Storage cabinet to store all spare fuses specified

f. Six spare circuit breaker indicating and locking-out relay LED lamps, two each red, green, and amber color

g. Circuit breaker lift truck

h. Circuit breaker manual racking wrench

i. Circuit breaker manual charge handle

j. Circuit breaker wipe adjustment tool

k. Secondary extension test cable for operating the circuit breaker in the disconnected position

l. Saddle type remote racking operator, complete with push-button, 120 VAC, 60 Hz, motor operator, and 25 feet of cable

m. One-pint can of touch-up paint

3. PAC system extra materials. Provide one complete set of the following materials.

   a. Quantity one (1) SEL-751 feeder protective relays, Device MPR

   b. Quantity one (1) lockout relays, Device 86, with the same contact development as the relays shown on the Drawings

   c. Quantity one (1) circuit breaker control switches with the same contact development and configuration as shown on the Drawings

   d. Quantity one (1) 3-position selector switch with the same contact development and configuration as shown on the Drawings

4. Grounding extra materials

   a. Provide two complete grounding sets, each set with the following features

      1) Three-phase, clear jacketed #1/0 AWG copper cable, with six-feet long phase leads and six-feet long ground lead.

      2) All three phase leads and the ground lead shall have bronze ball-stud clamps designed to attach to a 1″ diameter grounding ball. Clamps shall have an eye screw for hot stick operation and shall be drilled to accept a 5/8-11 UNC threaded ferrule on #1/0 AWG copper grounding cable.

      3) Provide an unshrouded copper cable ferrule with translucent shrink tubing for stress relief and inspection of cable strands between the ferrule and jacket.

      4) Provide a storage bag for temporary grounding clamps and cable sets. Bag shall be made of yellow, vinyl-laminated, nylon cloth, with plywood bottom and metal skids on bottom of bag.

      5) Acceptable manufacturers

a) Hubbell-Chance assembly part number G3C10606HCB1B1 with catalog number T60000865 grounding storage bag

b) Or equal as approved by the Engineer

b. Provide two insulated “shotgun” style hot sticks and related accessories for installing temporary grounds with the following features:

1) Single-piece style, with operating mechanism that opens a hook to grasp a clamp eye screw on temporary grounding clamps and retract it into the tool head. The operating mechanism shall have a thumb latch that must be depressed to release the hook. Complete with a factory-installed universal fitting on end opposite the clampstick head. Overall length shall be 6′-6″.

2) Yellow vinyl-impregnated fabric storage bag

3) One box of 50 packets of silicone wipes for hot line tools

4) Acceptable manufacturers

a) Hubbell-Chance Grip-All Clampstick, catalog number C4030292A with P6436 storage bag and C4002568 box of silicone wipes

b) Or equal as approved by the Engineer

c. Provide two high-voltage detection kits for use in applications for voltages from 240 VAC to 69 kVAC. The voltage detector shall be a proximity type instrument, making it unnecessary to make physical contact with the equipment being tested. The voltage detector shall be battery powered, made of non-conductive materials, be suitable for use with a hot stick using a splined universal end fitting, be provided with an accessory adapter to allow use with shotgun-style hotsticks, and shall have both audible and visual indication of voltage.

1) Acceptable manufacturers

a) Salisbury 4769 High Voltage 69 kV Self-Testing Voltage Detector Kit

b) Or equal as approved by the Engineer

d. Install one complete set of grounding extra materials. Identify each item with manufacturers name, description and part number on the exterior of the package.

PART 2 - PRODUCTS

2.1 PREFABRICATED POWER BUILDING

A. Acceptable manufacturers

1. Myers Power Products, Inc.

2. Powell Industries

3. ABB

4. Powercon Corporation

5. AZZ Switchgear Systems

6. JST Power

7. States Manufacturing

8. RussElectric

9. Or equal as approved by the Engineer

B. Provide a weatherproof, NEMA 3R building.

C. The building shall be seismically qualified to IEEE-693 “high”.

D. Design and construct the building per the criteria in Article 1.3 – SYSTEM DESCRIPTION. Building floor plan nominal dimensions are shown on the Drawings. The power building fabricator shall adjust these dimensions as required, including the building height, to accommodate the installed equipment.

E. The structural frame shall provide a moment-resisting, welded connection of base to walls, side walls, end walls, and walls to roof. The exterior walls and the roof shall be fabricated from fully welded panels for weather protection of internal equipment.

F. The base shall be all welded, seamless construction using ASTM A572 (C10 and larger) or ASTM A36 (C8 and smaller) structural steel channel, wide flange, and angle sections. Welding shall be in accordance with the requirements of AWSD1.1.

G. Provide lifting lugs as required for the building, placed in a position to provide uniform lifting load at each lifting lug location.

H. Provide anchor plates factory pre-welded to the building frame.

I. All bolts for field assembly of primary structural members shall be minimum 3/4″ diameter, high-strength ASTM A-325. Bolts for field assembly of secondary structural members shall be minimum 1/2″ diameter, high-strength ASTM A-307.

J. All exterior anchors, fasteners and hardware shall be Type 316 stainless steel.

K. Provide the following floor and wall materials at minimum, but rated to withstand the loading requirements of the project:

1. Floor plate: 1/4″ steel

2. Exterior walls and roof: 11-gauge steel

3. Interior walls and ceiling: 14-gauge steel

L. The floor shall be provided with gasketed floor cutouts where required for power and control cable entry/exit from the equipment. The cutouts shall be provided with 11-gauge galvanized cover plates.

M. The floor area supporting the electrical equipment shall be designed to meet the seismic installation and anchoring requirements of the electrical equipment manufacturer.

N. All incoming/outgoing cables to/from the power building shall enter the building through floor penetrations.

O. All cable interconnections between the switchgear protection and control panels, AC and DC panelboards, battery system, and other equipment inside the building shall be factory-wired using conduit as required.

P. The roof shall be sloped at 1/4″ per linear foot and shall be sloped away from the personnel doors or as shown on the Drawings. Provide gutters and downspouts for roof drainage. Gutters shall be concealed to the maximum extent possible, preferably behind the building fascia.

Q. The walls, ceiling, doors, and base shall be fully insulated, with a minimum of R13 insulation. Spray applied polyurethane insulation shall have an R value of 6.0/inch and a flame spread rating of 25 or less.

R. Battery enclosure

1. The battery enclosure shall be free standing NEMA 12 enclosure with dual access doors

S. Doors

1. Provide 48″ wide, single personnel doors as shown on the Drawings. The doors shall be 18-gauge galvanized steel, 1-3/4″ thick, UL listed, R4.17, with 1.5 hour fire rating. Provide weather strip, stainless steel hinges, aluminum threshold, drip shield, auto closer, cylinder lock, and listed panic hardware as described in this Article.

2. Provide 72″ wide, double equipment doors as shown on the Drawings. The doors shall be 12-gauge galvanized steel, with full gasketing, drip shield, padlockable three-point latching hardware, hold open shaft, cylinder lock, and interior metal skin over the insulation. Provide “DANGER, HIGH VOLTAGE, KEEP OUT” sign on the equipment doors.

3. All doors shall be weathertight.

4. Personnel doors shall be fitted with a one-point latching mechanism. The inside shall be equipped with a panic bar (Von Duprin Series 99 or equal) and a grab handle. The outside shall have an angled lever handle. The hardware shall have a brushed (satin) chromium finish.

5. Locksets, latchsets, and cylinders

    a. Standards:

        1) Cylindrical Locks: ANSI A156.2, Series 4000, Grade 1, UL listed.

    b. Lock Type: For all doors, provide Best 93K Series, cylindrical type, backset of 2-3/4 inches, with Best Type SFIC with key in lever. Provide all locks from the same manufacturer.

    c. Design: Solid lever handles, Best 15C design.

    d. Strikes: Provide each lockset, latchset, and deadlock with a strike and a strike box. Provide standard type strikes with extended lips where required to protect adjacent trim from being marred by latch bolt. Verify cutout types provided in metal frames.

    e. Construction cores: Provide construction keying for cylinders as required and keys for Supplier use in fabrication, shipping, and site assembly.

6. Keys and keying

    a. Keying: The District will provide final keying requirements during shop drawing review. Key and masterkey locks as directed by the Engineer using the District's existing system.

    b. Key type: Best Access System 7 pin removable core system.

    c. Number of keys

        1) Keyed alike sub-master key (opens all electrical doors): 8 keys

    d. Identification: Emboss face of each cylinder plug and key with minimum 3-digit visual key control system. Stamp all keys “DO NOT DUPLICATE”.

e. Ship keys and extractor keys directly from the factory to the District via registered mail. The District will remove construction plugs and install permanent cylinders as required.

f. Provide a construction keying system for Supplier's use as required during fabrication, shipping, and site assembly. Retain construction keys and inserts and turn over to the Engineer upon completion of manufacturer's field services.

7. Door intrusion switches

a. Provide an intrusion switch on each door with the following characteristics:

1) Balanced, triple-biased reed contact SPDT magnetic contact switch in a die-cast aluminum housing painted brown.

2) Plunger-type tamper switch actuated on removal of cover and optional magnetic tamper and pry tamper switches wired to Form C contact.

3) Acceptable manufacturers

a) Sentrol 2807T

b) Or equal as approved by the Engineer

T. Finish

1. Colors, all using manufacturer's standard painting system

a. Exterior walls and base: equivalent to Benjamin Moore, "Hampshire Gray" 380

b. Roof including gutters and downspouts: equivalent to Benjamin Moore, "Fairview Taupe" HC-85

c. Exterior metal doors, exterior door frames, exterior equipment enclosures and trim: equivalent to Benjamin Moore, "Fresco Urbain" 1253

d. Interior: ANSI-01 White

e. Floor: anti-skid ANSI-61 Gray

2. Provide a painting system with corrosion resistance > 3,000 hours (salt fog ASTM B117), humidity resistance of minimum 3,000 hours (ASTM B117), minimum adhesion of 1,000 psi (ASTM D4541), and elongation > 32% (ASTM D522). System shall have chemical resistance to acids, bases, salt solutions, fresh water, solvents, and petroleum products.

U. Provide all electrical utilities necessary for the proper operation of building services within the power building according to the following criteria:

1. Interior and Exterior, exposed conduit

    a. As specified in Section 26 05 33

    b. No wireway or gutter is allowed unless otherwise noted on the Drawings

2. Low-voltage building, power, and control wiring

    a. 600VAC, as specified in Section 26 05 19

3. Power cable

    a. Medium-voltage, 15 kV class as specified in Section 26 05 13.

4. Interior lighting

    a. Decorative indoor, linear flush-mount 48″ long luminaire, 4000K 80CRI LED lamp, 120VAC, with brushed nickel finish

    b. Provide number of luminaires necessary to meet the target lighting design criteria in Article 1.3 A 5 a.

    c. Acceptable products

        1) Lithonia Lighting LED Linear Catenary FMLCCL 48IN 40K 80CRI BN

        2) Or equal as approved by the Engineer

5. Emergency lighting

        1) As specified in Section 26 53 00

6. Exterior lighting

    a. Architectural wall sconce with 13W, 1,650 lumen, 3500K LED lamp, exterior full-cutoff wall pack, 120VAC, single fuse, integral photoelectric cell, and dark bronze finish.

    b. Provide exterior lighting at each personnel door and where shown on the Drawings

    c. Acceptable manufacturers

        1) Lithonia Lighting WPX0 LED ALO SWW2 MVOLT PE DDBXD

        2) Or equal as approved by the Engineer

7. Interior light switches

    a. 20A, heavy-duty specification grade, white color

    b. Provide two (2), three- or four-way light switches at each door in the switchgear room for bi-level control of interior lights.

    c. Provide individual light switches for each exterior light inside the building at each respective personnel door unless otherwise noted on the Drawings. Switches shall override the exterior light photocell control – exterior lights shall be capable of being turned on during the daytime and turned off at night. There are no exterior light switches.

    d. Acceptable products

        1) Hubbell HBL Extra Heavy-Duty Specification Grade Catalog Number HBL1221W (single-pole), HBL1223W (three-way), and HBL1224W (four-way) with 97071 one-gang, 97072 two-gang, or 97073 three-gang Type 430 stainless steel wallplates

        2) Or equal as approved by the Engineer

8. Interior receptacles

    a. 20A, 125VAC, NEMA 5-20R, 2P, 3W, extra heavy-duty industrial specification grade, duplex receptacle, white color, installed with the ground pin “up”

    b. Provide minimum of six (6) interior receptacles in the switchgear room.

    c. Acceptable products

        1) Hubbell HBL Extra Heavy-Duty Specification Grade Catalog Number HBL5362W

        2) Or equal as approved by the Engineer

9. Exterior receptacles

    a. 20A, 125VAC, NEMA 5-20R, 2P, 3W, weather resistant, extra heavy-duty industrial specification grade, duplex receptacle, black color, with weatherproof in use cover

    b. Provide exterior receptacles at each HVAC unit and a minimum of two additional exterior receptacles evenly spaced around the building. Install all outdoor receptacles with the ground pin “up”.

    c. Acceptable products

1) Hubbell HBL Extra Heavy-Duty Specification Grade Catalog Number HBL5362BKWR with Hubbell RW57350 deep single-gang “while in use” weatherproof cover

2) Or equal as approved by the Engineer

V. Fire Alarm Detection

1. Smoke Detectors

a. Install a minimum two (2) smoke detectors inside the power building. Smoke detectors shall be installed on opposite sides of the building.

b. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:

1) Factory Nameplate: Serial number and type identification.

2) Operating Voltage: 24 VDC, nominal.

3) Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.

4) Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base to provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.

5) Each sensor base contains an LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the sensor base LED shall be on steady.

6) Each sensor base contains a magnetically actuated test switch to provide for easy alarm testing at the sensor location.

7) Scan each sensor with the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a “wrong device”, the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5 percent obscuration for photoelectric sensor, 135 degrees Fahrenheit and 15 degrees Fahrenheit rate-of-rise for the heat sensor, but shall indicate a “Wrong Device” trouble condition.

8) Addressability: Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address to be located in base to eliminate false addressing when replacing sensors.

9) Setting of addresses not required for removal of the sensor head for cleaning.

10) Type: Ionization smoke sensors.

11) Provide smoke detector at the approximate locations as indicated on the Drawings and specified herein.

12) Provide end-of-line resistors as required.

13) Contacts to wire smoke detector to PLC for status.

2. Fire extinguishers

a. Fire extinguishers shall be UL listed, EPA-approved and listed as an alternative to Halon 1211.

b. Provide a fire extinguisher at each exit door location.

c. Fire extinguishers shall be clean agent HALOTRON I, 2-A:10-B:C (minimum rated), 15.5 lb. capacity, steel cylinder, with wall bracket.

d. Acceptable products

1) Kidde, PROPLUS15.5HM

2) Buckeye, Model 71550

3) Or equal as approved by the Engineer

2.2 15KV MEDIUM VOLTAGE AUTOMATICA DELAYED TRANSITION TRANSFER SWITCH

A. Refer to Section 33 77 01

2.3 15 KV MEDIUM-VOLTAGE METAL-CLAD SWITCHGEAR

A. Scope

1. The 15kV medium-voltage metal clad switchgear shall encompass the supply under this specification section (2.3) and shall be integrated with the 15kV medium-voltage automatic delayed transition transfer switch assembly specified under specification section (2.2) to form a complete 15kV metal clad switchgear assembly with coordinated ratings, interconnected wiring, enclosure dimensions, mounting details, and equipment finish.

B. Qualifications

1. IEEE-693 “High” seismic qualification is required.

2. All vertical sections in the switchgear shall have a UL label.

C. Ratings

1. Voltage: 12,470 V, three-phase, three-wire, 60 Hz

2. Main bus: 1,200 A

3. Neutral bus: Not required

4. Ground bus: 600 A

5. ANSI short-circuit rating: 25 kA

6. Bus bracing: 25 kA

7. Construction: indoor assembly with exterior cable compartment doors

D. Enclosure

1. NEMA 1 indoor construction.

2. Switchgear shall consist of a circuit breaker and auxiliary units, as shown on the Drawings, assembled to form a rigid, self-supporting, metal-clad structure. Provide front and rear access doors hinged on the left-hand side with provision for padlocking, protected ventilation openings, interior lighting and switch, GFCI utility outlets with protective devices and equipment heaters with protective devices.

3. Heaters

   a. Heaters shall be rated 240 VAC, operated at 120 VAC.

   b. For cells with breakers, heaters shall be controlled by an auxiliary “b” contact.

   c. In auxiliary sections, heaters shall remain always energized, with no switch or thermostat provided.

4. In each unit, major primary circuit parts (e.g. circuit breaker, buses, transformers) shall be completely enclosed by grounded metal barriers, including a front barrier as part of the circuit breaker.

5. Switchgear units shall be arranged as shown on the Drawings.

6. For rigidity during fault conditions all connections to rollout voltage transformer trays and control power transformer trays shall be rigid bus bars insulated to the full voltage rating of the switchgear assembly.

7. Circuit breaker compartments shall be designed to house 15 kV drawout-element circuit breakers. Stationary primary disconnect contacts shall be

silver-plated copper. Grounded metal safety shutters shall isolate all primary connections in the compartment when the circuit breaker is withdrawn from the connected position.

8. Provide laminate nameplates for each device. There shall be a master nameplate that indicates equipment ratings, manufacturer's name, shop order number, and general information.

9. Provide a mimic bus on the front of the switchgear using 3/8″ wide Lexan, adhesive-backed, and fastened with 4-40 x 3/8″ stainless steel screws to the switchgear. Color shall be red for all components.

10. All rear doors shall have keyed T-handles, a doorstop, and the capability of being padlocked.

11. Provide infrared (IR) sight glass windows in each enclosure in sufficient quantity to provide line-of-sight access to all bolted medium-voltage connections in the switchgear lineup. IR windows shall be manufactured by Hawk I.R. (Fluke), C-range, with 3″ IR crystal insert, low smoke and fume gasket, aluminum security cover, IP-65 rated for outdoor medium-voltage use, part number FLK-075-CL or equal.

E. Finish

1. All steel structure members shall be cleaned, rinsed, and phosphatized prior to painting.

2. The switchgear shall be painted with an electrostatically applied polyester powder with final baked on average thickness of 2.0 mils.

3. All exterior and interior surfaces of the switchgear assembly shall be given final finish coats of ANSI 61 gray as standard.

F. Main bus

1. The main bus shall be silver-plated copper and rated 15 kV maximum, 12.47kV nominal, three-phase, three-wire , 60Hz, solidly grounded, 95kV BIL, 25kA short-circuit, 1,200A continuous current. Bus bars shall have a continuous current rating based on temperature rise and documented by design tests. All joints shall be silver-plated with at least two bolts per joint.

2. Bus compartment shall be a totally enclosed metal housing surrounding the bus. Install fiber optic arc sensors in quantities required to fully monitor the main bus compartment in all sections of the metal clad switchgear, including main bus segments in the medium-voltage automatic transfer switch sections. Arc flash sensors to be Schneider Electric VA-1 with cable. Lengths as required to interface with Schneider Electric vamp 121D or engineer approved equal.

3. Bus bars shall be braced to withstand magnetic stresses developed by currents equal to main power circuit breaker close, carry, and interrupt ratings. Access to bus bars shall be through removable front panels. Provide molded insulation cover boots at bus joints with removable non-metallic hardware.

4. Bus bars shall have fluidized bed epoxy flame retardant and non-hygroscopic insulation.

5. Bus support insulators shall be porcelain.

6. Provide cable supports and cable boots for all incoming/outgoing cables.

7. Grounding ball studs

    a. Provide 1″ diameter grounding ball stud as follows:

        1) Load side of each feeder circuit breaker for grounding outgoing primary feeder phase cables, one per phase

        2) Line side of each source breaker, one per phase

        3) On the ground bus riser assembly in each feeder circuit breaker, voltage transformer, or CPT compartment

    b. Grounding ball studs shall have a 43kA/15 cycle and 30kA/30 cycle fault current rating. Orient the stud toward the compartment access opening.

    c. Acceptable products

        1) Hubbell-Chance, standard ball stud, catalog number C6002102 with C4060416 cover

        2) Or equal as approved by the Engineer

G. Ground bus

1. A 600A ground bus (1/4″ by 2″ tin-plated copper) shall extend throughout the assembly with connections to each circuit breaker grounding contact and cable compartment ground terminal. Joints shall be made up as indicated on the shop drawings. Station ground connection points shall be located in each end section. Designed per ANSI C37.20.2 to carry and withstand the full close and latch (momentary) current rating of the breakers in the switchgear for a minimum of two seconds.

2. Provide grounding ball stubs as described in Article 2.2 G.

H. Circuit breakers

1. Acceptable circuit breaker manufacturers

   a. Eaton

   b. Powell

   c. ABB

   d. Or equal as approved by the Engineer

2. Provide circuit breakers having the following nameplate ratings and features:

   a. Type: vacuum

   b. Rated maximum voltage: 15 kV

   c. Rated current: 1,200 A, 60 Hz

   d. Impulse withstand: 95 kV

   e. Interrupting time: 3 cycles

   f. Rated short-circuit amperes: 25 kA

   g. Short-time current: 25 kA

   h. Close & latch capability amperes: 68 kA

   i. DC component: 50%

   j. Rated voltage range factor: 1.00

   k. Operating duty cycle: O – 0.3 s – CO – 15 s – CO

   l. Close coil: 48 VDC

   m. Trip coil number 1: 48 VDC

n. Trip coil number 2: Not required

o. Charging motor: 48 VDC

3. Circuit breakers shall be direct roll-in type with swivel option allowing the breaker to roll directly into the cell from the floor without the use of a breaker lift truck.

4. Circuit breakers shall be operated by an electrically charged, mechanically and electrically trip-free, stored-energy spring. A handle shall be used to manually charge the spring for slow closing of contacts for inspection or adjustment.

5. Circuit breakers shall be equipped with secondary disconnecting contacts that shall automatically engage in the connected position.

6. Each circuit breaker compartment shall have a circuit breaker rack out device. Using the rack out device, a circuit breaker shall be self-aligning and shall be held rigidly in the operating position. In the disconnected position, the circuit breaker shall be easily removable from the compartment. Circuit breaker racking shall be accomplished with the door closed and latched. Insert handle through a hole in front door to operate rack out device.

7. An indicating semaphore shall show circuit breaker position when racking circuit breakers in or out of their connected positions.

8. Interlocks shall prevent moving the circuit breaker to or from the operating position unless the main contacts are open. Operating springs shall be discharged automatically when the circuit breaker is rolled fully into the connected or disconnected position. Rack out device shall have provisions to padlock in the connected or disconnected position. When locked in the disconnected position, the circuit breaker shall be removable from the compartment using a portable lifting device. The padlock shall not interfere with circuit breaker operation.

9. Automatic shutters shall cover the primary disconnect stabs when the circuit breaker is withdrawn to the test/disconnect position. Shutters shall be positively driven by linkages connected to the racking mechanism. A stationary barrier shall be located in front of the shutters for additional safety. Provide shutter labels that indicate the destination of the top and bottom stabs.

10. Provide a ten-stage auxiliary, mechanism-operated switch containing ten “a” (normally open) and ten “b” (normally closed) contacts for each circuit breaker. All spare contacts shall be wired to terminal boards.

11. Provide a six-stage position truck-operated cell switch for each circuit breaker indicating whether the circuit breaker is in the connected or disconnected position. The position switch shall contain six “a” (normally open) and six “b”

(normally closed) contacts. All spare contacts shall be wired to terminal boards.

12. Provide a mechanical operations counter.

I. Future circuit breaker units

1. Future circuit breaker units shall be spare, active units, including the drawout circuit breaker. Quantity of future circuit breaker units shall be as shown on the plans. This includes all primary buswork, current transformers, voltage transformers, circuit breaker racking mechanism, breaker stationary auxiliary switches, breaker position switches, finished unit door, and all required secondary devices prewired to terminal blocks for connection to future door-mounted metering equipment.

2. Provide secondary connections, prewired to terminal blocks to the maximum extent possible, to facilitate activation of future circuit breaker unitControl power transformer

3. Provide one 15 kVA control power transformers (CPT) as shown on the Drawings, rated 12.47 kV primary, 120/240 VAC secondary, 60 Hz, 95 kV BIL

4. CPT shall be rear-mounted, with rollout fuse drawer as an integral part of the switchgear, with E-rated, non-expulsion type current limiting fuses having blown fuse indication on the primary and a molded case thermal magnetic circuit breaker on the secondary. Provide a mechanical interlock to prevent withdrawal of the rollout fuse drawer prior to opening the secondary circuit breaker and a mechanical interlock to prevent accessing transformer in the rear compartment prior to locking the rollout fuse drawer in the disconnected position.

5. Taps: Four 2-1/2 percent primary winding taps, two above and two below nominal

J. 120/240 VAC Panelboard

1. Provide (1) 120/240 VAC single-phase panelboard in the control power transformer section of the medium voltage switchgear in compliance with section (2.6) panelboards of this specification.

K. Instrument transformers

1. Current transformers (CTs)

a. CTs shall have continuous thermal current rating factor (RF) not less than 2.0 at 30 deg C with ratings as follows, unless otherwise noted on the Drawings:

1) General protective relay applications: C200 accuracy class, 200/5 single-ratio.

b. Multi-ratio CTs shall be five-lead type with all CT taps wired to short-circuiting terminal blocks.

c. Single-ratio CTs shall be two-lead type with both CT taps wired to short-circuiting terminal blocks.

d. The H1 polarity shall be oriented as noted on the Drawings.

e. CT mechanical ratings shall withstand the thermal and mechanical stresses imposed by the short-circuit rating of the applied circuit breaker, equal to the momentary rating of the circuit breakers. CTs mounted in switchgear assemblies shall be part of an overall insulation system that meets or exceeds the nominal BIL rating for the switchgear voltage class.

2. Voltage transformers (VTs)

a. VTs shall be provided on a rollout drawer as shown on the Drawings. VTs shall be an integral part of the switchgear, with E-rated, non-expulsion type current limiting fuses having blown fuse indication on the primary and BIL rating equal to the switchgear.

b. VT ratios are 7.2kV to 120V. Transformer accuracy class shall be ANSI 0.3 MWXYZ, 1.2ZZ at 100% rated voltage with 120V based ANSI burden.

c. Thermal burden rating at 30/55 Deg Celsius shall be 1500/1000 VA.

3. Secondary control wiring shall be extra flexible 41 strand for #14 AWG control wire and 65 strand for #12 AWG current transformer wire, stranded, tinned-copper control wire, Type SIS cross-linked polyethylene with VM-1 flame retardant rating, rated 600 volts, with minimum #12 AWG for current transformer circuits and #14 AWG for general control circuits, except for specific circuits requiring larger wire.

4. Compression-type, non-insulated, ring terminals shall be furnished on all wire ends, unless not possible due to wire size and clearances. For these exceptions, it is acceptable to use insulated locking fork or ferrule-type terminals. Current transformer terminals shall have non-insulated ring terminals without exception.

5. Secondary control wires shall be armored where they pass through primary compartments.

6. Megger/States NT short circuit style terminal blocks shall be installed in current transformer secondary wiring between the current transformer and the meter/relay test switches.

7. All control wires with the exception of current transformer circuits shall terminate on sliding link style terminal blocks. Provide Megger/States Type NT terminal blocks rated 600V, 50A, number of poles as required, front connected, with stainless steel linking screw and engraved white marker strip. Provide minimum 20% spare points.

8. Provide heat-shrinkable, flame-retardant marking sleeves on all switchgear control wiring, with wire origin and destination information. Wrap-on or clip-on labels are not acceptable.

L. Surge arresters

1. Provide station class arresters on all incoming/outgoing mains and feeder circuit breakers, and where indicated on the Drawings. Arresters shall be gapless metal-oxide type with a nominal rating of 15 kV and an MCOV of 12.47 kV. The arrester shall be enclosed in a polymer housing. Arresters shall be designed and manufactured in accordance with the latest revision of ANSI/IEEE C62.11.

M. Power system metering

1. General

a. Multifunction digital recording power meter for use on a three-phase, four-wire power systems as shown on the Drawings with the requirements as follows:

1) Accuracy. The meter shall exceed ANSI C12.20-2015 0.1 and IEC 62053-22:2003 0.2 accuracy class requirements. Accuracy shall be guaranteed for at least 10 years.

2) Power Quality. The meter shall meet IEC 61000-4-30 Class A power quality accuracy for voltage, current, power frequency, supply voltage interruptions, dips and swells, harmonics, interharmonics, unbalance, and flicker.

3) True Four-Quadrant Metering. Energy and demand registers shall report delivered and received active power and energy as well as leading and lagging VARs for delivered and received reactive power and energy.

4) Load Profile Recording. The meter shall include at least 1 GB of nonvolatile memory for data storage and simultaneously record 512 channels for at least 1300 days at 10-minute intervals. Statistical recording shall include minimum, maximum, average, changeover interval, and end-of-interval calculations. The recording rate shall be adjustable from 3 seconds to 2 hours. Recorded data shall be

available via SEL, Modbus®, DNP3, MV-90, IEC 61850, and ASCII protocols.

5) Predictive Demand. A predictive demand calculation shall alarm when the demand for a fixed interval will pass a set value.

6) Transformer/Line-Loss Compensation. The meter shall compensate for meter locations remote from billing points. Bidirectional compensation shall include factors for excitation and loading losses in the transformer.

7) The meter shall offer a high-resolution display. The display shall present phasor diagrams, power, energy, voltage, current, frequency, harmonics, and maximum/minimum values. The display shall feature a programming interface that allows full configuration of the meter including naming, alarming, scaling, and demand settings. A test mode interface shall present an energy quantity to test, a test pulse mimic, and transformer/line loss calculations.

8) Front-Panel Indicators and Control Pushbuttons. The front panel shall include at least four programmable pushbuttons to enter Test mode, trigger waveform capture, and reset alarms. At least 14 programmable LEDs shall indicate status, alarms, and the presence of voltage.

9) Time-of-Use (TOU) Metering. The meter shall record demand and energy consumption during different time periods based on a user-defined calendar. Programming will allow for 4 seasons, 6 rates, 10 day types, 40 rate schedules, a 20-year calendar, and 15 self-reads.

10) Instrument Transformer Compensation. The meter shall compensate for instrument transformer ratio and phase errors and shall provide six calibration points for each transformer.

11) Minimum/Maximum Recording. Each phase voltage and current shall have the date and time of the last maximum and minimum value since resetting the maximum/minimum.

12) Sequential Events Recorder (SER). A chronological report shall record the most recent 80,000 events with 4-ms time-stamp accuracy.

13) Voltage Sag/Swell/Interruption Recording (VSSI). A VSSI recorder shall capture excursions with 1-ms time-stamp accuracy. At least 130,000 record samples shall adapt sampling rates from a quarter cycle to daily. VSSI summary and detailed reports shall be available less than 5 seconds after the event occurs.

14) Waveform Capture. The meter shall simultaneously capture 512 samples- per-cycle events for a total of 505 seconds from each phase. Available formats shall include filtered, CEV, and full-bandwidth COMTRADE files, which are available 5 seconds after the event subsides. Waveform event reports shall contain data including the trigger bit, digital input, digital output, and device status. The meter shall also report real-time power system disturbances in both time and frequency domains through the software HMI and on the front-panel touchscreen display.

15) Database Integration. The meter shall include an option for centralized data collection software, database, and an API with common data exchange. The centralized software shall include the ability to retrieve COMTRADE, EVE, VSSI, LDP, and SER data from multiple meters and exchange the data through a RESTful API.

16) Harmonic Metering. The meter shall report individual harmonics to the 63rd order or greater, including voltage, current, phase angles, and power magnitudes. The meter shall exceed IEC 61000-4-7 Class I and IEC 61000-4-30 Class A accuracy. Interharmonic values shall encompass 1 Hz to 3800 Hz in 1 Hz bins.

17) K-Factor Calculation. The meter shall perform K-factor calculations for transformer loading, as defined by IEEE transformer loading guides.

18) Flicker. The meter shall report instantaneous, short-term, and long-term flicker measurement per IEC 61000-4-15.

19) Inputs and Outputs. The meter contains three electromechanical outputs and two digital inputs, standard. Optional inputs and outputs include combinations of electromechanical and solid-state outputs, analog outputs, and digital inputs.

20) Clock. The meter shall have an internal battery-backed clock with 10 ppm or better accuracy and retain time without power for at least 10 years.

21) Time Synchronization. Time synchronization shall include IRIG-B, power line frequency, DNP3, Modbus, MV-90, SNTP, ASCII, and front- panel inputs. Time stamps synchronized to an IRIG-B signal shall have a resolution of 10 µs.

22) Analog and Math Logic. The meter shall support programmable logic for remote terminal unit (RTU) control and automation. Binary and analog meter data shall be available for Boolean logic calculations and mathematical functions. Boolean logic shall include AND, OR, NOT, rising-edge detection, and falling-edge detection,

as well as latches and counters. Mathematical functions shall include add, subtract, multiply, and divide as well as analog compare functions.

23) Communication. The meter shall support as many as ten simultaneous communications sessions via EIA-232 serial, EIA 485/EIA-422 multidrop, USB Type C, infrared, 10/100BASE-T Ethernet, 100BASE- FX Ethernet, or telephone modem.

24) Protocols. The meter shall support simultaneous Modbus, DNP3 communications protocols. The Modbus and DNP3 protocols shall support at least 2,000 simultaneous analog quantities with user-configurable mapping and scaling.

2. Acceptable products

1) Schweitzer Engineering Laboratories, SEL-735 with Color Touchscreen, part number: 0735LX20921GXXXXXX16202XX

2) Electro Industries, Nexus 1272, part number 1272-A-SWB2-20-60-SE- INP202-COMEXT4P:

a) (A): Advanced memory option for data and event monitoring/recording

b) (SWB2): Socket meter form factor mounted in a switchboard style case

c) (20): Class 20 – 5A nominal current inputs

d) (60): 208Y/120 VAC, three-phase, four-wire, 60Hz operating voltage and frequency

e) (D) Power Supply: 48 VDC control power

f) (INP202): Combination 10/100Base T Ethernet and 56k modem communication card. DNP 3.0 Level 2 protocol shall be available on both the Ethernet and serial ports

g) (COMEXT4P): Communicator EXT software single-computer license (one site)

3) Or equal as approved by the Engineer

N. Arc Flash Detection Protective Relay (AF)

1. Arc flash detection protective relay with 10 arc sensor inputs, output tripping contact rated 250 VAC/DC, 5 amps continuous and 15 amps for 3 seconds.

2. Provide with the following options:

    a. Panel flush mounting kit

    b. External din rail mounted power supply unit 48 VDC in to 24 VDC out

    c. All sensors in quantity and cable lengths as required to monitor all segments of the main bus of the medium voltage metal clad switchgear assembly including integrated medium voltage automatic transfer switch main bus

3. Acceptable manufacturers:

    a. Schneider Electric VAMP 121D with VA-1 sensors, power supply, and flash mounting kit

    b. Or equal as approved by the Engineer

O. Metering accessories

1. Optical probe

    a. ANSI type 2, zero power, infrared light, bidirectional communication interface for the Nexus 1272 meter. Optical probe shall magnetically adhere to the meter and shall have a flexible two-meter length cable with direct USB interface

    b. Provide quantity of three (3) optical probes

2. Acceptable manufacturers

    a. Electro Industries, part number A9U

    b. No substitutions

P. Switches and pilot devices

1. Instrument test switches

    a. Power system metering

        1) Provide a test switch for the power system metering CT and VT connections as follows:

            a) Description

                i) 10-pole, horizontal panel mount, with disconnect pins and clear dust cover, banana jacks on both A and B sides,

screw connectors and status windows with transparent lids, and custom labelling as specified in this Section.

b) Custom top and bottom labels

i) Top

(1) Text: blank.

(2) Color: WH|WH|WH|WH|WH|WH|WH|WH|WH|WH|

ii) Bottom

(1) Text: VA | LO- | -HI | VB | LO- | -HI | VC | LO- | -HI | VN

(2) Color: RD|WH|WH|RD|WH|WH|RD|WH|WH|RD|

c) Custom disconnect pin labels

i) Labelling: VA | IA – IA | VB | IB – IB | VC | IC – IC | VN

ii) Color: RD | WH – WH | RD | WH – WH | RD | WH – WH | RD

2) Acceptable manufacturers

a) SecuControl, STS-A switch

b) No substitutions

2. Cutout switches

a. Relay cut-out

1) Rotary switch type

a) Oval handle, two position, maintained rotary switch, 90-degree snap action, double-pole, double-throw, 10A at 48 VDC, standard indexing with nameplate engraved “CUT IN” at vertical and “CUT OUT” at right hand 45-degree position.

b) Acceptable manufacturers

i) Electroswitch Series 101, Model 102602

ii) Or equal as approved by the Engineer

b. Trip cutout switches

1) Yellow handle, single pole, front-connected potential assembly. Mount on rear of enclosure door.

2) Acceptable products

a) States Type SMH-401-D, Arrangement 42Y

b) Or equal as approved by the Engineer

c. Grounding cutout switches

1) Green handle, single pole for current transformer single-point grounding. Mount on rear of enclosure door.

2) Acceptable products

a) States Type SMH-401-V, Arrangement 42G

b) Or equal as approved by the Engineer

3. Pilot devices

a. Pushbuttons

1) 30.5mm, oil tight, heavy-duty, DPDT, momentary contact, rated 10 ampere continuous, 600 VAC maximum. Pushbutton shall have double-block (2 NO, 2NC) operator, and flush ring. Provide blue cap for Device 86 indication light “push to test” applications.

2) Acceptable manufacturers

a) General Electric CR104PB

b) Cutler-Hammer 10250T

c) Or equal as approved by the Engineer

b. Indicating lights

1) Acceptable products

a) ABB Modular Range, Press-to-Test Pilot Lights, part number MP3-MLFPTL**, where ** is the voltage type and lens color.

2) Indicating lights shall be 22mm press-to-test pilot lights with chrome metal bezel, full voltage LED lamps, and lens color as indicated on the Drawings.

3) Acceptable manufacturers

a) General Electric Type ET-16

b) Data Display Products PL16

c) Or equal as approved by the Engineer

4) 16 30 mm, LED push to test type, green (circuit breaker open), red (circuit breaker closed), and blue (circuit breaker tripped), amber (circuit breaker racked-in)

5) Power supply voltage: 48 VDC

Q. PROTECTION, AND CONTROL (PAC) EQUIPMENT

1. Provide PAC components mounted and wired per Section (2.4) Protection and Control (PAC) Equipment

a. All PAC protection, automation and integration application development shall be provided by the PAC System Integrator.

b. All software provided under this Contract shall be licensed to the District.

c. All protective relays specified shall comply with surge withstand capability levels for oscillatory and fast transients specified in ANSI/IEEE C37.90.1

2. Switches

a. Power supply cutout switches

1) Red handle, two pole, ganged handles, for 48VDC and 120VAC power supply circuits.

2) Acceptable manufacturers

3) States Type SMH-402-R, Arrangement #42-42#

4) Or equal as approved by the Engineer

3. Field terminal blocks

a. 30 ampere, 600V, with brass screw terminals and white marking strip. Mount on rear of switchboard rack. Provide shorting terminal blocks for all current transformer applications and sliding link terminal blocks for all other applications.

b. Acceptable manufacturers

1) Shorting terminal blocks

a) Megger, States Type NT #SM-25104G, with individual white marker tags, straight strap, four poles each, with current shorting feature

b) Or equal as approved by the Engineer

2) All other field terminal blocks

a) Megger, States Type NT # SM-25012, with individual white marker tags, sliding link screws, and 12 poles each

b) Or equal as approved by the Engineer

4. Grounding

a. Provide instrument transformer secondary circuit, protective relays and other devices having a case ground stud or requiring a specific circuit ground, with a ground connection to the internal switchgear ground bus in each switchgear section, with a #12 AWG minimum green-colored copper wire and a bolted terminal lug. Effectively ground the remainder of the devices through the enclosure structure.

5. Nameplates

a. As shown on the Drawings and specified elsewhere in this Section.

b. All nameplates on this project shall be 1/16" laminate with black letters on white background.

c. Unless otherwise required for the application, provide 1" x 3" nameplates with 1/4" letters.

d. Affix nameplates to the equipment with 4-40 x 3/8" stainless steel screws.

6. Fuses: As recommended by the Supplier

7. Control wiring

a. 600 VAC, as specified in Section 26 05 19 UL-listed Type SIS, 600V, single conductor annealed soft copper with 7/0.0242 Class B stranding per ASTM B8

b. 30 mil, special low-smoke, low-corrosivity, flame retardant cross-linked polyethylene (XLPE) insulation with gray color and VW-1 listing, rated 90 degrees Celsius in wet or dry applications

c. Used only for circuits whose origin and destination termination points are within the switchboard

d. #12 AWG for current circuits and #14 AWG for all other circuits

e. Acceptable manufacturers

1) Southwire Company

2) General Cable

3) Or equal as approved by the Engineer

8. Ethernet switches

a. Provide IEEE 802.3u 100Base-TX and 100Base-FX autosensing Ethernet switches supporting Fast Ethernet communications over both fiber-optic (FO) and copper cables. Managed switch shall be designed and configured for IEC 61850 high-speed teleprotection applications.

b. Mounting: Switch shall be standard panel mount type for industrial application having a minimum operating temperature of -40°C and +85° C, and suitable for installation in a UL508 control panel.

c. Power Supply A: 24/48 VDC

d. Power Supply B: 24/48 VDC

e. Port configuration

1) As indicated on the Drawings.

2) Provide conformal coated circuit boards.

f. Switches shall include an alarm relay contact output rated for 1 ampere at 24VDC.

g. Acceptable manufacturers

1) Managed switches shall be

a) SEL-2730M0APCC1111AAAAX1.

b) SFP transceiver 8131-01 (Multi-Mode) & 8130-02 (Single-Mode) as required.

2) No substitutions

9. Protective Relays

a. Asset List

1) MPR1-M1

2) MPR2-M1

3) MPR1-M2

4) MPR2-M2

5) MPR1-E

6) MPR1-N

7) MPR1-L1

8) MPR1-L2

9) MPR1-L3

b. Three phase overcurrent relay, with sync check, undervoltage, over/under frequency, reverse power, and breaker failure protection.

c. Provide the following options:

1) Mounting: Front Panel Mount suitable for installation in the low voltage compartments of the switchgear.

2) Terminal blocks: Connectorized; provide the wiring harness

3) Current inputs: 5A nominal, 60Hz, ABC phase rotation

4) Communications port: RS-232

5) Power supply and control input voltage: 48 VDC

d. Acceptable manufacturers

1) Schweitzer Engineering Laboratories, Type SEL-751 feeder protection relay

2) No substitutions

10. Timer Relay

a. Asset Tag: T1

b. Used for time-delayed restoration of source M1Device T1). 48 VDC coil, electro-pneumatic time calibration, 3-30 minutes on-delay, double-pole, double-throw contacts, with panel mount kit for horizontal mounting

c. Acceptable manufacturers

1) Agastat, Model 7012NHX

2) Or equal as approved by the Engineer

11. Lockout Relays

a. Devices 86-M1, 86-M2, 86E, 86AF

b. Auxiliary high-speed, multi-contact, lockout relay, manual reset, 48 VDC, oval handle, 13 ohm coil, with contact configuration as shown on the drawings.

c. Acceptable manufacturers

1) Electroswitch Series 24 LOR, Model 780*C (* = number of decks as shown on the drawings)

d. Or equal as approved by the Engineer

12. Relay and instrument test switches

a. Switch assembly for multi-circuit testing of switchboard relays and meters. Single test switch units, suitable for front panel mounting in the low voltage compartments of the switchgear, complete with individual see-through plastic covers.

1) Acceptable manufacturers

a) ABB, Type FT-1

b) Or equal as approved by the Engineer.

b. Devices should be tagged MPR1-M1, MPR2-M1, MPR1-M2, MPR2-M2, MPR1-E, MPR2-E, MPR1-L1, MPR1-L2, MPR1-L3

1) Six ABB FT-1 test switches arranged in 2 rows as follows:

Row #1:

a) Row #1:Position A: 8-pole switch with 4 current shorting assemblies, white handles

b) Position B: 6-pole switch with 6 single pole AC potential assembly red handles

c) Position C: 4-pole switch with 4 single-pole DC potential assembly, red handles

Row #2:

1. 10-pole switch with 10 single pole assembly blue handles
2. 10-pole switch with 10 single pole assembly blue handles
3. 10-pole switch with 10 single pole assembly blue handles

13. Surge suppressor
    a. DC spike and transient filter shall be sized as required and mountedt on back of switchgear.
    b. Manufacturer
        1) Islatrol, Model E-5HV
        2) Or equal as approved by the Engineer
14. Terminal blocks
    a. Relay test voltage and trip cutout
        1) Yellow handle, number of poles as shown on the drawings, front-connected potential assembly. Mount on rear of switchboard rack.
        2) Acceptable manufacturers
            a) AVO International, States Type SJK
            b) Or equal as approved by the Engineer
    b. Field terminal blocks
        1) 30 ampere, 600V, with brass screw terminals and white marking strip. Mount on rear of switchboard rack.
        2) Acceptable manufacturers
            a) AVO International, States Type NT. Provide shorting type terminal blocks for current transformer circuits
            b) Or equal as approved by the Engineer
15. Control Switches
    a. Circuit breaker control (Devices CS-M1, CS-M2, CS-E, CS-L1, CS-L2, CS-L3)

1) Trip-close and spring return to normal. Provide contact configuration as shown on the drawings. 48 VDC operating voltage.

2) Acceptable manufacturers

a) Electroswitch Series 24

b) Or equal as approved by the Engineer

b. Selector switch

1) Oval handle three position rotary switch, 90 degree snap action, double-pole, double-throw, 10A @ 48 VDC, nameplate engraving 1-2-3.

2) Acceptable manufacturers

a) Electroswitch Series 101

b) Or equal approved by engineer

16. Pilot devices

a. Pushbuttons

1) 30.5mm, oiltight, heavy-duty, DPDT, momentary contact, rated 10 ampere continuous, 600 VAC maximum. Double-block (2 NO, 2NC) operator, standard blue cap, and flush ring

2) Acceptable manufacturers

a) General Electric CR104PB

b) Cutler-Hammer 10250T

c) Or equal as approved by the Engineer

b. Indicating Lights

1) LED type, green (circuit breaker open), red (circuit breaker closed), and blue (circuit breaker tripped)

2) Power supply voltage: 125 VDC <facility name>, 48 VDC <facility name>

3) Acceptable manufacturers

a) General Electric Type ET-16

b) Data Display Products PL16

c) Or equal as approved by the Engineer

2.4 DIRECT CURRENT BATTERY SYSTEM

A. Provide battery systems as indicated on the drawings and specified herein, to operate breaker mechanisms, control equipment, and protective relays.

B. The battery system shall be for installation in a free standing double door NEMA 12 enclosure.

1. Batteries shall be rechargeable flooded-cell nickel-cadmium that shall give minimum twenty years service without topping-up or other maintenance.

2. Design criteria

a. Voltage

1) Nominal: 48 VDC, ungrounded, 120Ah on an 8-hour rating

2) Window: As required for the specified switchgear equipment.

b. Load Profile

1) Capable of operating all circuit breakers simultaneously, through four open-close operations, without recharging, and circuit breaker protective devices and indicating lamps and control and relay components for all switchgear units. (Assume a 5 ampere continuous load).

c. Environmental

1) Nominal Temperature: 68 degrees Fahrenheit

2) Minimum Temperature: 25 degrees Fahrenheit

3) Maximum Temperature: 100 degrees Fahrenheit

d. Charging Method: Dual-Rate

e. Design Margin: 1.1

f. Aging Factor: 1.25

3. Each switchgear cubicle shall have a fused direct current circuit as indicated on the drawings. Provide batteries with a rack assembly to house the batteries and charger.

4. Design battery rack for IEEE-693 'High’ seismic rating'. Battery stands shall be corrosion resistant.

5. Batteries shall be provided with battery hold down clamps, terminal covers, cell spacers, fasteners, lugs, and connecting cables as required.

6. Provide a current limiting battery charger to automatically recharge the batteries. Include overload protection, silicon diode full wave rectifiers, voltage surge suppressors, direct current ammeter, and voltmeter with fused alternating current output. Current output shall not be not less than 40 amperes. Provide Form C output contacts for AC fail, low battery voltage, high battery voltage, ground fault, and common fail alarms.

7. Provide a corrosive and acid resistant enclosure for the battery system.

C. Acceptable manufacturers

1. Batteries

a. Alcad Vantage VN series

b. Or equal as approved by the Engineer

2. Seismic battery stand

a. Alcad

b. Or equal as approved by the Engineer

3. Battery charger

a. Stored Energy Systems (SENS) Type DCT

b. Or equal as approved by the Engineer

2.5 AC AND DC PANELBOARDS

A. Provide AC and DC panelboards as specified in Section 26 24 16.

1. Asset names

a. 234-EPS-LP-001

b. 234-EPS-LP-002

2.6 HVAC EQUIPMENT

A. Provide a 240 VAC, single-phase, exterior wall-mounted air conditioner unit with heater having the following features and accessories:

1. Control package consisting of a low-pressure switch, high-pressure switch, low ambient control, compressor anti-cycle relay, and alarm relay

2. Digital display thermostat with auto change over, conventional heat/cool, one stage heat, one stage cool, and 24V control between the AC unit and thermostat

3. Supply grill, return grill, and pleated filter

4. Non-fusible disconnect switch

5. AC service duplex exterior receptacle

6. Acceptable manufacturers

    a. Bard Manufacturing Company, Inc.

    b. Or equal as approved by the Engineer

2.7 ETHERNET COMMUNICATION CABLE (COPPER)

A. Category 6, indoor unshielded twisted pair

1. Cable shall be capable of supporting network applications up to 1 GB/s, characterized to 600 MHz, and meet IEEE 802.3, TIA/EIA-568-C.2, and TIA/EIA-854 standards for Category 6 applications. Cable shall be UL listed and CMP plenum-rated for all indoor horizontal and vertical runs, suitable for installation in conduit, and wireway.

2. Conductors and insulation: 4 twisted pairs, 8 conductors total, 23 AWG solid bare copper conductors, with each conductor insulated with plenum-rated fluorinated ethylene propylene (FEP) insulation and overall flame-retardant light grey colored PVC jacket. Pairs shall be color-coded white/blue, white/orange, white/green, and white/brown.

3. Acceptable manufacturers

    a. Berk-Tek LANmark-2000, part number 10167307

    b. Or equal as approved by the Engineer

B. Category 6 patch cords

1. Designed for Category 6 Gigabit Ethernet applications, UL listed, wired for T568B applications, length as required, with color-matched blue jacket and rubber boot, meeting TIA/EIA-568-C.2 standards.

2. Designed to work with center tuned outlet jacks from the same manufacturer as the patch cord.

3. Acceptable products

a. Ortronics Clarity 6 modular patch cord

b. Or equal as approved by the Engineer

C. Communication outlet jacks

1. RJ-45 outlet jack designed for Category 5 applications, center tuned with the patch cord specified in this section for optimal performance, green color, and wired for T568B applications.

2. Acceptable products

a. Phoenix Contact, RJ coupling, part number VS-08-BU-RJ45/BU – 1689064 with panel mounting frames – VS-08-A-RJ45/MOD-1-IP20-1689433

b. Or equal as approved by the Engineer

2.8 FIBER-OPTICS

A. Patch panels

1. Interconnect panel with metal housing for terminating and protecting fiber cables. Provide with accessories for mounting on the interior building wall (location to be determined).

2. Include cable entry knockouts, routing radius guides, and strain relief bracket for cable management. Provide lockable doors with lock kits. Provide accessory jumper protection door.

3. Provide each interconnect center with two, 12-splice, Type 4R, reduced-length splice trays for heat-shrink fusion splices and splice tray holders.

4. Provide two connector panels per interconnect center in order to terminate 24 multimode loose-tube cables. The 24 fibers shall be terminated in two closet connector housing panels with the following connectors:

a. Splice tray 1 of 2: provide a closet connector housing pigtail panel having twelve (12) 62.5 µm multimode (OM1) metal/metal ST compatible connectors. A separate installation Contractor will fusion splice the blue buffer tube fibers of the outside plant loose-tube cable to the pigtail.

b. Splice tray 2 of 2: provide a closet connector housing pigtail panel having twelve (12) 62.5 µm multimode (OM1) LC duplex ceramic/composite connectors. A separate installation Contractor will fusion splice the orange buffer tube fibers of the outside plant loose-tube cable to the pigtail.

B. Acceptable manufacturers

1. Corning, LANscape Solutions WIC-04P with WIC2-DOOR jumper protection door and installation hardware and WCH-STRNRLF-KIT cable strain relief kit.

2. Corning, LANscape Solutions closet connector housing pigtail panels

    a. Connector panel

        a) CCH: closet connector housing

        b) CP: panel

        c) 12: 12 fiber count

        d) 2T: 62.5 µm multimode (OM1) ST compatible, metal alignment, metal housing connectors

        e) KH: 62.5 µm multimode (OM1) MIC cable subunit

3. Corning, LANscape Solutions WCHSPLC-2P splice tray holder

4. Corning, LANscape Solutions M67-110 0.4-in, Type 4R reduced length splice tray

5. Or equal as approved by the Engineer

C. Multimode fiber-optic patch cords

1. Multi-mode fiber patch cords shall have the following features:

    a. Lengths as required

    b. Tight buffered

    c. Jacket color: orangeAqua

    d. Jacket rating: UL OFNR

    e. Connector types: LC or ST as required, to match equipment specified in this section or as shown on the Drawings

    f. Provided with labeling and identification

    g. Maximum insertion loss: 0.50 dB

    h. Maximum return loss: less than -20 dB

    i. Minimum bend radius: 1-inch

    j. Connector intermateability: TIA/EIA-604-2

k. Non-contact dust caps on all connector ends

2. Acceptable Manufacturers

a. Schweitzer Engineering Laboratories

b. Corning Optical CommunicationsOrtronics Fiber Optic Assemblies

c. Or equal as approved by the Engineer

2.9 GROUNDING

A. Provide two stainless steel ground pads located at opposite corners of the power building base for connection to the site ground system.

B. Provide a continuous copper ground bus to interconnect all components within the power building to two exterior ground pads located on the structural steel base.

C. Provide a ground test station assembly inside the building consisting of a 1/4″ thick solid copper ground bar, with pre-drilled universal lug holes, and wall-mounted on 600V standoff insulators.

D. Provide #4/0 AWG copper cable ground drops from all electrical equipment to the continuous copper ground bus.

E. Provide two #4/0 AWG copper cable ground drops from the building base to the ground test station.

F. Label all ground drops at the ground test station.

G. See Specification Section 26 05 26 for additional grounding and bonding requirements.

2.10 SWITCHBOARD MATTING

. Corrugated switchboard matting designed to help prevent electric shock around electrical equipment.

A. ASTM D178 – Type II, Class 2, 1/4″ thick minimum recommended for use on 17 kVAC circuits in accordance with ASTM D178.

B. Top corrugated surface and knurled bottom, chemical, oil, and ozone resistant.

C. Acceptable manufacturers

1. Ranco Industries, Inc.

2. Salisbury

3. Or equal as approved by the Engineer

2.11 SOURCE QUALITY CONTROL

A. Work included

1. Provide notification of all work performed off the project site in fabrication, assembly, and coating plants; provide safe access to all areas where work to be inspected is being performed; and reimburse the District for travel expenses described in this Section.

2. It is not acceptable to the Engineer to separately test the medium-voltage switchgear, and other component parts at any location other than the 15 kV power building Supplier's manufacturing facility. A complete functional checkout of the power building and all installed equipment as specified in this Section is required and this shall take place at the 15 kV power building Supplier's manufacturing facility.

3. The District will send three (3) engineers and two (2) electrical technicians to the Supplier's manufacturing facility to witness a complete functional checkout of the power building and all installed equipment as specified in this proposal. Include all travel costs in the proposal

B. Provide the District with advanced written notification of the dates for the fabrication and testing processes described in this Section.

1. For sites where the travel is less than 75 miles one way from Oakland provide notification 3 workdays prior to required presence of Engineer.

2. For sites where the travel is more than 75 miles one way from Oakland provide notification a minimum of 15 work days prior to required presence of Engineer.

3. If the required notification is not given, the Engineer will schedule the inspection at its convenience and the activity to be witnessed shall not proceed until the Engineer arrives or the Engineer notifies the Supplier that it is choosing to waive its witness inspection requirement. In the event that the required notification is not given, and the activity has occurred in the absence of the Engineer, the Engineer may reject the processes completed to date and require the activity to be redone.

4. Delays resulting from waiting on the witness inspection will be non-excusable. Expenses incurred by delays, repeat of the work process, or to correct unacceptable work shall be borne by the Supplier.

C. Travel expenses

1. The Supplier shall include in the bid price all travel expenses for three (3) District Engineers to conduct meetings and factory inspections if the Supplier's

location exceeds 125 miles one-way from Oakland. The District anticipates two trips will be required:

a. The pre-fabrication meeting specified in Article 1.5– QUALITY ASSURANCE.

b. The factory testing specified in this Article.

Travel expenses for these trips shall be based on the current fiscal year GSA per diem rate for the area.

2. If travel exceeds 200 miles one-way from Oakland, in addition to travel expenses at the current fiscal year GSA per diem rate for the area, travel expenses shall also include round trip, direct economy class airfare from Oakland, San Francisco, Sacramento, or San Jose Airports to the manufacturer's plant or testing facility, mid-sized car rental or taxi services, fuel, tolls, ground transportation to and from the airport, and airport parking at the departing airport.

3. For international or travel outside the continental United States, per diem rates shall be based on the US Department of State for the specific location and dates of travel. Travel expenses shall include the direct cost of securing passports, visas, language interpreters, document translators, communications, and internet access.

4. If weekend stays are requested to defray transportation costs, reimbursement for the inspectors stay over the weekend shall include meal allowance, hotel expenses, phone and internet access charges, rental car or transportation charges to and from eating establishments, laundry service, language interpreters, or other necessary business expenses or services.

5. Reimburse the District for any witness inspection that has to be repeated due to repair or rework of unacceptable work Reimbursement shall include District inspector’s wages, or if done by a District agent, the agent’s complete invoice for the needed inspection.

6. All fees incurred such as airline reservation change fees, loss of fare due to purchase of nonrefundable tickets, etc., due to Supplier-requested changes to the inspection schedule after the initial notification shall be borne by the Supplier.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Manufacturer's field services

1. Provide the following manufacturer's field services:

a. Site examination

1) Verify site conditions and inspect the concrete pad and conduit stub-ups constructed by others. Manufacturer shall note all defective conditions with the site installation so that they can be corrected by others prior to delivery of the power building to the site.

2) Examine the access route to the plant that the transport vehicle will need to follow. Provide recommendations to District staff for staging and lay down areas at the site that will be required for the transport vehicle and off-loading operations.

b. Erection

1) Provide field installation of the power building on the foundation at the site including:

a) Perform an on-vehicle inspection of the power building and internal electrical equipment upon arrival at the site and documenting the condition before off-loading from the transport vehicle.

b) Arrange crane off-loading from the transport vehicle onto the concrete pad.

c) Specify, size, and source all required rigging, including sizing of spreader bars, cables and other lifting hardware.

d) Coordinate all details of proper sling arrangement with the rigger and crane operator.

c. Reinstallation

1) Reconnect shipping split wiring.

2) Reassemble all items removed for shipment.

d. Anchorage

1) Contractor shall coordinate with District's contractor as required for anchorage prior to reinstallation to ensure the building meets the previously approved factory testing.

e. Site tests and inspections

1) Perform a functional test of all building auxiliary systems, including lighting, receptacles, and HVAC.

2) Perform a functional test of all items removed for shipment from the factory.

3) The Supplier's proposal shall include a minimum of five (5) days for a service representative to perform this work.

B. Manufacturers service representative

1. The manufacturers of the following equipment shall furnish a service representative for the equipment and materials startup as listed:

a. 15 kV Medium-Voltage Metal-Clad Switchgear

b. 48 VDC Station Battery and Charger

c. PAC equipment including all protective relay and control systems

d. HVAC System

e. 15kV Medium Voltage Automatic Delayed Transition Transfer Switch

2. The service representatives shall be technically competent, factory trained, experienced in the installation and operation of the equipment, and authorized by the manufacturer to perform the work stipulated.

C. Each service representative shall be a direct employee of the manufacturer of the respective component equipment.

D. The service representative shall provide the following additional services and assistance as required for the proper installation, testing, and operation of each item of equipment to include but not be limited to:

1. Service considered by the manufacturer as a condition to providing the warranties and guarantees specified herein.

2. Service required to correct design and manufacturing errors.

3. Equipment inspection and testing after installation and changes or adjustments required to assure proper operation.

E. Battery system installation and commissioning

1. General

a. All battery system commissioning and field services shall be performed by the battery manufacturer's service representative as described in Section 26 33 13.

F. This work shall be performed prior to any Pre-energization work by the third-party electrical testing firm.

a. Battery capacity testing shall be performed under the scope of work of the third-party electrical testing firm under the scope of work of a separate installation Contractor.

2. Battery

a. Battery manufacturer's service representative shall perform initial, on-site commissioning of the battery installation, including:

1) Verifying torque of all fasteners per the battery manufacturer's initial torque values listed in their installation manual

2) Removing shipping vent plugs, verifying electrolyte levels and preparing the battery system to be connected to the battery charger

3) Verifying that the cell connections are correct, positive (+) to negative (-), from the battery string to the DC panelboard

4) Measuring the voltage across each cell and the string.

5) Activating the battery charger for the first time and providing the initial charge at the volts/per cell and time duration recommended by the manufacturer

3.2 SWITCHGEAR

A. Factory quality control

1. Assemble, adjust, and complete manufacturer's standard production tests in accordance with the following referenced standards:

a. Switchgear: IEEE C37.20.2

b. Power Circuit Breakers: IEEE C37.09 – Chapter 5

2. The District shall perform functional witness testing of the switchgear in a factory demonstration test (FDT) prior to shipment.

B. Factory demonstration test (FDT)

1. The factory demonstration test shall demonstrate the following:

a. Compliance with this specification

b. Successful checkout of the manufacturer's standard production tests

c. Verification that all required field terminals for interface to external PAC Panel, AC and DC power panels, and similar equipment have been provided

d. Proper workmanship and correctness of all material, including all switchgear devices, internal wiring, and extra materials

e. Proper operation of all switchgear hardware through a complete functional checkout of every relay, switch, and meter. The approved AC and DC schematics shall be proved and highlighted on a line-by-line basis.

2. The Supplier shall arrange the factory demonstration test program so that a complete component-by-component functional checkout of the switchgear can be completed by the District inspectors in the time specified in this Section.

3. The switchgear supplier shall have an electrician or technician available for testing for the full duration of the test.

4. The tests shall demonstrate the specified functions to the satisfaction of the Engineer.

3.3 PAC EQUIPMENT

A. The PAC Equipment shall be tested in the Supplier's factory using a combination of circuit continuity checks, and electrical operation with temporary settings in relays.

B. Perform a complete factory function test of the PAC Equipment using simulated I/O.

C. Field functional testing will be performed by a third-party NETA testing agency hired by the contractor.

3.4 COMMUNICATION CONNECTIONS

A. All Ethernet-capable devices internal to the power building, as shown on the drawings, shall be pre-wired, connected, and tested prior to shipment. Device wiring shall adhere to the configurations and specifications indicated in the drawings, including proper labeling of each connection. Testing must confirm full functionality and communication integrity between all devices.

3.5 SWITCHBOARD MATTING INSTALLATION

A. Install switchboard matting in front and back of all electrical equipment on the project.

B. Cut two 3′-0″ square sections of switchboard matting for use as a portable personal protection platform for employees working near energized equipment. Store the two mats at the tool board in each power building.

3.6 SCHEDULES

A. Supplier shall complete fields 8 – 15 of the AIM Asset Templates as follows:

a. 8. MANUFACTURER NAME

1) This is the manufacturer name of the equipment listed. This field is limited to 25 characters. For equipment specified in this Section as "No equal", the manufacturer name is already included in the partially completed AIM Asset List Templates.

b. 9. EQUIPMENT MODEL #

1) This is the model number of the equipment listed. Do not list the serial number in this area. For equipment specified in this Section as "No equal", the equipment model is already included in the partially completed AIM asset lists.

c. 10. SERIAL #

1) This is the manufacturer's serial number for the equipment listed.

d. 11. PURCHASE PRICE

1) This is the equipment price found on the bill of material, for example. Do not include special characters in this field; no $, comma, or decimals. For example, $3,500.24 should be entered as 3500. The price should only be for the equipment referenced in the Equipment Name field.

e. 12. VENDOR NAME

1) Vendor name as indicated for the project.

f. 13. VENDOR PHONE #

1) Contact phone number for the vendor listed above.

g. 14. VENDOR CONTACT NAME

1) Contact name for the vendor listed above.

h. 15. WARRANTY EXPIRATION DATE

i. This is the warranty expiration date specified per the contract. Label as MM / DD / YYYY.

2. The District will provide the AIM Asset Template MS Excel spreadsheets to the Supplier upon request. Submit the completed AIM Asset Templates in MS Excel format.

END OF SECTION

SECTION 26 12 19

PAD-MOUNTED LIQUID-FILLED MEDIUM-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section includes:

1. Fabricate transformers in accordance with applicable ANSI, NEMA, and IEEE standards, except where specific requirements of this section take precedence.

2. Transformers shall be pad-mounted, compartmental type consisting of a transformer tank, one medium-voltage primary cable terminating compartment using separable, insulated medium-voltage connectors, and one low-voltage secondary compartment for underground conduit entrance. Transformer tank and compartments shall be assembled as an integral unit, and designed for outdoor installation on a concrete pad.

3. The required number of transformers and identification is as follows:

a. 25 kVA 1Ø South Spillway, Asset Tag: 1529-EPS-XFR-001

b. 25kVA 1Ø Camanche House, Asset Tag: 24-EPS-XFR-004

c. 500kVA 3Ø Camp Pardee, Asset Tag: 24-EPS-XFR-008

d. 2MVA 3Ø Pardee Powerhouse, Asset Tag: 536-EPS-XFR-006

B. Related Sections

1. Section 01 33 00 – Submittal Procedures.

2. Section 01 43 11 – Seismic Qualification and Certification.

3. Section 01 81 02 – Seismic Design Criteria.

4. Section 26 05 53 – Identification for Electrical Systems

1.2 QUALITY ASSURANCE

A. Seismic design requirements:

1. The transformer shall be designed to withstand seismic forces as required in Section 01 43 11.

1.3 SUBMITTALS

A. Product data showing and identifying manufacturer, catalog numbers, dimensions, weights, nameplate data, dielectric coolant volume, recommended concrete pad design, accessories specified in this section, and material of all components.

B. Assembly drawings with front, side, section views and uprights. Drawings shall show location of all accessories and conduit stub-up areas.

C. Anchor bolt calculations and placement drawing

D. Connection and single-line diagrams

E. Transformer through-fault damage curves for both three-phase and secondary single-phase-to-ground conditions for three-phase transformers, and transformer through-fault curves for both single-phase and secondary single-phase-to-ground conditions for single-phase transformers.

F. Equipment seismic qualifications, seismic calculations, and anchorage calculations/details as specified in Sections 01 43 11 and 01 81 02.

G. Manufacturer's installation instructions

H. Quality assurance submittals

1. Certified factory IEEE Std C57.12.00, Table 17 routine test report, in accordance with IEEE Std C57.12.90

2. Certified dissolved gas analysis (DGA) laboratory test report for transformers

I. Dimensioned as-built documents and O&M manuals

J. Training plan and schedule

1.4 REFERENCES

A. American National Standards Institute (ANSI)/Institute of Electrical and Electronic Engineers (IEEE):

1. ANSI C57.12.22, Transformers – Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase and Single-Phase Distribution Transformers with High-Voltage Bushings, 2,500 kVA and Smaller: High Voltage, 34,500 Grd Y/19 920 Volts and Below; Low Voltage, 480 Volts and Below Requirements

2. ANSI C57.12.70 – Terminals Markings and Connections for Distribution and Power Transformers

3. ANSI/IEEE C57.12.00 – Distribution, Power, and Regulating Transformers, General Requirements for Liquid-Immersed

4. ANSI/IEEE C57.12.80 – Terminology for Power and Distribution Transformers

5. ANSI/IEEE C57.12.90 – Test Code for Liquid-Immersed Distribution, Power and Regulating Transformers and Guide for Short Circuit Testing of Distribution and Power Transformers

6. ANSI/IEEE C57.109 – Guide for Liquid-Immersed Transformer Through-Fault-Current Duration

B. California Code of Regulations:

1. Title 24, Part 3 – California Electrical Code (CEC)

C. National Electrical Manufacturers Association

1. NEMA TR-1 – Transformers, Regulators, and Reactors

1.5 WARRANTY

A. Submit manufacturer's standard warranty.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery addresses

1. Pardee Chemical Plant

a. 3535 Sandretto Road, Valley Springs, CA 95252

B. Buildings shall not be shipped to the site until:

1. Certified factory test reports, including the punchlist developed during the factory demonstration test, have been approved

C. The transformer manufacturer shall protect and adequately pack equipment for the environmental conditions during transit to the jobsite.

D. All interconnection cables between shipping splits shall be disconnected, coiled, and protected for transit. Dedicated shipping splits terminal blocks labeled to match the wire tags shall be furnished.

E. Sensitive components removed from cabinets shall be clearly marked for easy reassembly at the jobsite.

F. A copy of the latest revision of the bill of material shall be shipped with the equipment.

G. Maintain factory protection of equipment and cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. Heat enclosures to prevent

condensation. Connect space heaters to temporary power upon delivery of the equipment to the site or interim storage facility. Space heaters shall be energized at all times.

1.7 MANUFACTURES FIELD SERVICES

A. The transformer manufacturer shall provide the field services of a factory technician as necessary to supervise/inspect installation, test and start-up all equipment provided as part of the price proposal. The price shall include all travel and living expenses in addition to the technician's time required to complete supervision of the installation, testing, and start-up. All equipment required for testing, start-up, and performance verification shall be provided by the manufacturer's technician.

B. At a minimum the manufacturer shall provide the following technician person-days for each occurrence:

Description	**Person-Days**
Inspection	2
Installation Assist	2
Settings, Adjustments	1
Start Up and Testing	1

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufactures: Subject to compliance with these specifications, the typical equipment, systems and accessories installed shall be manufactured by:

1. Hitachi

2. General Electric Company

3. Eaton

4. ABB Or equal as approved by the Engineer

2.2 RATING

A. Transformer: 3-phase and 1-phase, 60 hertz, and designed in accordance with the following:

1. Coolant: UL classified mineral oil suitable for use in power transformers.

2. Temperature Rise: 55/65 degrees Celsius. The average winding temperature rise above ambient temperature, when tested at the base transformer rating, shall not exceed 55 degrees C, and when tested at 112 percent of the base rating, shall not exceed 65 degrees C.

3. Type: ONAN

4. Capacity Rating:

    a. 25kVA 1Ø South Spillway

    b. 25kVA 1Ø Camanche House

    c. 500kVA 3Ø Camp Pardee

    d. 2MVA 3Ø Pardee Powerhouse

5. Primary:

    a. South Spillway: 12,470_VAC

    b. Camanche House: 7,200/12,470 VAC Reconnectable Primary

    c. Camp Pardee: 12,470 VAC Delta

    d. Pardee Powerhouse: 7,200 VAC Delta

    e. Provide rated kVA taps for two 21/2 percent steps above and 21/2 percent steps below rated nominal voltage

6. Secondary:

    a. South Spillway: 120/240_V

    b. Camanche House: 120/240 V

    c. Camp Pardee: 7,200 VAC Wye

    d. Pardee Powerhouse: 12,470 VAC Wye

7. Secondary System Configuration:

    a. South Spillway: 1Ø 3wire

    b. Camanche House: 1Ø 3-wire

    c. Camp Pardee: 3Ø 4-wire

    d. Pardee Powerhouse: 3Ø 4-wire

8. Nominal Impedance: 5.75 percent

    a. Basic Impulse Insulation Level (BIL):

        1) Primary: 95kV for 7,200V service

2) Primary: 110 kV for 12,470 service

3) Secondary: 10kV for 120/240V load

4) Secondary: 95 kV for 7,200V load

5) Secondary: 110 kV for 12,470V load

9. Sound Level: 58 dB (maximum average)

10. Surge Arresters

a. Primary: 7.65kV MCOV for 7,200V Service 3 wire

b. Primary: 10.2 kV MCOV for 12,470V Service 3 wirePrimary: 5.1kV MCOV for 7,200V Service 4 wire

c. Primary: 7.65 kV MCOV for 12,470V Service 4 wire

11. Grounding Pad.

12. Overcurrent Protection:

a. Bayonet-Type, Oil-Immersed Expulsion Fuses with a under oil partial range current limiting backup fuse:

1) Accessible through primary compartment.

2) Externally replaceable with hot stick.

3) Fault sensing with interrupting capacity of 1,800 amperes RMS asymmetrical.

b. Spare Fuses: For each transformer, provide three additional spare fuses, the same size as those installed. Spare fuses shall be shipped with the transformer.

2.3 FABRICATION

A. Construction: Sealed tank construction with welded cover. Dead front type. Permanently locate an inorganic gasket between the cover and the tank flange during the welding of the transformer cover to prevent the entrance of weld spatter into the tank.

B. Terminal Compartments:

1. Locate side-by-side, separated by a steel barrier, full height, air filled, and incoming and outgoing terminal compartments with hinged doors.

2. Install infrared inspection window on both transformer doors to facilitate thermal imaging inspections.

3. The incoming compartment shall be accessible only after the outgoing compartment has been opened. Incoming compartment shall enclose the transformer primary bushings.

4. Compartment hood shall be removable for pulling cables and making connections. Compartment door sills shall be removable to permit rolling or skidding unit into place over conduit stub-ups.

5. Provide incoming and secondary outgoing bushings to accept the quantity and size of conductors indicated on the drawings.

    a. Transformer primary connections shall be as follows for cable sizes shown on the drawings:

        1) Provide medium-voltage bushings for a radial feed configuration using a modular connection system complying with IEEE 386, for use on 15kV class EPR solid dielectric cable.

        2) The high-voltage bushings shall be 200A, 15kV class bushing wells with loadbreak bushing well inserts installed. The bushings shall be externally removable and shall be supplied with a removable stud.

        3) Separable 200A, 15kV class loadbreak elbow connectors shall be provided for cable termination at loadbreak bushing inserts. Connectors shall have a capacitive test point on the terminator body. Each connector shall come with an insulated plug, cap, stud, compression lug, cable adapter and metallic tape shield adapter.

    b. For Camanche House and Spillway, secondary terminations shall be tin-plated spade-type bushings. Quantity of connection holes shall match the number of outgoing cables shown on the drawings.

6. Primary and secondary winding material (coils) shall be made of copper.

7. Cable accessory parking stands shall be provided and shall be located such that the separable insulated connectors can be operated by hot-line tools.

8. Provide a bolted tamper-resistant handhole in the tank cover for access to internal connections. Handhole shall be 8-inch diameter (minimum).

9. Compartment Doors:

    a. Hinged to latch in open position. Incoming compartment door shall have a fastening device that is accessible only through the outgoing compartment.

b. Both compartment doors shall be able to be locked with a single padlock.

c. Hinge assemblies shall be made of 316 stainless steel.

10. Enclosure must be available in the colors shown below and meet the finish requirements as defined in IEEE Std. C57.12.28™-2014 standard.

a. Munsell Green color 7GY 3.29-1.5 (standard)

2.4 ACCESSORIES

A. Provide the following standard features and accessories:

1. Top filter press connection with pipe cap, 1/2-inch minimum

2. Drain and filter press valve, 1/2-inch minimum, globe-type, sampling valve

3. No-load primary tap changer with an externally operated, snap action switch and hotstick or wrench-operable handle. Handle shall have provisions for padlocking.

4. Diagrammatic nameplate on both the inside and outside surfaces of the outgoing compartment door. Inside nameplate shall be readable with cables in place.

5. 7,200V/12,470V primary windings reconnectable no load swap action selector switch with hot stick or wrench operable handle with provision for padlocking in both positions (for Camanche House transformer only).

6. Liquid-level gauge

7. Top liquid thermometer, dial-type, 0-120 degrees Celsius scale

8. Pressure vacuum gauge, -10 psig to +10 psig scale

9. Copper-faced ground pads for number of connections as shown on the drawings

10. Handhole in cover

11. Lifting lugs at each corner of tank for lifting the complete transformer

12. Jacking facilities at each corner of base for jacking the complete transformer

13. Qualitrol pressure relief valve mounted in low-voltage compartment with automatic resealing-resetting operation and mechanical indicator which identifies device operation.

14. Internal, oil-immersed, gang-operated, two-position (ON-OFF), loadbreak, manually operated radial switch. Switch shall be able to switch transformer

full-load current. Switch handle shall be located in primary compartment and shall be hot-stick operable.

15. Internal surge arresters

    a. Camanche and Spillway Transformers:

        1) Internal surge arresters on the primary winding. External surge arresters on the secondary winding. Secondary arresters shall be mounted adjacent to the secondary terminals of each transformer complete with brackets and mounting hardware. Arresters shall be distribution class, gapless metal oxide type.

    b. Camp Pardee and Pardee Powerhouse Transformers:

        1) Surge arresters on the primary and secondary winding terminals. Utilize elbow arresters for deadfront connections. Arresters shall be distribution class, gapless metal oxide type

2.5 LABELLING

A. A plastic laminated copy of the as-built main plant distribution single-line diagram, certified test results, baseline dissolved gas and metals analyses, and instruction manual shall be provided in the inside of the low-voltage compartment door.

PART 3 - EXECUTION

3.1 FACTORY QUALITY CONTROL

A. Shop Testing: Transformer shall receive routine tests in accordance with Table 17 of ANSI/IEEE C57.12.00/C57.12.90 in addition to other specific tests noted in this Section for the unit to be supplied. Certified test form shall contain the following testing result summary:

1. Transformer ID as shown on the drawings, manufacturer product number, serial number, and test date

2. Phase, frequency, and coolant type

3. High and low voltage winding type, voltage rating, and BIL

4. Voltage values for each of the five primary tap settings

5. Regulation at 100 percent , 90 percent, 85 percent, 80 percent, and 75 percent PF

6. Efficiency at 125 percent, 100 percent, 75 percent, 50 percent, and 25 percent load

7. Insulation power factor (percent), capacitance, and insulation resistance

8. Applied voltage test

9. Induced voltage test

10. Routine impulse test

11. Polarity and phase relation check on the rated voltage connection

12. Ratio check at all tap settings

13. No-load loss and exciting current at rated voltage

14. Impedance voltage and load loss at rated current and frequency on the rated voltage connection

15. Resistance measurements of all windings on the rated voltage tap

16. Liquid testing – PF and dielectric breakdown voltage

17. Mechanical leak test: Prior to shipment, liquid-fill and pressure-test transformer for at least 8 hours at the maximum operating pressure for detecting the presence of leaks.

B. Verification of Performance: Submit test results certified by a registered professional engineer.

C. Transformer shall be UL or Factory Mutual Approved.

3.2 INSTALLATION

A. Install on concrete pad following manufacturer's instructions and layout from approved shop drawings.

B. Provide equipment anchorage to resist seismic forces as directed by the approved seismic calculations.

C. Manufacturer or manufacturer's representative shall inspect the equipment before start-up and certify that system has been correctly installed and prepared for start-up as specified in this section.

3.3 PROTECTION

A. Protect products until acceptance by the Engineer.

B. Transformers shall be stored in climate-controlled buildings prior to installation. Under no circumstances are transformers to be left sitting on the ground outside prior to installation.

3.4 ADJUSTING

A. Adjust primary taps so that secondary voltage is within 2 percent of rated voltage.

3.5 CLEANING

A. Clean transformers to remove construction debris, dirt, and shipping materials.

3.6 PAINTING

A. Repair scratched or marred exterior surfaces to match original finish.

3.7 TRAINING

A. Training shall be by manufacturer's qualified representative and shall include instruction on complete service, operation, and maintenance of the transformer, as recommended by the manufacturer.

END OF SECTION

SECTION 26 13 16.13

MEDIUM VOLTAGE LOAD INTERRUPTER SWITCHGEAR

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Furnish and install NEMA 3R outdoor medium voltage load interrupter switchgear as shown on the drawings and as specified herein. The switchgear and identification to be provided is as follows:

a. Camp Pardee, Asset Tag: 24-EPS-SWF-001

b. South Spillway, Asset Tag: 1529-EPS-SWF-001

B. Related sections:

1. Section 01 33 00 – Submittal Procedures

2. Section 01 43 11 – Seismic Qualification and Certification

3. Section 01 81 02 – Seismic Design Criteria

4. Section 26 05 53 – Identification for Electrical Systems

5. Equipment mounting hardware and seismic calculations shall be as specified in Sections 01 43 11 and 01 81 02.

1.2 QUALITY ASSURANCE

A. The equipment furnished under this section shall be the product of a manufacturer who has produced this same type of equipment for a period of at least five (5) consecutive years.

B. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

C. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

D. The switchgear equipment shall be listed or labeled by Underwriter's Laboratories or other equivalent, nationally recognized independent testing laboratory for the class of service intended. A nationally recognized testing laboratory is defined as one which is approved in accordance with OSHA regulations, by the United States Secretary of Labor. Provide certification of listed equipment

E. Provide Seismic tested equipment as follows:

1. The equipment and major components shall be suitable for and certified by actual seismic testing to meet all applicable seismic requirements of the latest International Building Code (IBC) or latest California Building Code (CBC) with OSHPD Amendments, including OSHPD Special Seismic Certification (OSP) Pre-Approval.

2. The Project Structural Engineer will provide site specific ground motion criteria for use by the manufacturer to establish SDS values required.

3. The IP rating of the equipment shall be 1.5

4. The Structural Engineer for the Site will evaluate the SDS values published on the Manufacturer's or OSHPD website to ascertain that they are "equal to" or "greater than" those required for the Project Site.

5. The following minimum mounting and installation guidelines shall be met, unless specifically modified by the above referenced standards.

a. The Contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared and stamped by a licensed civil engineer in the state. Mounting recommendations shall be provided by the manufacturer based upon the above criteria to verify the seismic design of the equipment.

b. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.

F. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 00, shop drawings and product data, for the following:

1. Equipment shop drawings showing elevation and plan views, conduit entrance spaces, nameplate data, bus arrangement, dimensions, weight, and shipping splits . Indicate all options, special features, ratings and deviations from this Section.

2. Point-to-point compartment wiring diagrams for control circuits and accessories. Show wire and terminal numbers.

3. Conduit stub-up and layout plans coordinated with the outdoor enclosure plan submittal.

4. Time-current characteristics for all fuses.

5. Product data sheets and catalog numbers for fuses and replaceable parts. List all options and accessories furnished specifically for this project.

6. Itemized bill of materials for accessories and control equipment

7. Instruction and renewal parts books

8. Itemized list of spare parts furnished specifically for this project, including quantities, description and part numbers

9. Certified factory test reports including the punchlist developed during the factory demonstration test. Describe point-by-point how each punchlist comment was addressed. Initial and date all items.

10. Manufacturer's field service test procedures, checklists, and test forms. Layout plans and details for switchgear footprint and mounting. Plans shall be on a minimum size of 11"x17" drawing. Coordinate layout plan with conduit entrance and stub-up requirements as shown on the contract plan drawings.

11. External circuit terminations wiring diagrams with numbered terminal point designations

12. Detailed lists of factory tests and field tests to be performed, including additional factory tests of the switchgear

13. Proposed acceptance and performance test and demonstration procedures for the switchgear

14. Proposed "check off" test for coordination of terminal blocks and wiring between switchgear and switchboard

15. Training classes and schedules together with detailed lesson plans

16. The name, address, and phone number of the local sales representative and technical assistance for the equipment

17. The name, address, and phone number of the local parts distributor for the equipment

18. Nameplate schedule for internal and external (front panel mounted) components

B. Provide seismic conformance computations carried out by a professional civil or structural engineer registered in the State of California. Submit calculations that verifies that the switchgear has been designed and constructed to withstand the specified seismic requirements. Submit calculations prior to manufacture of equipment.

C. Submit anchoring calculations for switchgear per Sections 01 43 11 and 01 81 02.

1.4 REFERENCE STANDARDS

A. Switchgear and components shall be designed, built and tested in accordance with the latest revision of the following standards:

1. ANSI/IEEE C37.20.3 – IEEE Standard for Metal-Enclosed Interrupter Switchgear

2. ANSI/IEEE C37.20.4 – IEE Standard for Indoor AC Switches (1 kV-38 kV) for Use in Metal-Enclosed Switchgear ANSI C37.22 – Preferred Ratings and Related Required Capabilities for Indoor AC Medium-Voltage Switches Used in Metal-Enclosed Switchgear

3. National Electrical Manufacturers Association (NEMA)

a. ANSI/NEMA C37.57 – Metal-Enclosed Interrupter Switchgear Assemblies – Conformance Testing

b. ANSI/NEMA C37.58 – Indoor AC Medium-Voltage Switches for Use in Metal-Enclosed Switchgear – Conformance Test Procedures CSA 22.2 No.31-M89 – Switchgear Assemblies

4. EEMAC G8-3.3 – Metal-Enclosed Interrupter Switchgear Assemblies

5. National Fire Protection Association (NFPA)

a. NFPA 70E, Standard for Electrical Safety in the Workplace

1.5 MANUFACTURER'S FIELD SERVICES

A. Manufacturer's representative shall be present at the site or classroom designated by the Engineer, for the minimum person-days listed, travel time and expenses excluded.

B. Provide operating and maintenance training to District personnel for the medium voltage load interrupter switchgear.

1. Customize the training program specifically for the equipment supplied on this project.

2. The proposal shall include 1 day/8 hours of training time and 1 round trips for training services described in this Section for a field service engineer employed by the Supplier.

3. Each training session will have 12 attendees.

4. The session will be scheduled at a mutually convenient time for all parties.

C. Submit a manufacturer's certificate of proper installation upon successful completion of the field testing and startup effort.

1.6 WARRANTY

A. Submit manufacturer's standard warranty.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery address

1. Pardee Chemical Plant

a. 3535 Sandretto Road, Valley Springs, CA 95252

B. Buildings shall not be shipped to the site until:

1. Certified factory test reports, including the punchlist developed during the factory demonstration test, have been approved

C. The switchgear manufacturer shall protect and adequately pack equipment for the environmental conditions during transit to the jobsite.

D. All interconnection cables between shipping splits shall be disconnected, coiled, and protected for transit. Dedicated shipping splits terminal blocks labeled to match the wire tags shall be furnished.

E. Sensitive components removed from cabinets shall be clearly marked for easy reassembly at the jobsite.

F. A copy of the latest revision of the bill of material shall be shipped with the equipment.

G. Maintain factory protection of equipment and cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. Heat enclosures to prevent condensation. Connect space heaters to temporary power upon delivery of the equipment to the site or interim storage facility. Space heaters shall be energized at all times.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURES

A. Eaton

B. ABB

C. Siemens

D. Or equal as approved by the Engineer

2.2 RATINGS

A. Switchgear assembly:

1.	Nominal System Voltage	12.47 kV three-phase three wire
2.	System Grounding	Solid
3.	Maximum Design Voltage	15 kV
4.	BIL	95kV
5.	Main Cross Bus Momentary Current (10 Cycle)	40 kA Asymmetrical RMS
6.	Main Cross Bus 2-Second short circuit current	25 kA Symmetrical RMS
7.	Type of Fuse	CLE
8.	Fuse Interrupting Rating	63 kA Sym RMS
9.	Fuse Rating	As shown on Drawings
10.	Fused Switch Fault close	101 kA Asym RMS

2.3 CONSTRUCTION

A. Structure

1. The metal-enclosed load interrupter switchgear shall consist of deadfront, completely metal-enclosed vertical sections containing load interrupter switches and fuses of the number, rating and type noted on the drawings or specified herein.

2. The following features shall be supplied on every vertical section containing a three-pole, two-position open-closed switch:

a. A minimum 8-inch x 16-inch high-impact viewing window that permits full view of the position of all three switch blades through the closed door. The window shall not be more than 58 inches above the switch pad level to allow ease of inspection.

b. The door shall be interlocked with the switch so that:

1) The switch must be opened before the door can be opened

2) The door must be closed before the switch can be closed

c. A hinged grounded metal barrier that is bolted closed in front of every switch to prevent inadvertent contact with any live part, yet allows for a full-view inspection on the switch blade position

d. Provision for padlocking the switch in the open or closed position

e. Green OPEN, Red CLOSED switch position indicators with the words "Open" and "Closed" .

f. A hinged cover with rustproof quarter turn nylon latches over the switch operating mechanism to discourage casual tampering

g. The switch shall be removable from the structure as a complete operational component

3. Vertical section construction shall be of the universal frame type using die-formed and bolted parts. All enclosing covers and doors shall be fabricated from steel whose thickness shall be equal to or greater than those specified in ANSI/IEEE C37.20.3. No owner removable hardware for covers or doors shall be thread-forming type. To facilitate installation and maintenance of cables and bus in each vertical section, a split removable top cover and padlockable hinged rear door held closed by bolts shall be provided. A G90 grade galvanized base shall isolate equipment from contact with the concrete pad providing protection from rust. Heavy-duty hot dipped galvanized anchor clips shall be provided to anchor the switchgear to the concrete pad.

4. Each vertical section containing a switch shall have a single, full-length, flanged front door and shall be equipped with two (2) rotary latch-type padlockable handles. Provision shall be made for operating the switch and storing the removable handle without opening the full length door.

5. Each load interrupter switch shall have the following features:

a. Three-pole gang-operated mechanism

b. Manual quick-make, quick-break over-toggle-type mechanism that does not require the use of a chain or a cable for operation, and utilizes a heavy-duty coil spring to provide opening and closing energy

c. The speed of opening and closing the switch shall be independent of the operator, and it shall be impossible to tease the switch into any intermediate position under normal operation

d. Separate main and break contacts to provide maximum endurance for fault close and load interrupting duty

e. Insulating barriers between each phase and between the outer phases and the enclosure

f. A maintenance provision for slow closing the switch to check switch blade engagement and slow opening the switch to check operation of the arc interrupting contacts

B. Bus

1. All phase bus conductors shall be tin-plated copper.

2. Ground bus shall be silver-plated copper and be directly fastened to a galvanized metal surface of each vertical section, and be of a size sufficient to carry the rated
(2-second) current of the switchgear assembly.

3. A neutral bus shall be provided only when indicated on the drawings. It shall be insulated for 1000 Vac to ground. The current rating of the neutral bus shall be 600 amperes.

C. Bus Insulation System

1. All bus shall be supported utilizing a high strength and high creep, support providing 10.5-inch of creep distance between phases and ground. The molded fins shall be constructed of high track resistant aramid nylon.

2. All standoff insulators on switches and fuse mountings shall be glass polyester.

D. Wiring/Terminations

1. One (1) terminal pad per phase shall be provided for attaching contractor-supplied cable terminal lugs for a maximum of two (2) conductors per phase of the sizes indicated on the drawings. Sufficient space shall be allowed for contractor supplied electrical stress relief termination devices.

2. Small wiring, fuse blocks and terminal blocks within the vertical section shall be furnished as indicated on the drawings. Each control wire shall be labeled with wire markers. Terminal blocks shall be provided for owner's connections to other apparatus

E. Fuses

1. Fault protection shall be provided by fuses with continuous ratings as shown in the contract documents. Furnish three (3) spare fuses for each fused switch. Any fuse/switch integrated momentary and fault close ratings specified shall have been verified by test and UL and CSA certified

F. Accessories

1. Furnish distribution class surge arresters with ratings in accordance with manufacture's recommendations

2. Furnish two (2) each normally open and normally closed (NO/NC) auxiliary contacts for external use rated 10 amps, 250 VAC

G. Nameplates

1. A nameplate shall be mounted on the front door of each switch vertical section in accordance with the drawings.

H. Finish

1. Prior to assembly, all enclosing steel shall be thoroughly cleaned and phosphatized. A powder coating shall be applied electrostatically, then fused-on by baking in an oven. The coating is to have a thickness of not less than 1.5 mils. The finish shall have the following properties:

Impact resistance (ASTM D-2794)	60 direct/60 indirect
Pencil hardness (ASTM D-3363)	H
Flexibility (ASTM D-522)	Pass 1/8-inch mandrel
Salt spray (ASTM B117-85 [20])	600 hours
Color	ANSI 61 gray

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.

B. All necessary hardware to secure the assembly in place shall be provided by the Contractor.

3.2 FACTORY TESTING

A. Standard factory tests shall be performed on the equipment under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.

B. Factory tests as outlined above shall be witnessed by the owner's representative.

1. The manufacturer shall notify the owner two (2) weeks prior to the date the tests are to be performed

2. The manufacturer shall include the cost of transportation and lodging for up to three (3) owner's representatives. The cost of meals and incidental expenses shall be the owner's responsibility

C. The manufacturer shall provide three (3) certified copies of factory test reports.

3.3 MANUFACTURER'S CERTIFICATION

A. The Contractor shall support the District's Contractor during startup and commissioning and provide a qualified factory-trained manufacturer's representative to certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.

B. The Contractor shall provide three (3) copies of the manufacturer's certification.

3.4 TRAINING

A. The Contractor shall provide a training session for up to five (5) owner's representatives for 2 normal workdays at a job site location determined by the owner.

B. The training session shall be conducted by a manufacturer's qualified representative and consist of instruction on the assembly, switches and major components

END OF SECTION

SECTION 26 13 16.14

15KV MEDIUM VOLTAGE SECTIONALIZING CABINETS

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes:

1. Test and mechanical characteristics of three-phase sectionalizing enclosures.

a. Camp Pardee 15kV Sectionalizing Cabinet, Asset Tag: 24-EPS-SWN-001

b. South Spillway 15kV Sectionalizing Cabinet, Asset Tag: 1529-EPS-SWN-001

B. Related sections

1. Section 01 33 00 – Submittal Procedures

2. Section 01 43 11 – Seismic Qualification and Certification.

3. Section 01 81 02 – Seismic Design Criteria

4. Section 26 05 53 – Identification for Electrical Systems

1.2 QUALITY ASSURANCE

A. Seismic design requirements:

1.3 SUBMITTALS

A. Product data showing and identifying manufacturer, catalog numbers, dimensions, weights, nameplate data, dielectric coolant volume, recommended concrete pad design, accessories specified in this section, and material of all components.

B. Assembly drawings with front, side, section views and uprights. Drawings shall show location of all accessories and conduit stub-up areas.

C. Anchor bolt placement drawing

D. Connection and single-line diagrams

E. Equipment seismic qualifications, seismic calculations, and anchorage details as specified in Sections 01 43 11 and 01 81 02.

F. Manufacturer's installation instructions

G. Certified test reports

H. Dimensioned as-built documents and O&M manuals

I. Training schedule

1.4 REFERENCES

A. All characteristics, definitions, and terminology, except as specifically covered in this specification, shall be in accordance with the latest revision of the following standards

1. IEEE Std C57.12.28™-2014 standard - IEEE Standard for Pad-Mounted Equipment - Enclosure Integrity.

2. IEEE Std C57.12.38™-2014 standard - IEEE Standard for Pad-Mounted-Type, Self-Cooled, Single-Phase Distribution (Parking Stands Only).

3. IEEE Std 386™-2006 standard - IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V.

1.5 WARRANTY

A. Submit manufacturer’s standard warranty.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery address

1. 3535 Sandretto Road, Valley Springs, CA 95252

B. Buildings shall not be shipped to the site until:

i. Certified factory test reports, including the punchlist developed during the factory demonstration test, have been approved

C. The manufacturer shall protect and adequately pack equipment for the environmental conditions during transit to the jobsite.

D. All interconnection cables between shipping splits shall be disconnected, coiled, and protected for transit. Dedicated shipping splits terminal blocks labeled to match the wire tags shall be furnished.

E. Sensitive components removed from cabinets shall be clearly marked for easy reassembly at the jobsite.

F. A copy of the latest revision of the bill of material shall be shipped with the equipment.

G. Maintain factory protection of equipment and cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. Heat enclosures to prevent condensation. Connect space heaters to temporary power upon delivery of the equipment to the site or interim storage facility. Space heaters shall be energized at all times.

PART 2 – PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Eaton’s Cooper Power series

B. ABB

PART 3 - CONSTRUCTION

3.1 CONSTRUCTION

A. The sectionalizing enclosure must be continuous seam-welded and manufactured of 12-gauge HRPO mild steel and shall be rated NEMA 3R for outdoor installation.

B. Enclosures must also be available in stainless steel and aluminum for high corrosive areas.

C. All hardware must be stainless steel for corrosion resistance.

D. Enclosure must be available in the colors shown below and meet the finish requirements as defined in IEEE Std. C57.12.28™-2014 standard.

1. Munsell Green color 7GY 3.29-1.5 (standard)

E. Enclosure must include a top hinged removable cover and allow one person operation. Cover must also include a wind stop to prevent accidental closing.

F. Enclosure must include a deep angled recessed door with low sill for easy accessibility.

G. Enclosure must include universal mounting plates painted light grey for optimum visibility of cable terminations and must accept the following:

1. 200 A, 15,25 & 35 kV, two-, three- and four-position loadbreak junctions (enclosure size dependent).

2. 600 A, 15/25 & 35 kV, two-, three- and four-position deadbreak junctions (enclosure size dependent).

H. Enclosures must be available with junctions and configurations as shown on the drawings.

I. Enclosure must include “parking lot” parking stand design providing multiple options for parking of accessories and providing rigidity to the back of the enclosure to prevent oil-canning during operation.

J. Enclosure must provide a minimum of 1 parking stand pocket per phase.

K. Enclosure must include a minimum of one grounding provision per phase.

L. Enclosure must include provisions for lifting.

M. Enclosure must include a recessed lock pocket, padlock hasp and pentahead bolt for security.

3.2 DIMENSIONS

A. Enclosures must be available in the following sizes:

1. 30”H X 24”W X 22”D

2. 30”H X 30”W X 22”D

3. 30”H X 48”W X 22”D

4. 30”H X 66”W X 22”D

5. 30”H X 84”W X 22”D

6. 30”H X 98”W X 30”D

3.3 OPTIONAL FEATURES

A. 3/8” ground bar installed.

3.4 GROUND SLEEVES

A. Fiberglass ground sleeves to accommodate enclosures must be available in 18” and 30” heights.

3.5 BASE EXTENSIONS

A. Provide steel base extensions to accommodate enclosures shown on the drawings. Extensions shall be provided in 24” heights for all enclosures shown on the drawings.

END OF SECTION

SECTION 26 22 13

LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Energy efficient, dry-type, single-phase and three-phase low-voltage transformers

B. Related sections:

1. Section 01 33 00 – Submittal Procedures

2. Section 01 43 11 – Seismic Qualification and Certification

3. Section 01 81 02 – Seismic Design Criteria

4. Section 26 05 53 – Identification for Electrical Systems

1.2 REFERENCES

A. Low-voltage distribution transformers shall be designed, built, tested, and installed in accordance with the latest editions and revisions of the following:

1. California Code of Regulations

a. Title 24, Part 3 – California Electrical Code (CEC)

2. Code of Federal Regulations (CFR)

a. Title 10, Chapter II, Subchapter D, Part 431, Subpart K – Distribution Transformers

3. Institute of Electrical and Electronics Engineers

a. ANSI/IEEE Std 693 – IEEE Recommended Practice for Seismic Design of Substations

b. IEEE C57.12.01 – General Requirements for Dry-Type Distribution and Power Transformers Including Those with Solid Cast and/or Resin-Encapsulated Windings

c. IEEE C57.12.91 – Test Code for Dry-Type Distribution and Power Transformers

d. ANSI/IEEE C57.96 – Distribution and Power Transformers, Guide for Loading Dry-Type appendix to ANSI C57.12 standards

4. National Electrical Contractors Association (NECA)

a. ANSI/NECA 409 – Standard for Installing and Maintaining Dry-Type Transformers

5. National Electrical Manufacturers Association (NEMA)

a. ST-20 – Dry Type Transformers for General Applications

b. TP-1 – Guide for Determining Energy Efficiency for Distribution Transformers

c. TP-2 – Standard Test Methods for Measuring the Energy Consumption of Distribution Transformers

6. National Fire Protection Association (NFPA)

a. ANSI/NFPA 70 – National Electrical Code (NEC)

b. NFPA 70E – Standard for Electrical Safety in the Workplace

7. Underwriters Laboratories

a. UL 506 – Specialty Transformers

1.3 SUBMITTALS

A. In addition to the requirements of Section 01 33 00, provide:

1. Product Data

2. Plan, front, and side view drawing including overall dimensions, weights, and anchoring details

3. Internal schematics (elementary diagrams) and connection diagrams

4. Transformer mounting bracket design for wall-mount applications

5. Dimensioned as-built documents, installation, and O&M manuals

6. Quality Assurance/Control Submittals

a. Certified factory test reports

b. IEEE Std 693 seismic qualification certification per Section 01 43 11

c. Transformer anchorage calculations per Sections 01 43 11 and 01 81 02

d. Low noise, -5dB below NEMA standard certification

1.4 QUALITY ASSURANCE

A. Transformers shall have the UL Energy Efficiency Verification mark and shall be certified to meet or exceed the minimum energy efficiency requirements of 20 C.F.R. §410.

B. Transformers shall be qualified for use in seismic areas as follows:

1. High seismic loading as defined in IEEE Std 693, for in-service installation bolted to a concrete pad in accordance with the anchor design provided in the seismic anchorage calculation submittal specified in this section.

2. Seismic compliance shall be qualified only through shake table testing. Compliance by calculation is not acceptable.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Follow the manufacturer's handling instructions.

B. When the equipment arrives on-site, the District's construction inspector will examine this equipment. If it is necessary to remove the original shipping packing for inspection, the Contractor shall cover the top and any openings to protect the equipment against weather, dirt, and rodents during the construction period.

C. Outdoor transformers are not weather resistant until completely and properly installed and shall be treated exactly the same as indoor transformers until after they are installed. Transformers that are not installed and energized immediately shall be stored in a clean, dry, rodent-free space having a uniform temperature to prevent condensation.

1.6 COMMISSIONING

A. Commission transformers as specified in Section 26 08 00.

PART 2 - PRODUCTS

2.1 DISTRIBUTION TRANSFORMERS - LOW VOLTAGE LIGHTING AND POWER

A. Acceptable manufacturers

1. General Electric Type QL DOE 2016 Design

2. Eaton DOE 2016 Efficient Transformers

3. Hammond HPS Sentinel G

4. Or equal as approved by the Engineer

B. Rating

1. Three-phase: kVA, primary voltage, and secondary voltage as indicated on the drawings

2. Single phase: kVA, primary voltage, and secondary voltage as indicated on the drawings

3. BIL: 10 kV

4. Taps: Installed where indicated on the drawings, with at least four 2-1/2 percent primary winding taps, two above and two below nominal

5. Sound level: Special low noise design, -5dB less than NEMA ST-20 maximum average sound level for dry type transformers

6. Efficiency: low loss type, with minimum efficiencies per 20 C.F.R. §410

C. Construction

1. 220 degrees C insulation system based upon 150 degrees C rise for transformers 75kVA and above. For transformers less than 75kVA the insulation shall be 220 degrees C with 115 degree C rise. Transformer shall be rated for 40 degrees C ambient.

2. Temperature rating of transformer enclosure shall be 90 degrees C maximum.

3. Indoor transformers shall be the ventilated type with a NEMA 2 enclosure.

4. Outdoor transformers shall be non-ventilated, totally enclosed type with NEMA 3R enclosure.

5. Primary and secondary coil windings shall be copper.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install transformer on housekeeping pad where specified on the drawings. Provide vibration-absorbing pads and securely bolt to base to minimize sound transmission.

B. Provide equipment anchorage to resist seismic forces as directed by the approved seismic calculations.

C. Maintain a minimum of 6” clearance for heat dissipation.

3.2 CLEANING

A. Remove all rubbish and debris from inside and around the transformers. Remove dirt, dust, or concrete spatter from the interior and exterior of the equipment using brushes, vacuum cleaner, or clean, lint free rags. Do not use compressed air.

B. Replace all covers. Check for pinched wires and securely fasten all covers.

3.3 ADJUSTING

A. Measure the primary and secondary phase-to-phase and phase-to-neutral voltages, along with the secondary phase-to-ground and neutral-to-ground voltages, after energizing the transformer and prior to loading.

B. Adjust primary taps so that secondary voltage is within 2 percent of rated voltage.

C. Check the phase rotation of the transformer secondary.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Furnish all labor, materials, equipment, and incidentals required and install all panelboards as shown on the drawings and as specified herein.

B. Related sections

1. Section 01 33 00 – Submittal Procedures

2. Section 01 43 11 – Seismic Qualification and Certification

3. Section 01 81 02 – Seismic Design Criteria

4. Section 26 05 53 – Identification for Electrical Systems

1.2 REFERENCES

A. Panelboards shall be designed, built, tested, and installed in accordance with the latest editions and revisions of the following:

1. Institute of Electrical and Electronics Engineers (IEEE)

a. ANSI/IEEE C62.41.1-2002, Guide on the Surge Environment in Low-Voltage AC Power Circuits

b. ANSI/IEEE Std 693, IEEE Recommended Practice for Seismic Design of Substations

2. National Electrical Contractors Association (NECA)

a. ANSI/NECA 407, Standard for Installing and Maintaining Panelboards

3. National Electrical Manufacturers Association (NEMA)

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

4. National Fire Protection Association (NFPA)

a. NFPA 70E, Standard for Electrical Safety in the Workplace

5. Underwriters Laboratories (UL)

a. UL 508A, Industrial Control Panels

b. UL 1449, Standard for Surge Protective Devices

1.3 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

B. Bill of materials

C. Shop drawings

1. Summary report of all panelboards supplied under this Section, including panelboard tag name, type, service, number of circuits, direction of feed, mounting, main device ratings, terminal lug data, and short-circuit rating.

2. Detailed description and layout for each panelboard including the following:

a. Panel electrical and construction ratings

b. Catalog numbers and rating data for main and branch protective devices

c. Description of all options

d. Panel interior layout

3. Outline drawing showing dimensions

4. Wiring diagram

D. Quality assurance/control submittals

1. IEEE Std 693 seismic qualification certification per Section 01 43 11 – Seismic Qualification and Certification

2. UL labeling

3. Provide electrical safety submittals that are specific to the work in this Section in accordance with Section 01 35 24 – Project Safety Requirements, including:

a. Task-specific job briefing and planning checklist for the specific work to be performed

b. Hazardous energy control plan, including task-specific procedural steps for the specific work to be performed, in accordance with the Contractor's lockout/tagout (LOTO) program

E. As-built shop drawings, installation, and O&M manuals per Section 01 33 00 – Submittal Procedures

1.4 QUALITY ASSURANCE

A. Panelboards shall be designed for use in seismic areas as follows:

1. High seismic loading as defined in IEEE Std 693, for in-service installation bolted to a concrete mounting surface in accordance with the anchor design provided in the seismic anchorage calculation submittal specified in this section.

2. Seismic compliance shall be qualified only through shake table testing. Compliance by calculation is not acceptable.

B. Provide a seismic qualification label on each panelboard

C. Provide UL labeled panelboards

D. All personnel working on the installation, commissioning, and operation of the equipment specified in this Section shall have documented and current training for all work tasks specified in this Section as required by NFPA 70E

1.5 DELIVERY, STORAGE AND HANDLING

A. Follow the manufacturer's handling instructions, the requirements of NEMA PB 1.1, and the requirements in Section 26 05 00 – Common Work Results for Electrical.

B. Panelboards that are not installed and energized immediately shall be stored in a clean, dry, rodent-free, and heated building having a uniform temperature and air circulation to prevent condensation.

C. Leave original packing materials intact until panelboards are ready for installation.

PART 2 - PRODUCTS

2.1 GENERAL

A. Panelboards shall include the quantity, ampere, interrupting rating, and ratings of circuit breakers as shown on the panelboard schedules included in the drawings.

B. Provide additional features including ground fault circuit interrupting breakers and Surge Protective Devices (SPD) equipment where noted in this section

C. Asset Names:

1. South Spillway Panelboard: 1529-EPS-LP-001

2. Pardee Chemical Plant Switchgear Panelboard: 234-EPS-LP-001

2.2 PANELBOARDS

A. Acceptable Products:

1. Eaton, Pow-R-Line (or equivalent model)

2. ABB, A-Series II (or equivalent model)

3. Siemens, P-Series (or equivalent model)

4. Or equal as approved by the Engineer

B. Rating

1. Panelboard ratings shall be as shown on the drawings. All panelboards shall be rated for the voltage specified.

2. Panelboards shall be fully rated for the specified circuit breaker fault current interrupting capacity. Series connected short circuit ratings are not acceptable.

3. Indoor enclosure rating shall be NEMA Type 1 gasketed, unless noted otherwise on the drawings.

4. Outdoor enclosure rating shall be NEMA Type 3R, unless noted otherwise on the drawings.

C. Construction

1. All interiors shall be completely factory assembled with circuit breakers, wire connectors, etc. All wire connectors, except screw terminals, shall be of the anti-turn solderless type and all shall be suitable for copper wire of the sizes indicated.

2. Interiors shall be so designed that circuit breakers can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be so designed that circuits may be changed without machining, drilling or tapping.

3. Branch circuits shall be arranged using double row construction except when narrow column panels are indicated. Branch circuits shall be numbered by the manufacturer.

4. A nameplate shall be provided listing manufacturer's name, panel type and rating.

5. Construction of panel shall be door-in-door type.

D. Buses

1. Bus bars for the mains shall be of copper. Full size neutral bars shall be included. Phase bussing shall be full height without reduction. Cross connectors shall be copper.

2. Neutral bussing shall have a suitable lug for each outgoing feeder requiring a neutral connection.

3. Spaces for future circuit breakers shall be bussed for the maximum device that can be fitted into them.

4. Provide equipment ground bars

E. Boxes

1. Recessed or flush mounted boxes shall be made from galvanized code gauge steel having multiple knockouts, unless otherwise noted. Boxes shall be of sufficient size to provide a minimum gutter space of 4-in on all sides.

2. Surface mounted boxes and trims shall have an internal and external finish as hereinafter specified below. Surface mounted boxes shall be field punched for conduit entrances.

3. Provide at least 4 studs for mounting the panelboard interior

F. Trim

1. Hinged doors covering all circuit breaker handles shall be included in all panel trims.

2. Doors shall have semi flush type cylinder lock and catch, except that doors over 48-in in height shall have a vault handle and 3-point catch, complete with lock, arranged to fasten door at top, bottom and center. Door hinges shall be concealed. Furnish two keys for each lock. All locks shall be keyed alike; directory frame and card having a transparent cover shall be furnished on each door.

3. The trims shall be fabricated from code gauge sheet steel.

4. All exterior and interior steel surfaces of the panelboard shall be properly cleaned and finished with ANSI Z55.1, No. 61 light gray paint over a rust inhibiting phosphatized coating. The finish paint shall be of a type to which field applied paint will adhere.

5. Trims for flush panels shall overlap the box by at least 3/4-in all around. Surface trims shall have the same width and height as the box. Trims shall be fastened with quarter turn clamps.

2.3 COMPONENTS

A. Circuit breakers

1. Equip panelboards with circuit breakers with frame size and trip settings as shown on the drawings.

2. Provide circuit breakers from the same manufacturer as the panelboard manufacturer to ensure compatibility.

3. Circuit breakers shall be molded case, bolt-in type. Handle ties are not acceptable.

4. Circuit breakers shall have an interrupting capacity of not less than 10,000 amperes RMS symmetrical.

5. GFCI (ground fault circuit interrupter) shall be provided for circuits where shown on the drawings. GFCI units shall be 1 pole, 120 volt, molded case, bolt-on breakers, incorporating a solid state ground fault interrupter circuit insulated and isolated from the breaker mechanism. The unit shall be UL listed Class A Group I device (5 milliamp sensitivity, 25 millisecond trip time) and an interrupting capacity of 10,000 amperes RMS. GFCI units used for heat trace or where required by the manufacturer shall have 30 mA sensitivity.

B. Transient Voltage Surge Suppression (TVSS)

1. Acceptable products

a. Eaton, SPD (or equivalent model)

b. ABB, Tranquell ME (or equivalent model)

c. Siemens, TPS (or equivalent model)

d. Or equal as approved by the Engineer

2. Provide an SPD for application within an ANSI/IEEE C62.41 Category A environment, 60 kA per mode, 120 kA per phase

3. The TVSS shall be mounted integrally with all AC panelboards specified in this Section and on the Drawings and shall be manufactured by the same manufacturer as the panelboard.

4. The suppression voltage rating (SVR) shall be tested in accordance with UL-1449.

5. Provide a remote status Form C dry contact for remote annunciation of fault condition status.

6. Provide an LCD surge counter that indicates how many surges have occurred at the location.

C. Marking and Identification

1. Provide equipment nameplate per Section 26 05 53 – Identification for Electrical Systems.

2. Provide nameplates for unit load description and for each control or indicating device. Engrave nameplates as shown on the Drawing or as directed, using lettering approximately 3/8-in high for unit identification nameplates. The nameplates shall be black lettering on white laminated phenolic material.

3. A manufacturer's plaque shall be fastened to the panelboard. The plaque shall indicate model number, serial number, amperes, volts, short circuit rating, etc.

D. Accessories

1. Provide a bell and auxiliary for all circuit breakers used in a 48VDC application and for all main breakers. Accessories shall be factory installed. Bring three wire leads out of the breaker: common, a bell alarm "make" contact, and auxiliary switch "a" contact.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount boxes for surface mounted panelboards on unistrut so there is at least 1/2-in air space between the box and the wall.

B. Close all unused openings in panelboard enclosures using manufacturer-approved means to return the enclosure to the nameplate environmental rating.

C. Connect panelboard branch circuit loads so that the load is distributed as equally as possible between the phase busses

D. Type circuit directories giving location and nature of load served. Install circuit directories in each panelboard.

E. Install markers on the front cover of all panelboards which identify the voltage and phase rating. Markers shall be made of self-sticking B-500 vinyl cloth printed with black characters on an Alert Orange background, 2-1/4-in high by 9-in wide, Style A as manufactured by W.H. Brady Co. or equal as approved by the Engineer.

F. Install phase rotation markers on all three-phase panelboards using markers specified in Section 26 05 53 – Identification for Electrical Systems.

G. Install panelboard nameplates on the front door of the panelboard as specified on the drawing nameplate schedule.

3.2 CLEANING

A. Remove all rubbish and debris from inside and around the panelboard. Remove dirt, dust, or concrete spatter from the interior and exterior of the equipment using brushes, vacuum cleaner, or clean, lint-free rags. Do not use compressed air.

B. Replace all covers. Check for pinched wires and close all doors. Make sure that the enclosure parts are properly aligned and fastened securely.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Furnish all labor, materials, equipment, and install wiring devices as shown on the drawings and as specified herein.

2. Provide all interconnecting conduit and branch circuit wiring for receptacle circuits in accordance with the CEC.

B. Related sections

1. Section 01 33 00 – Submittal Procedures

2. Section 26 05 53 – Identification for Electrical Systems

1.2 SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 00.

1.3 REFERENCE STANDARDS

A. Wiring devices shall comply with the requirements of the California Electrical Code (CEC).

B. U.S. General Services Administration's Federal Specification's (GSA)

1. Specification WS 896

2. Specification WC 596-F

C. Underwriters Laboratories

1. UL 498

PART 2 - PRODUCTS

2.1 MATERIALS

A. Wall Switches

1. Switches shall be heavy duty, specification grade, toggle action, flush mounting quiet type with ground screw terminal.

2. Number of poles as shown on the drawings

3. Toggle switch shall be white color.

4. Rating shall be 20A, 120/277 Volt.

5. Acceptable manufacturers:

    a. Cooper Wiring Devices, D-1

    b. Hubbell, Inc.

    c. Pass & Seymour, Inc.

    d. Or equal as approved by the Engineer

B. Duplex Receptacles – General Purpose Type

1. Receptacles shall be industrial specification grade, straight blade, 2 pole, 3 wire.

2. Rating shall be 20A, 125Volt.

3. High impact and chemical resistant nylon face and color white

4. NEMA configuration 5-20R

5. Acceptable Manufacturers:

    a. Cooper Wiring Devices

    b. Hubbell, Inc.

    c. Pass & Seymour, Inc.

    d. Or equal as approved by the Engineer

C. Duplex Receptacles – Corrosion Resistant

1. Industrial grade corrosion resistant type receptacles shall have a high impact and chemical resistant nylon face with color gray.

2. Line contacts shall be made of solid brass that is resistant to corrosion.

3. Single or Duplex as shown on the drawings

4. 20A, 125V with NEMA 5-20R configuration

5. Acceptable Manufacturers:

a. Cooper Wiring Devices, M-1

b. Crouse-Hinds, Co.

c. Appleton Electric

d. Or equal as approved by the Engineer.

D. Duplex Receptacles - Ground fault Interrupter Type

1. Industrial specification grade, 20 Amp, 125 Volt, 2 Pole, 3 Wire, GFCI feed thru type with "test" and "reset" buttons.

2. NEMA 5-20R configuration.

3. Acceptable Manufacturers:

a. Cooper Wiring Devices

b. Hubbell, Inc.

c. Pass & Seymour, Inc.

d. Or equal as approved by the Engineer.

E. Single Receptacles – Special Use

1. Provide the following industrial specification grade receptacle types where shown on the drawings:

a. 20 Amp, 125 Volt, 2 Pole, 3 Wire, power lock type

b. 20 Amp, 250 Volt, 2 Pole, 3 Wire, NEMA 6-20R

c. 30 Amp, 125 Volt, 2 Pole, 3 Wire, twist-lock type, NEMA L5-30R

d. 20 Amp, 250 Volt, 2 Pole, 3 Wire, twist-lock type, NEMA L6-20R

e. 30 Amp, 250 Volt, 2 Pole, 3 Wire, twist-lock type, NEMA L6-30R

f. Receptacles called out on drawings but not listed above shall still be industrial grade.

2. Acceptable Manufacturers:

a. Cooper Wiring Devices

b. Hubbell, Inc.

c. Pass & Seymour, Inc.

d. Or equal as approved by the Engineer.

F. Device Plates

1. Plates for indoor flush mounted devices shall be of the required number of gangs for the application involved and shall be as follows:

a. NEMA 1 (Finished) Areas: Smooth, high impact nylon of the same manufacturer and color (white) as the device. Color selection shall be submitted and approved by the Engineer.

b. NEMA 4X, 4 and 12 (Indoor Process) Areas: Stainless steel, brushed with stainless steel mounting screws.

2. Plates for indoor surface mounted device boxes shall be cast metal of the same material as the box.

3. Install oversized plates where standard plates do not fully cover the wall opening.

4. Device plates for switches mounted outdoors or indicated as weatherproof shall be gasketed, with provisions for padlocking switches "On" and "Off".

5. Multiple surface mounted devices shall be ganged in a single, common box and provided with an adapter, if necessary, to allow mounting of single gang device plates on multigang cast boxes.

6. Engraved device plates shall be provided where required.

7. Device plates for UPS power receptacles shall be labeled “UPS POWERED, CIRCUIT NO. LP-XXXX”. The UPS circuit number is as shown on the drawings.

8. Identify receptacle and light switch device plates as required in Section 26 05 53.

G. Weatherproof Switch Cover with Device (Outdoor)

1. Single pole toggle switch with metal switch cover

2. 10A, 125V

3. Acceptable Manufacturers:

a. Cooper Wiring Devices

b. Crouse-Hinds

c. Or equal as approved by the Engineer.

H. Weatherproof Receptacle Cover

1. Industrial specification grade UL listed for wet locations with self-closing spring door and gasketing

2. Suitable for single and duplex receptacles

3. Cover manufactured by same manufacturer of receptacle

I. Weatherproof Constant Use Cover

1. UL listed single or two gang box cover made of polycarbonate, vertical arrangement

2. Acceptable Manufacturers:

a. Crouse-Hinds

b. Or equal as approved by the Engineer.

J. Multi Outlet Assemblies

1. Assembly enclosures shall consist of two-piece, all steel or anodized aluminum raceways which shall allow for field installation of wiring and standard receptacles as shown on the Drawings.

2. Multi outlet assemblies shall be UL Listed as a multi-outlet assembly.

3. The multi outlet assembly shall include surge suppression modules that can be easily removed and replaced without removing the metal cover. The surge protective devices shall be tested per UL 1449.

4. Raceway bases and removable covers shall be .040-inch steel, minimum of 2-1/8-inch high by 1-5/8-inch deep. Entrance fittings shall be sized for 3/4-inch conduit.

5. Raceways shall include all fittings, couplings, etc. for the complete installation of a finished system.

6. Provide outlets, jacks, and terminators of the type and location shown on the drawings.

7. Acceptable Manufacturers:

a. Wiremold, Plugmold

b. Or equal as approved by the Engineer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install switch and receptacles outlets flush with the finished wall surfaces in NEMA 1 areas on the drawings or when raceways are shown as concealed on the drawings.

B. Do not install flush mounted devices in areas designated NEMA 3R, 12, 4, or 4X on the drawings. Provide surface mounted devices in these areas.

C. Provide weatherproof covers and device covers in areas designated NEMA 3R, 4 or 4X on the drawings and in outdoor areas.

D. Provide “Constant Use” covers for receptacles used for sump pumps in vaults and other mechanical equipment that is connected by means of a plug into a receptacle outlet.

E. Indoor dry areas: provide convenience outlets mounted 18” above the floor unless noted otherwise.

F. For any below grade vaults, structures, or pump rooms, mount receptacles 48” above the finished floor.

G. The location of all devices is shown, in general, on the drawings and may be varied within reasonable limits so as to avoid any piping or other obstruction without extra cost, subject to the approval of the Engineer. Coordinate the installation of the devices for piping and equipment clearance.

H. Indicate circuit number for receptacle and light switches per Section 26 05 53.

END OF SECTION

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: 600 volt class fuses

B. Related sections

1. Section 01 33 00 – Submittal Procedures

2. Section 26 05 53 – Identification for Electrical Systems

1.2 REFERENCES

A. Underwriters Laboratories (UL)

1. 508 – Standard for Industrial Control Equipment

1.3 SUBMITTALS

A. Shop drawings

1. Include drawings of spare fuse cabinet(s)

2. Complete list of fuses indicating manufacturer, UL Class, and ampere rating for each location where fuses are to be installed.

B. Product data

1. Include time-current and peak let-through curves for each class of fuse.

1.4 MAINTENANCE

A. Extra materials

1. Provide a 10% minimum of spare fuses (0-2000 Amperes):, but not less than three (3) of each size and type installed under any section in the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Fuses - 600 V and Accessories

1. UL Class L Fuses

a. KLPC by Littelfuse

b. KRP-C by Bussmann

c. Or equal as approved by the Engineer

2. UL Class L 600 V AC/DC Fuses

a. LDC by Littelfuse

b. Or equal as approved by the Engineer

3. UL Class RK1 Fuses

a. LLN-RK/LLS-R by Littelfuse

b. LPN-RK/LPS-RK by Bussmann

c. Or equal as approved by the Engineer

4. UL Class RK5 Fuses

a. FLNR/FLSR by Littelfuse

b. FRN-R/FRS-R by Bussmann

c. Or equal as approved by the Engineer

5. UL Class J Fuses

a. JTD by Littelfuse

b. LPJ by Bussman

c. Or equal as approved by the Engineer

6. UL Class T Fuses

a. JLLN/JLLS by Littelfuse

b. JJN/JJS by Bussmann

c. Or equal as approved by the Engineer

7. UL Class CC Fuses

a. CCMR/KLDR by Littelfuse.

b. FNQ-R by Bussmann.

c. Or equal as approved by the Engineer.

8. Fuses for fluorescent ballasts

    a. LGR by Littelfuse

    b. GLR by Bussmann

    c. Or equal as approved by the Engineer

9. Fuse-holders for fluorescent ballasts

    a. LHR by Littelfuse

    b. HLR by Bussmann

    c. Or equal as approved by the Engineer

10. Fuse-holders for HID luminaires

    a. 5710CC/5710CCP by Littelfuse

    b. HPF-RR by Bussmann

    c. Or equal as approved by the Engineer

2.2 GENERAL

A. Provide fuses 600 volt and below as indicated on the drawings and as specified.

B. Fuses shall have a minimum interrupting rating of 200,000 amperes.

C. Completely install, connect, and test for insulation integrity distribution, conversion, or utilization equipment requiring fuses, prior to installation of fuses.

D. Provide fuses bolted in place with "Belleville" washers between each bolt head or nut, or fuse blade.

E. Affix a label indicating recommended torque for fuse mounting bolts or studs to the inside of fuse access doors.

F. Provide a durable, readily visible label inside each fuse enclosure clearly indicating the correct type and size of the replacement fuse. The label shall not cover or interfere with equipment manufacturer’s instructions.

G. Provide the UL Class and type of fuses as indicated on the drawings and as specified.

H. To assure selective coordination of protective devices, provide fuses by the same manufacturer.

2.3 FUSING OF CONTROL CIRCUITS

A. Use UL listed branch-circuit fuses for control circuit protection. Provide time-delay Class CC fuses installed in UL listed Class CC fuse blocks.

B. Provide minimum protection for control circuits in accordance with the latest revision of UL Standard 508 for Industrial Control Equipment.

C. Control power transformers: Fuse both the primary and secondary circuit of control power transformers. Provide fuse ratings in accordance with CEC requirements. Provide RK1 fuses or time-delay UL listed Class CC fuses installed in UL listed Class CC fuse blocks.

2.4 SPARE FUSE CABINET(S)

A. Type

1. Seam-welded minimum 16-gauge steel

2. Approximately 30 inches by 24 inches by 12 inches

3. Full width steel shelf

4. Key-locked, hinged door fitted with dust resisting gasket

5. Wall mounted

6. Grey enamel finish

7. SPARE FUSE CABINET permanently marked on outside of door

8. Suitable frame or pocket inside door of each cabinet with typewritten spare fuse inventory in clear plastic protective insert

9. Acceptable manufacturers

    a. Bussman, SFC-FUSE-CAB

    b. Littelfuse, LSFC

    c. Or equal as approved by the Engineer

B. Provide as many cabinets as required to hold entire spare fuse inventory.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Evenly torque mounting bolts and nuts to ASTM recommendations for the type and diameter of mounting bolts or studs provided. Affix a label to the inside of the fuse access doors indicating recommended torque for fuse mounting bolts or studs.

3.2 INITIAL START-UP AND SPARE FUSES

A. Replace fuses opened during start-up and testing. At contract completion, each fuse-holder shall contain serviceable fuses as specified.

B. After completion of testing, deliver spare fuses in quantities specified. Fuses shall be new, in the manufacturer’s original packaging, and stored in the spare fuse cabinet.

3.3 PROTECTION

A. Protect products until acceptance by the Engineer.

END OF SECTION

SECTION 26 53 00

EXIT SIGNS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Work necessary to furnish and install, complete, illuminated exit signs as specified herein.

B. Related sections:

1. Section 01 33 00 – Submittal Procedures

2. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables

3. Section 26 05 33 – Raceways and Boxes for Electrical Systems

1.2 REFERENCES

A. Exit signs shall be installed in accordance with the latest edition and revisions of the following:

1. California Code of Regulations (CCR)

a. Title 24, Part 3 – California Electrical Code (CEC)

2. U.S. Department of Energy (DOE)

a. ENERGY STAR –Program Requirements for Exit Signs

3. Underwriters Laboratories (UL)

a. 924 – UL Standard for Emergency Lighting and Power Equipment

1.3 SUBMITTALS

A. Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Furnish submittals for approval as outlined below:

1. Submit catalog information of the specified luminaires in accordance with the Luminaire Schedule in the Drawings.

1.4 QUALITY ASSURANCE

A. Like items of equipment provided hereunder shall be the end products of one manufacturer in order to achieve standardization for appearance, maintenance, and replacement.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Upon delivery to the job site, all luminaires and lamps shall be stored in a clean, dry, indoor conditioned location prior to installation.

1.6 WARRANTY

A. Exit signs shall have a minimum five-year warranty for the entire unit. Sealed nickel-cadmium battery shall have a minimum five-year warranty.

PART 2 - PRODUCTS

2.1 GENERAL

2.2 LAMPS

A. Lamps shall be light-emitting diode (LED).

2.3 EXIT SIGNS

A. Provide exit signs of the size and type shown on the Luminaire Schedule in the Drawings complete with batteries, lamps integrally mounted, charger and controller, mounting brackets, and other accessories as herein specified.

B. Exit signs:

1. Shall be single-face, white units with red translucent letters and directional arrows, as required. Ensure letters are no less than 6 inches high with principal strokes of letters no less than 3/4-inch wide.

2. Shall meet ENERGY STAR performance requirements, input power demand of 5 watts or less per sign, and any leading or lagging power factor of not less than 0.7.

3. Shall provide battery-powered emergency illumination automatically and instantaneously upon failure or interruption of normal electric power.

C. The fixtures shall be connected to and rated for use on an unswitched 120volt AC, 60Hertz, single phase circuit, and the connection shall be made permanent.

D. The enclosures shall be rated as shown on the Luminaire Schedule in the Drawings. Compartment the enclosures so that the charger and controls are separate from the battery.

E. The illumination time during emergency operation shall be 90 minutes minimum.

F. Each fixture shall contain sealed, maintenance-free, rechargeable, nickel-cadmium batteries. The batteries shall be encased in a high impact, heat resistant, translucent plastic container with permanently sealed cover to prevent leakage of electrolyte.

G. Each fixture shall contain a hermetically sealed load relay which automatically and instantaneously connects the lamp load to the battery upon failure of the ac supply and disconnects the lamp when normal power is restored after a time delay. Each fixture shall incorporate a completely automatic, solid state, two rate charger of sufficient capacity to restore the battery to full charge. Solidstate components shall operate at less than 50 percent of rating.

H. Each fixture shall have a push to test switch for quick testing of lamps and battery, a self-test and diagnostic function which identifies any failures of the unit's electrical components, and an external light indicator which indicates the status of the unit.

I. Provide fixtures with an automatic low voltage disconnect to protect the battery from deep discharge.

J. Acceptable manufacturers:

1. Emergi-Lite
2. Lithonia Lighting
3. RAB Lighting
4. As shown on the Luminaire Schedule on the Drawings
5. Or equal as approved by the Engineer

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in strict accordance with manufacturer's recommendations.

B. Provide separate circuit wiring to luminaire as required by the CEC and make all circuit connections permanent with conduit and wire.

C. Do not install or connect batteries to exit signs until the units are connected to permanent power and are ready for testing.

END OF SECTION

SECTION 33 77 01

15KV MEDIUM VOLTAGE
AUTOMATIC DELAYED TRANSITION TRANSFER SWITCH

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Delayed transition transfer switch (DTTS) with number of poles, amperage, voltage, withstand, and close-on ratings as shown in the Drawings. The DTTS shall consist of medium voltage 15 kV freestanding metal-clad switchgear with vacuum circuit breakers and a microprocessor controller to provide automatic operation. The transfer switch and controller shall be the products of the same manufacturer. The DTTS shall transfer the load in delayed transition (break-before-make) mode. Transfer is accomplished with a user-defined interruption period in both directions adjustable from 1 second to 5 minutes in at least 15 increments

B. Related sections

1. Section 01 33 00 – Submittal Procedures

2. Section 01 43 11 – Seismic Qualification and Certification

3. Section 01 81 02 – Seismic Design Criteria

4. Section 26 05 53 – Identification for Electrical Systems

1.2 SUBMITTAL

A. General

1. Make submittals in accordance with Section 01 33 00

2. Provide a fabrication schedule, including anticipated delivery date.

3. Provide shipping dimensions and shipping weights.

4. Provide contact information for the manufacturer’s representatives that will be conducting manufacturer’s field services.

5. Product data

6. Provide anchorage submittal that outlines the Supplier's recommended anchorage for the Automatic Transfer Switch to the concrete pad at the mounting location. The submittal shall include the following:

    a. Anchorage calculations stamped and signed by a civil or structural engineer registered in the state of California for review and approval by the District.

    b. The recommended anchors for the ATS to the concrete pad

    c. Any coordination required with the site installation Contractor in layout and construction of the concrete pad to accommodate the ATS

    d. Any required logistical coordination required with the site installation Contractor

7. Itemized bill of material

B. Automatic Transfer Switch, Switch Controller, Switchgear, Circuit Breakers, Ancillary Components

1. Product data for all ATS assembly components

2. Data sheets

    a. Breaker summary and nameplate data sheet

    b. Ground and test device summary and nameplate data sheet

    c. Nameplate schedule for all components

    d. ATS lineup section summary data sheet, including nameplate data and UL stack labeling

    e. Summary data sheet of all ATS options provided, including certifications, electrical options, and mechanical options

    f. Equipment summary data sheet of all special requirements required by this specification section

3. Drawings

    a. Title sheet

    b. Front view, floor plan and side view of each vertical section

    c. Panel layout for each section

    d. Breaker internal schematic diagram

e. Contact developments of control and selector switches, protective relays, test switches, DC and AC auxiliary relays, and similar items

f. Three-line AC and DC elementary diagrams for metering, relay, and control circuits. Three lines shall include both switchgear compartment three lines and an overall three line encompassing all three phase PAC components . DC elementaries shall incorporate PAC components.

g. Point-to-point compartment wiring diagrams showing all wire and terminal numbers

h. High seismic installation details

i. Handling, lifting, rigging, and jacking details

j. Control wiring installation details

k. Cable taping instructions and details

4. DC current requirements

a. Trip, close, and charging motor for the circuit breaker

b. All other DC-powered equipment

5. Itemized bill of material for all ATS assembly components and spare parts

6. IEEE Std 693 “High” seismic qualification certification

7. Seismic anchorage calculations

8. Certification of equipment by Underwriters Laboratory (UL) or other equivalent nationally recognized independent testing laboratory

9. California code certification

10. Factory test procedures

11. Certified factory test reports including the punch list developed during factory testing. Describe point-by-point how each punch list comment was addressed

12. Field commissioning reports

1.3 FIELD QUALITY CONTROL

A. Field quality control requirements are included in Section 26 05 91.

1.4 REFERENCES

A. Underwriters Laboratories (UL)

1. 508 – Industrial Control Equipment

2. 1008A – Standard for Medium Voltage Transfer Switches, 1st Edition, for transfer switches rated greater than 750 volts up to 46 kV

B. ANSI/IEE

1. C37.20.2 – Standard for Metal-Clad Switchgear.

2. C37.04 – Standard Rating Structure for AC High-Voltage Circuit Breakers.

3. C37.06 – Standard for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis – Preferred Ratings an Related Required Capabilities for Voltages Above 1000V.

4. C37.11 – Standard Requirements for electrical control for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis or a total current basis.

5. C37.09 – Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis.

6. C57.13 – Standard Requirements for Instrument Transformers

C. ANSI

1. Z55.1 – Gray Finishes for Industrial Apparatus and Equipment

D. IEEE

1. C37.100.1 – Standard of Common Requirements for High Voltage Power Switchgear Rated Above 1000 V

E. NEMA

1. SG4 – Alternating Current High Voltage Circuit Breakers

2. SG5 – Power Switchgear Assemblies

3. Standard ICS10 (formerly ICS2-447) – AC Automatic Transfer Switches

F. NFPA

1. 99 - Essential Electrical Systems for Health Care Facilities.

2. 110 - Emergency and Standby Power Systems

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Delayed transition transfer switches shall be ASCO 7000 Series. Any alternate shall be submitted for approval to the consulting engineer at least 10 days prior to bid. Alternate bids must list any deviations from this specification.

B. The metal-clad switchgear and circuit breaker shall be manufactured by Square D, Siemens or an approved equal

2.2 EXTRA MATERIALS/ACCESSORIES

A. Submit one racking handle per Medium Voltage DTTS line-up. Charging handle to be furnished on each breaker mechanism

B. Provide one circuit breaker lifting device

C. Supply the Following Recommended Spare Parts for the 15kV Medium Voltage DTTS

ASCO Part No.	Qty.	Description
15.5CAVH1E	3	Bussman, Fuse Type CAV 1 Amp, 15.5KV
942095	3	ABB, Control Relay, 2NO/2NC, 48-130V, 50/60Hz Coil, 600VAC, 10A Cont., 7200VA Make, 720VA Break, ABB Type NF22E-12
483763	1	ASCO Harness GRP1/5 Y-Adapter
601800-002	1	ASCO Group 5 Control Panel
601799	1	ASCO, Dual Operator Control (DOC)
203987-010	3	Bussman, Fuse Type KTK 1 Amp, 600V
203987-015	3	Bussman, Fuse Type KTK 6 Amp, 600V
985449	1	Chint, Circuit Breaker, 2P, 10A, 125VDC
255102	3	Deltrol Controls, Relay DPDT 24VDC Coil
658-403-1	3	Electro Switch Green LED’s for Circuit Breaker Control Switch
658-402-1	3	Electro Switch Red LED’s for Circuit Breaker Control Switch
658-401-1	3	Electro Switch Yellow LED’s for Circuit Breaker Control Switch
707016-007-A	3	IDEC, PL Green LED, 16mm, 24VAC/VDC Pilot Light
707016-006-A	3	IDEC, PL Red LED, 16mm, 24VAC/VDC Pilot Light

Per supplier	1	Transfer switch microprocessor controller
PK61SP	2	Square D Spray Paint, ANSI 61
410120VAC	1	Timemark Corp., Capacitor Trip Device, Auto Charge, 120VAC 60Hz Input, 380VDC Min. Output

2.3 ASSEMBLY

A. The metal-clad switchgear shall consist of a Type 1 Indoor enclosure containing circuit breakers and the necessary accessory components all factory assembled (except for necessary shipping splits) and operationally checked. The assembly shall be a self-supporting and floor mounted on a level concrete pad. The integrated switchgear assembly shall withstand the effects of closing, carrying and interrupting currents up to the assigned maximum short circuit rating.

B. System Voltage: 12.47 kV nominal, three-phase solidly grounded, 60 Hz

C. Maximum Design Voltage: 15.0 kV

D. Impulse Withstand (Basic Impulse Level): 95 kV

E. Power Frequency Withstand: 36 kV, 1 minute test

F. Main Bus Ampacity: 1200 amps, continuous

G. Momentary Current Ratings: Equal to the circuit breaker close and latch rating, 50 kAIC @ 15 kV

2.4 COMPONENTS

A. Stationary Structure

1. The switchgear shall comprise a minimum of three sections containing 1200 Amp medium voltage circuit breakers; Normal and Emergency source potential transformers; 1200 Amp medium voltage main bus; 1200 Amp medium voltage normal, emergency and load termination sections; transfer switch microprocessor controller; and protection, control and metering components assembled to form a rigid self-supporting completely enclosed structures providing steel barriers between sections

B. Circuit Breaker Compartment

1. Each circuit breaker compartment shall be designed to house a horizontal drawout metal-clad vacuum circuit breaker. The stationary primary disconnecting contacts are to be silver-plated copper and mounted within glass polyester support bushings. The movable contacts and springs shall be mounted on the circuit breaker element for ease of inspection/maintenance

2. Entrance to the stationary primary disconnecting contacts shall be automatically covered by metal shutters when the circuit breaker is withdrawn from the connected position to the test or disconnected position or removed from the circuit breaker compartment. Extend a ground bus into the circuit breaker compartment to automatically ground the breaker frame with high-current spring type grounding contacts located on the breaker chassis when in the test and connected positions. Guide rails for positioning the circuit breaker and all other necessary hardware are to be an integral part of the circuit breaker compartment. Blocking devices shall interlock breaker frame sizes to prevent installation of a lower ampere rating or interrupting capacity element into a compartment designed for one of a higher rating. It shall be possible with indoor switchgear to install a circuit breaker into a bottom compartment without use of a transport truck or lift device

C. Ground Bus

1. A ¼ inch x 2 inch copper ground bus shall extend through the entire length of the transfer switch

D. Main Bus Compartment

1. The main bus is to be rated 1200 amps and be fully insulated for its entire length with an epoxy coating by the fluidized bed process. The conductors are to be [silver-plated copper] and be of a bolted [not welded] design. Access to this compartment is gained from the front or rear of the structure by removing a steel barrier. Provide standard provisions for future extension, as applicable. Main bus compartment shall accommodate addition of arc flash sensor cable as specified in section 2.2G(2) of this specification

E. Doors and Panels

1. Relays, control switches, etc., shall be mounted on a formed front-hinged panel for each circuit breaker compartment. Front doors shall include features to facilitate quick and complete removal or reinstallation of entire front door assembly. Door hinges shall have removable pins. Where allowable, all control circuits (except, for example, current transformers and grounding) shall be wired via plugs/receptacles prior to termination

F. Circuit Breakers

1. The circuit breakers shall be rated 12.47kV nominal volts, 15000 maximum volts, 60 Hz, with a continuous current rating of 1200 amps and a maximum symmetrical interrupting rating of 25kA/500MVA - 15 kV system. Furnish vacuum circuit breakers with one vacuum interrupter per phase. Breakers of same type and rating shall be completely interchangeable. The circuit breaker shall be operated by means of a stored energy mechanism which is normally charged by a universal motor but can also be charged by the manual handle supplied on each breaker for manual emergency closing or testing. The closing

speed of the moving contacts is to be independent of both the control voltage and the operator. Provide a full front shield on the breaker. Secondary control circuits shall be connected automatically with a self- aligning, self-engaging plug and receptacle arrangement when the circuit breaker is racked into the connected position. Provision shall be made for secondary control plug to be manually connected in test position. A minimum of 4 auxiliary contacts (2a 2b), shall be provided for external use. Six additional cell-mounted auxiliary contacts MOC type for external use shall be provided. The racking mechanism to move the breaker between positions shall be operable with the front door closed and position indication shall be visible with door close.

2. An interlocking system shall be provided to prevent racking a closed circuit breaker to or from any position. An additional interlock shall automatically discharge the stored-energy operating mechanism springs upon removal of the breaker out of the compartment

3. The circuit breaker control voltage shall be: 48 volts DC from the battery system as specified in section 26 05 91

G. Instrument Transformers

1. Voltage transformers are drawout mounted with primary current-limiting fuses and shall have ratio as indicated. The transformers shall have mechanical rating equal to the momentary rating of the circuit breakers and shall have metering accuracy per ANSI Standards. Refer to drawings for voltage transformer ratings

2. Current transformers: Each breaker compartment shall have provision for mounting of two 200:5 single ratio C200 CTs on the line side of each circuit breaker per phase. The current transformer assembly shall be insulated for the full voltage rating of the switchgear. The current transformers wiring shall be Type SIS #12AWG minimum

H. Control Wiring

1. The switchgear shall be wired with Type SIS #12 AWG minimum. The control wiring shall be UL listed and have VW-1 flame retardant rating. Wires shall terminate on terminal blocks with marker strips numbered in agreement with detailed connection diagram

2.5 FABRICATION

A. Construction: Each equipment bay shall be a separately constructed cubicle assembled to form a rigid freestanding unit with sufficient bracing to minimize distortion. Minimum sheet metal thickness shall be 11 gauge steel on all exterior surfaces. Adjacent bays shall be securely bolted together to form an integrated rigid structure. The rear covers shall be removable to assist installation and maintenance of bus and cables

B. The metal-clad switchgear shall be fully assembled, inspected and tested at the factory prior to shipment. Large line-ups shall be split to permit normal shipping and handling as well as for ease of rejoining at the job site

2.6 FACTORY FINISHING

A. All steel parts, shall be cleaned and a iron phosphate (indoor equipment) pre-treatment applied prior to paint application

B. Paint color shall be ANSI-61 light grey; TGIC polyester powder applied electro statically through air. Following paint application, parts shall be baked to produce a hard durable finish. The average thickness of the paint film shall be 2.0 mils. Paint film shall be uniform in color and free from blisters, sags, flaking and peeling

C. Adequacy of paint finish to inhibit the buildup of rust on ferrous metal materials shall be tested and evaluated per paragraphs 5.2.8.1-7 of ANSI C37.20.2-1987. Salt spray withstand tests in accordance with ASTM #D-1654 and #B-117 shall be periodically performed on a sample to confirm conformance with the corrosion resistance standard of at least 600 hours minimum (indoor equipment).

2.7 MICROPROCESSOR CONTROLLER

A. The controller's sensing and logic shall be provided by a single built-in microprocessor for maximum reliability, minimum maintenance, and the ability to communicate serially through an optional serial communication module

B. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance. Sensing and control logic shall be provided on multi-layer printed circuit boards. Interfacing relays shall be industrial grade plug-in type with dust covers. The panel shall be enclosed with a protective cover and be mounted separately from the transfer switch unit for safety and ease of maintenance. The protective cover shall include a built-in pocket for storage of the operator’s manuals

C. All customer connections shall be wired to a common terminal block to simplify field-wiring connections

D. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:

1. EN 55011 Emission standard - Group 1, Class A

2. EN 50082-2 Generic immunity standard, from which: EN

3. 61000-4-2 Electrostatic discharge (ESD) immunity

4. ENV 50140 Radiated Electro-Magnetic field immunity

5. EN 61000-4-3 Radiated RF Electromagnetic Field Immunity

6. EN 61000-4-4 Electrical fast transient (EFT) immunity

7. EN 61000-4-5 Surge transient immunity

8. EN 61000-4-6 Conducted Radio-Frequency field immunity

9. EN 61000-4-11Voltage Dips, Interruption and Variations Immunity

2.8 CONTROLLER DISPLAY AND KEYPAD

A. A four line, 20 character LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through the serial communications input port. The following parameters shall only be adjustable via DIP switches on the controller

1. Nominal line voltage and frequency

2. Single or three phase sensing

3. Operating parameter protection

4. Transfer operating mode configuration (Open transition, Closed transition, or Delayed transition)

B. To appropriately trained operators, all instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals

2.9 VOLTAGE, FREQUENCY, AND PHASE ROTATION SENSING

A. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup, dropout, and trip setting capabilities (values shown as % of nominal unless otherwise specified

Parameter	Sources	Dropout / Trip	Pickup / Reset
Undervoltage	N&E,3Ø	70 to 98%	85 to 100%
Overvoltage	N&E,3Ø	102 to 115%	2% below trip
Underfrequency	N&E	85 to 98%	90 to 100%
Overfrequency	N&E	102 to 110%	2% below trip
Voltage unbalance	N&E	5 to 20%	1% below dropout

B. Repetitive accuracy of all settings shall be within ± 0.5% over an operating temperature range of -20°C to 60°C

C. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via serial communications port access

D. The controller shall be capable (when activated by the keypad or through the serial port) of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or CBA).

E. Source status screens shall be provided for both normal & emergency to pro- vide digital readout of voltage on all 3 phases, frequency, and phase rotation.

2.10 AUTOMATIC AND USER SUPERVISED NON-AUTOMATIC CONTROL

A. Open, Closed, and Delayed Transition Switching Solutions provide complete automatic control of the transfer switch. Because ASCO 7000 Series Transfer Switches are constructed as Metal-Clad Switchgear, they also include full function Non-Automatic Control to permit safe, electrically interlocked user supervised operation

B. A Transfer Switch Automatic-Manual selector switch allows the user to place the transfer switch in a fully manual mode of operation. The Normal and Emergency Source Circuit Breakers may then be operated using the circuit breaker control switches on the front of each circuit breaker compartment. This provides electrically interlocked operation to ensure that both circuit breakers cannot be closed simultaneously. Additionally, the Normal or Emergency Source Circuit Breakers may be tripped open by the circuit breaker control switches at any time during Automatic or Manual operation

C. Included Components:

1. “Transfer Switch Auto-Man” Utility Quality Selector Switch

2. “Breaker Control” Utility Quality Switch.One each for Normal & Emergency Circuit Breaker.

a. Trip, Close, and Pull to Lock

b. Closed LED – Red

c. Open LED – Green

d. Tripped LED – Amber (When Optional Protective Relaying is provided)

3. Controls Not In Auto LED (Indicates Automatic Operating Mode Disabled

2.11 TIME DELAYS

A. An adjustable time delay of 0 to 6 seconds shall be provided to override momentary normal source outages and delay all transfer and engine starting signals. Capability shall be provided to extend this time delay to 60 minutes by providing an external 24 VDC power supply.

B. A time delay shall be provided on transfer to emergency, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.

C. An adjustable time delay of 0 to 6 seconds to override momentary emergency source outage to delay all retransfer signals during initial loading of engine generator set.

D. Two time delay modes (which are independently adjustable) shall be provided on re-transfer to normal. One time delay shall be for actual normal power failures and the other for the test mode function. The time delays shall be adjustable from 0 to 10 hours. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.

E. A time delay shall be provided on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.

F. A time delay activated output signal shall also be provided to drive an external relay(s) for selective load disconnect control. The controller shall have the ability to activate an adjustable 0 to 5 minute time delay in any of the following mode

1. Prior to transfer only.

2. Prior to and after transfer.

3. Normal to emergency only.

4. Emergency to normal only.

5. Normal to emergency and emergency to normal.

6. All transfer conditions or only when both sources are available

G. The controller shall also include the following user-adjustable time delays for optional Closed Transition and Delayed Transition operation

1. LoadDisconnDelay: load disconnect position delay time for delayed transition operation

H. All time delays shall be adjustable in 1 second increments, except the extended parallel time, which shall be adjustable in .01 second increments

I. All time delays shall be adjustable by using the LCD display and keypad or with a remote device connected to the serial communications port

2.12 ADDITIONAL FEATURES

A. A three position momentary-type test switch shall be provided for the *test / automatic / reset* modes. The test position will simulate a normal source failure. The reset position shall bypass the time delays on either transfer to emergency or retransfer to normal

B. A SPDT contact, rated 5 amps at 30 VDC, shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred

C. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the DTTS is connected to the normal source and one contact closed, when the DTTS is connected to the emergency source.

D. LED indicating lights (16 mm industrial grade, type 12) shall be provided; one to indicate when the DTTS is connected to the normal source (green) and one to indicate when the DTTS is connected to the emergency source (red).

E. LED indicating lights (16 mm industrial grade, type 12) shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal and emergency sources, as determined by the voltage sensing trip and reset settings for each source.

F. The following features shall be built-in to the controller, but capable of being activated through keypad programming or the serial port only when required by the user:

   1. Provide the ability to select “commit/no commit to transfer” to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load

G. Engine Exerciser - The controller shall provide an internal engine exerciser. The engine exerciser shall allow the user to program up to seven different exercise routines. For each routine, the user shall be able to

   1. Enable or disable the routine

   2. Enable or disable transfer of the load during routine

   3. Set the start time

      a. Time of day

      b. Day of week

      c. Week of month (1^{st}, 2^{nd}, 3^{rd}, 4^{th}, alternate or every)

4. Set the duration of the run

5. At the end of the specified duration the switch shall transfer the load back to normal and run the generator for the specified cool down period. A 10-year life battery that supplies power to the real time clock in the event of a power loss will maintain all time and date information

6. The following feature shall be built - into the controller, but capable of being activated through keypad programming or the communications interface port

    a. Terminals shall be provided for a remote contact which opens to signal the DTTS to transfer to emergency

    b. System Status - The controller LCD display shall include a "System Status" screen which shall be readily accessible from any point in the menu by depressing the "ESC" key a maximum of two times. This screen shall display a clear description of the active operating sequence and switch position. For example, Normal Failed Load on Normal TD Normal to Emerg 2min15s

    c. Controllers that require multiple screens to determine system status or display "coded" system status messages, which must be explained by references in the operator's manual, are not permissible

    d. Self Diagnostics - The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed

    e. Communications Interface – The controller shall be capable of interfacing, through an optional serial communication module, with a network of transfer switches, locally (up to 4000 ft.) or remotely through modem serial communications. Standard software specific for transfer switch applications shall be available by the transfer switch manufacturer. This software shall allow for the monitoring, control and setup of parameters

    f. Data Logging – The controller shall have the ability to log data and to maintain the last 99 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non-volatile memory:

        1) Event Logging

            a) Data and time and reason for transfer normal to emergency.

            b) Data and time and reason for transfer emergency to normal.

            c) Data and time and reason for engine start.

d) Data and time engine stopped.

e) Data and time emergency source available.

f) Data and time emergency source not available

2) Statistical Data

a) Total number of transfers.

b) Total number of transfers due to source failure.

c) Total number of days controller is energized.

d) Total number of hours both normal and emergency sources are available.

g. Communications Module:

1) A full duplex RS485 interface shall be installed in the DTTS controller to enable serial communications. The serial communications shall be capable of a direct connect or multi-drop configured network. This module shall allow for the seamless integration of existing or new communication transfer devices. The serial communication interface shall be equal to ASCO Accessory 72A

2.13 OPTIONAL FEATURES

A. POWER MANAGER

1. Furnish Power Managers at locations shown to monitor all functions specified below

a. The Power Managers shall be listed to UL 3111-1, CSA, CE Mark, and industrially rated for an operating temperature range of -20°C to 60°C

b. The Power Manager shall be accurate to 1% measured, 2% computed values and display resolution to .1%. Voltage and current for all phases shall be sampled simultaneously to assure high accuracy in conditions of low power factor or large waveform distortions (harmonics)

c. The Power Manager shall be capable of operating without modification at nominal frequencies of 45 to 66 Hz and operate at 48 VDC.

d. Each Power Manager shall be capable of interfacing with an optional communications module to permit information to be sent to central location for display, analysis, and logging

e. The Power Manager shall accept inputs from industry standard instrument trans-formers (120 VAC secondary PTs and 5A secondary CTs.) Direct

phase voltage connections, 600 VAC and under, shall be possible without the use of PTs

f. The Power Manager shall be applied in single, 3-phase, or three & four wire circuits. A fourth CT input shall be available to measure neutral or ground current

g. All setup parameters required by the Power Manager shall be stored in non-volatile memory and retained in the event of a control power interruption

h. The following metered readings shall be communicated by the Power Manager, via serial communication, when equipped with optional serial communications module

1) Current, per phase RMS and neutral (if applicable)

2) Current Unbalance %

3) Voltage, phase-to-phase and phase-to-neutral

4) Voltage Unbalance %

5) Real power (KW), per phase and 3-phase total

6) Apparent power (KVA), per phase and 3-phase total

7) Reactive power (KVAR), per phase and 3-phase total

8) Power factor, 3-phase total & per phase

9) Frequency

10) Accumulated Energy, (MWH, MVAH, and MVARH)

i. The following energy readings shall be communicated by the Power Manager

1) Accumulated real energy KWH

2) Accumulated reactive energy KVAH

3) Accumulated apparent energy KVARH

4) For real and reactive energy reported values, separate total for energy flow from each source shall be stored, including the arithmetic sum

2. Power Manager Input/Output Options

a. Power Managers shall be equipped with the following I/O

1) Provide (8) solid state status inputs.

2) Provide four (4) relay output contacts

b. The Power Managers shall be equipped with an optional continuous duty, long-life, 4 line x 20 character LCD backlit display to provide local access to the following metered quantities

1) Current, per phase RMS and neutral (if applicable)

2) Current Unbalance %

3) Voltage, phase-to-phase and phase-to-neutral

4) Voltage Unbalance %

5) Real power (KW), per phase and 3-phase total

6) Apparent power (KVA), per phase and 3-phase tfiotal

7) Reactive power (KVAR), per phase and 3-phase total

8) Power factor, 3-phase total & per phase

9) Frequency

10) Accumulated Energy, (MWH, MVAH, and MVARH)

c. Displaying each of the Power Manager quantities shall be accomplished through the use of menu scroll buttons

d. For ease in operator viewing, the display shall remain on continuously, with no detrimental effect on the life of the Power Manager

e. Setup for system requirements shall be allowed from the front of the Power Manager. Setup provisions shall include

1) CT rating (xxxxx:5)

2) PT rating (xxxxxxx:120) (if applicable; 14400V maximum)

3) System type (single; three phase; 3 and 4 wire)

4) Communication parameters

f. Reset of the following electrical parameters shall also be allowed from the front of the Power Manager\

1) Real energy (MWH), apparent energy (MVAH) and reactive energy (MVARH)

g. All reset and setup functions shall have a means for protection against unauthorized/accidental changes

2.14 ENCLOSURE

A. All standard and optional door-mounted switches and pilot lights shall be 16-mm industrial grade type or equivalent for easy viewing & replacement

PART 3 - EXECUTION

3.1 SOURCE QUALITY CONTROL

A. Power building supplier (refer to Section 26 05 91) shall complete required factory testing as dictated by the DTTS supplier. The DTTS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements

B. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards, and withstand and closing ratings. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification

C. The DTTS manufacturer shall be certified to ISO 9001:2008 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001:2008

D. The equipment shall be factory tested to simulate a complete and integrated system in accordance with the drawings. The circuit breakers supplied shall be installed in their actual positions and electrically and mechanically tested. A narrative of the system operation shall be provided and shall be utilized when testing the equipment. Copies of the test reports shall be provided

E. Upon request at order placement, the manufacturer shall provide upon completion of the order a certificate of seismic qualifications.

F. Circuit breaker test reports shall be provided

G. Customer inspection of equipment and witnessing of factory tests shall be provided. Refer to Section 26 05 91.

H. All tests shall comply with applicable ANSI standards

1. Dielectric Test: ANSI C37.20 Para. 5.3.1, latest revision

2. Mechanical Test: ANSI C37.20 Para. 5.3.2, latest revision

3. Grounding of Instrument Transformer Case Test: ANSI C37.20 Para. 5.3.3, latest revision

4. Electrical Operation & Control Wiring Test: ANSI C37.20 Para. 5.3.3, latest revision

5. Polarity Test: ANSI C37.20 Para. 5.3.4.3, latest revision

6. Sequence Test: ANSI C37.20 Para. 5.3.4.4, latest revision

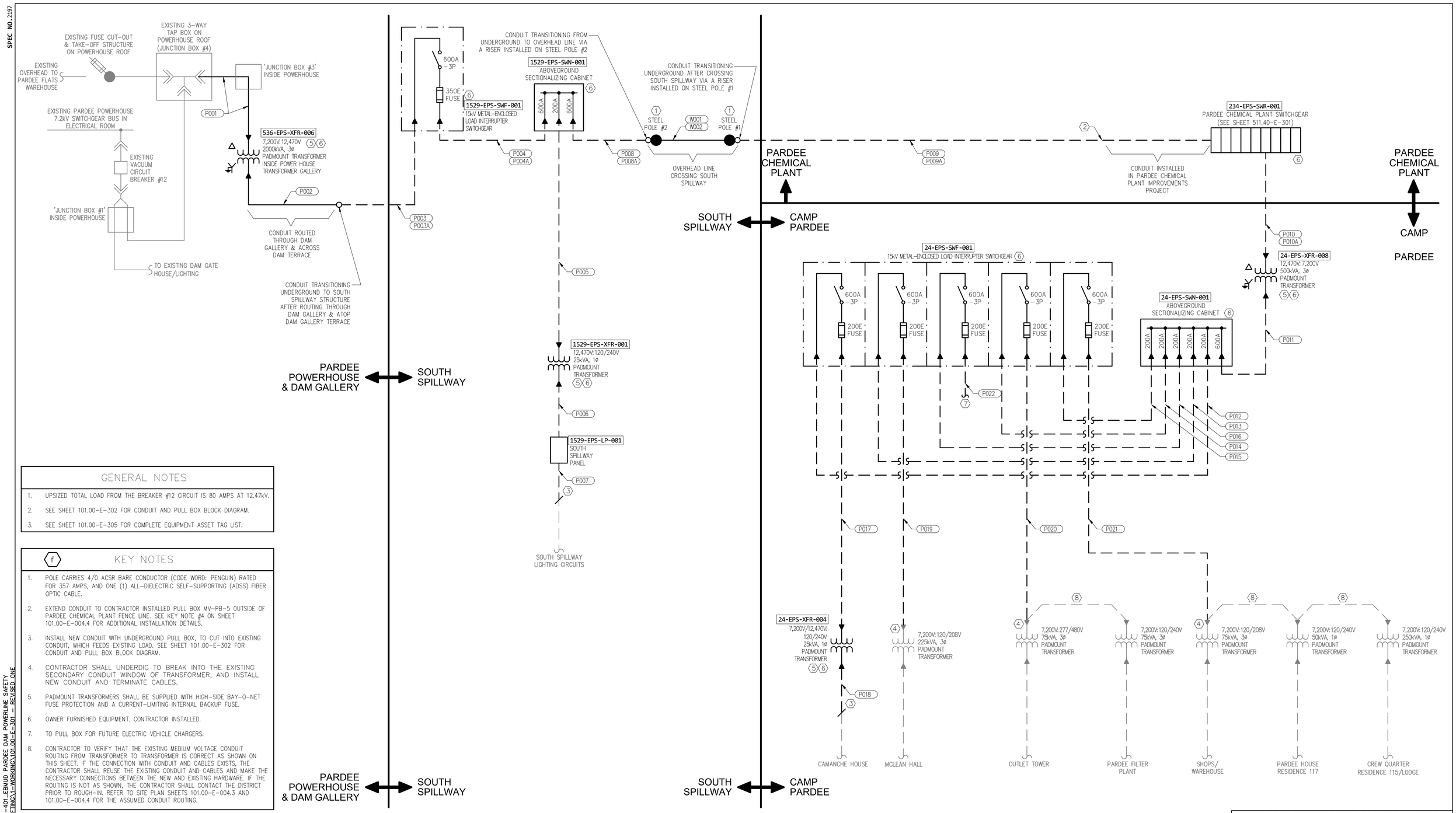
3.2 SERVICE REPRESENTATION

A. The DTTS manufacturer shall maintain a national service organization of company-employed personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year

B. The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years

END OF SECTION

SPEC NO. 2197



GENERAL NOTES

1. UPSIZED TOTAL LOAD FROM THE BREAKER #12 CIRCUIT IS 80 AMPS AT 12.47kV.
2. SEE SHEET 101.00-E-302 FOR CONDUIT AND PULL BOX BLOCK DIAGRAM.
3. SEE SHEET 101.00-E-305 FOR COMPLETE EQUIPMENT ASSET TAG LIST.

KEY NOTES

1. POLE CARRIES 4/0 ACSR BARE CONDUCTOR (CODE WORD: PENGUIN) RATED FOR 357 AMPS, AND ONE (1) ALL-DIELECTRIC SELF-SUPPORTING (ADSS) FIBER OPTIC CABLE.
2. EXTEND CONDUIT TO CONTRACTOR INSTALLED PULL BOX MV-PB-5 OUTSIDE OF PARDEE CHEMICAL PLANT FENCE LINE. SEE KEY NOTE #4 ON SHEET 101.00-E-004.4 FOR ADDITIONAL INSTALLATION DETAILS.
3. INSTALL NEW CONDUIT WITH UNDERGROUND PULL BOX, TO CUT INTO EXISTING CONDUIT, WHICH FEEDS EXISTING LOAD. SEE SHEET 101.00-E-302 FOR CONDUIT AND PULL BOX BLOCK DIAGRAM.
4. CONTRACTOR SHALL UNDERDIG TO BREAK INTO THE EXISTING SECONDARY CONDUIT WINDOW OF TRANSFORMER, AND INSTALL NEW CONDUIT AND TERMINATE CABLES.
5. PADMOUNT TRANSFORMERS SHALL BE SUPPLIED WITH HIGH-SIDE BAY-O-NET FUSE PROTECTION AND A CURRENT-LIMITING INTERNAL BACKUP FUSE.
6. OWNER FURNISHED EQUIPMENT. CONTRACTOR INSTALLED.
7. TO PULL BOX FOR FUTURE ELECTRIC VEHICLE CHARGERS.
8. CONTRACTOR TO VERIFY THAT THE EXISTING MEDIUM VOLTAGE CONDUIT ROUTING FROM TRANSFORMER TO TRANSFORMER IS CORRECT AS SHOWN ON THIS SHEET. IF THE CONNECTION WITH CONDUIT AND CABLES EXISTS, THE CONTRACTOR SHALL REUSE THE EXISTING CONDUIT AND CABLES AND MAKE THE NECESSARY CONNECTIONS BETWEEN THE NEW AND EXISTING HARDWARE. IF THE ROUTING IS NOT AS SHOWN, THE CONTRACTOR SHALL CONTACT THE DISTRICT PRIOR TO ROUGH-IN. REFER TO SITE PLAN SHEETS 101.00-E-004.3 AND 101.00-E-004.4 FOR THE ASSUMED CONDUIT ROUTING.

LEGEND

UNDERGROUND CONDUIT — — — —

ABOVEGROUND CONDUIT ————

NEW (BOLD LINES) ————

EXISTING (FADED LINES) ————

3" ON ORIGINAL DOCUMENT

0 1 2 3

REVISED ONE-LINE DIAGRAM

NOT TO SCALE

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW
PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

PARDEE DAM POWERLINE AND SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

REVISED ONE-LINE DIAGRAM

PROJ NO.			
SCALE AS SHOWN	101.00-E-301		0
DATE	STRUCT.	DISC. NUMBER	REV.

USERKOOSHA TOOFAN
DATE 9/26/2024 1:52 PM
FILE: Z:\OBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS PROJECT\01-DRAFTING\1-WORKING\101.00-E-301 - REVISED ONE LINE DIAGRAM.DWG

SPEC NO.2197

PARDEE POWER HOUSE	
ASSET TAG LIST	EQUIPMENT DESCRIPTION
536-EPS-XFR-006	2 MVA SPILLWAY TRANSFORMER
536-EPS-MPR-112-SWR-P	PROTECTIVE RELAY FOR PARDEE POWERHOUSE BREAKER #12 - PRIMARY
536-EPS-MPR-112-SWR-B	PROTECTIVE RELAY FOR PARDEE POWERHOUSE BREAKER #12 - BACKUP
536-EPS-ETH-001	ETHERNET SWITCH FOR PARDEE CHEMICAL PLANT SWGR M1 BREAKER FAILURE

PARDEE DAM	
ASSET TAG LIST	EQUIPMENT DESCRIPTION
1529-EPS-XFR-001	25KVA SPILLWAY TRANSFORMER
1529-EPS-SWF-001	15KV LOAD INTERRUPTER SWITCHGEAR
1529-EPS-SWN-001	15KV SECTIONALIZING CABINET
1529-EPS-LP-001	100A PANELBOARD

CAMP PARDEE	
ASSET TAG LIST	EQUIPMENT DESCRIPTION
24-EPS-XFR-004	25KVA CAMANCHE TRANSFORMER
24-EPS-XFR-008	500KVA CAMP PARDEE TRANSFORMER
24-EPS-SWF-001	15KV LOAD INTERRUPTER SWITCHGEAR
24-EPS-SWN-001	15KV SECTIONALIZING CABINET

PARDEE CHEMICAL PLANT SWITCHGEAR	
ASSET TAG LIST	EQUIPMENT DESCRIPTION
234-EPS-SWR-001	CHEMICAL BUILDING SWITCHGEAR
234-EPS-BKR-101-SWR	CHEMICAL BUILDING SWITCHGEAR BREAKER
234-EPS-BKR-102-SWR	CHEMICAL BUILDING SWITCHGEAR BREAKER
234-EPS-BKR-103-SWR	CHEMICAL BUILDING SWITCHGEAR BREAKER
234-EPS-BKR-104-SWR	CHEMICAL BUILDING SWITCHGEAR BREAKER
234-EPS-BKR-105-SWR	CHEMICAL BUILDING SWITCHGEAR BREAKER
234-EPS-BKR-106-SWR	CHEMICAL BUILDING SWITCHGEAR BREAKER
234-EPS-BKR-107-SWR	CHEMICAL BUILDING SWITCHGEAR BREAKER
234-EPS-ATS-101-SWR	CHEMICAL BUILDING SWITCHGEAR ATS
234-EPS-LP-003	CHEMICAL BUILDING SWITCHGEAR AC PANEL
234-EPS-PP-004	CHEMICAL BUILDING SWITCHGEAR DC PANEL
234-EPS-BTR-001	BATTERY SYSTEM
234-EPS-BYC-001	BATTERY CHARGER
234-EPS-MPR-101-SWR-P	PROTECTIVE RELAY FOR MAIN BREAKER SOURCE #1 - PRIMARY
234-EPS-MPR-101-SWR-B	PROTECTIVE RELAY FOR MAIN BREAKER SOURCE #1 - BACKUP
234-EPS-MPR-102-SWR-P	PROTECTIVE RELAY FOR MAIN BREAKER SOURCE #2 - PRIMARY
234-EPS-MPR-102-SWR-B	PROTECTIVE RELAY FOR MAIN BREAKER SOURCE #2 - BACKUP
234-EPS-MPR-103-SWR	PROTECTIVE RELAY FOR ATS EMERGENCY BREAKER
234-EPS-MPR-104-SWR	PROTECTIVE RELAY FOR ATS NORMAL BREAKER
234-EPS-MPR-105-SWR	PROTECTIVE RELAY FOR LOAD BREAKER #1
234-EPS-MPR-106-SWR	PROTECTIVE RELAY FOR LOAD BREAKER #2
234-EPS-MPR-107-SWR	PROTECTIVE RELAY FOR LOAD BREAKER #3
234-EPS-LP-001	AC PANELBOARD
234-EPS-LP-002	DC PANELBOARD
234-EPS-ETH-001	ETHERNET SWITCH FOR PARDEE CHEMICAL PLANT SWITCHGEAR M1 BREAKER FAILURE
234-EPS-ETH-002	ETHERNET SWITCH FOR PARDEE CHEMICAL PLANT SWITCHGEAR
234-EPS-PM-001	BREAKER SOURCE #1 POWER MONITOR
234-EPS-PM-002	BREAKER SOURCE #2 POWER MONITOR
234-EPS-PM-003	ATS POWER MONITOR
234-EPS-PM-004	LOAD BREAKER #1 POWER MONITOR
234-EPS-PM-005	LOAD BREAKER #2 POWER MONITOR
234-EPS-PM-006	LOAD BREAKER #3 POWER MONITOR

ASSET TAG LIST

USERKOOSHA TOOFAN
DATE:9/26/2024 4:05 PM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS PROJECT\01-DRAFTING\1-WORKING\101.00-E-305 - EQUIPMENT ASSET TAG LIST.DWG

3" ON ORIGINAL DOCUMENT
0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW
PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

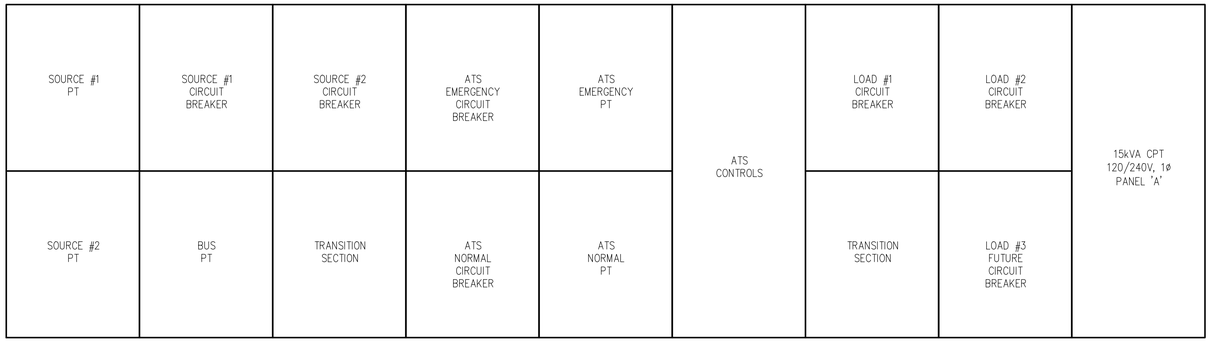
EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

PARDEE DAM POWERLINE AND SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

ASSET TAG LIST

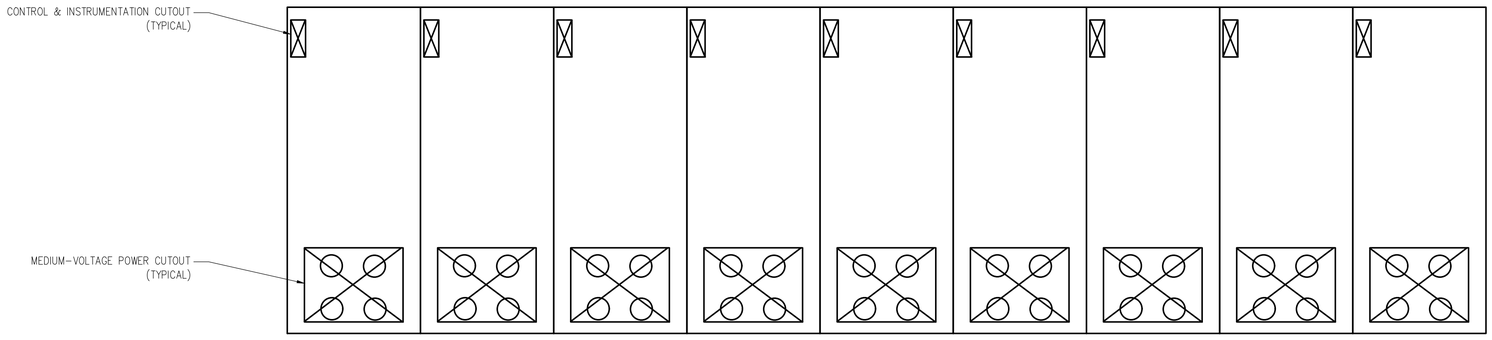
PROJ NO.			
SCALE AS SHOWN	101.00-E-305		0
DATE	STRUCT.	DISC. NUMBER	REV.

SPEC NO. 2197



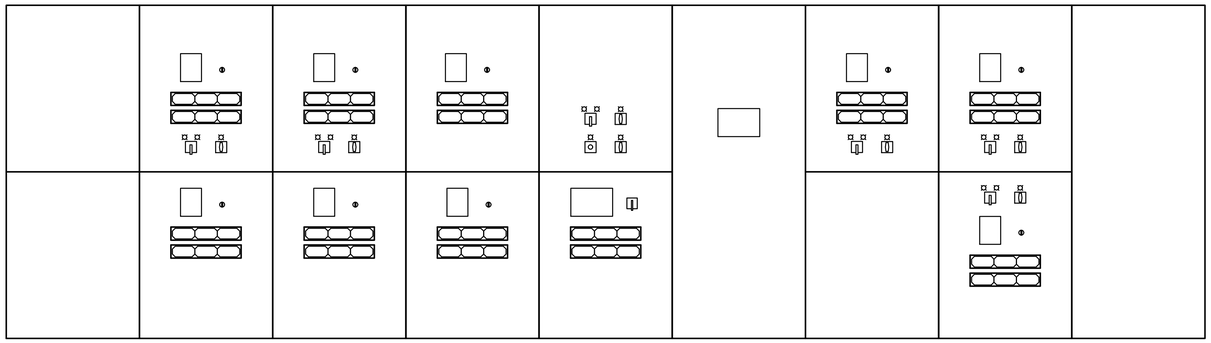
SWITCHGEAR (SWGR) ELEVATION

NOT TO SCALE



SWITCHGEAR (SWGR) PLAN

NOT TO SCALE



SWITCHGEAR (SWGR) CONTROL LAYOUT

NOT TO SCALE

USERKOOSHA TOOFAN
DATE:8/30/2024 1:59 PM
FILE: Z:\OBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS PROJECT\01-DRAFTING\1-WORKING\511.40-E-006 - CHEMICAL PLANT SWITCHGEAR PLAN & ELEVATION.DWG

3" ON ORIGINAL DOCUMENT
0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY	
DESIGN CHECKED BY	
DRAWN BY	
SR. PROJ ENGR. R.P.E. NO.	
APPROVED	
PRINCIPAL IN CHARGE, R.P.E. NO.	

EBMUD REVIEW

PROJECT ENGINEER R.P.E. NO.

RECOMMENDED SR. R.P.E. NO.

APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

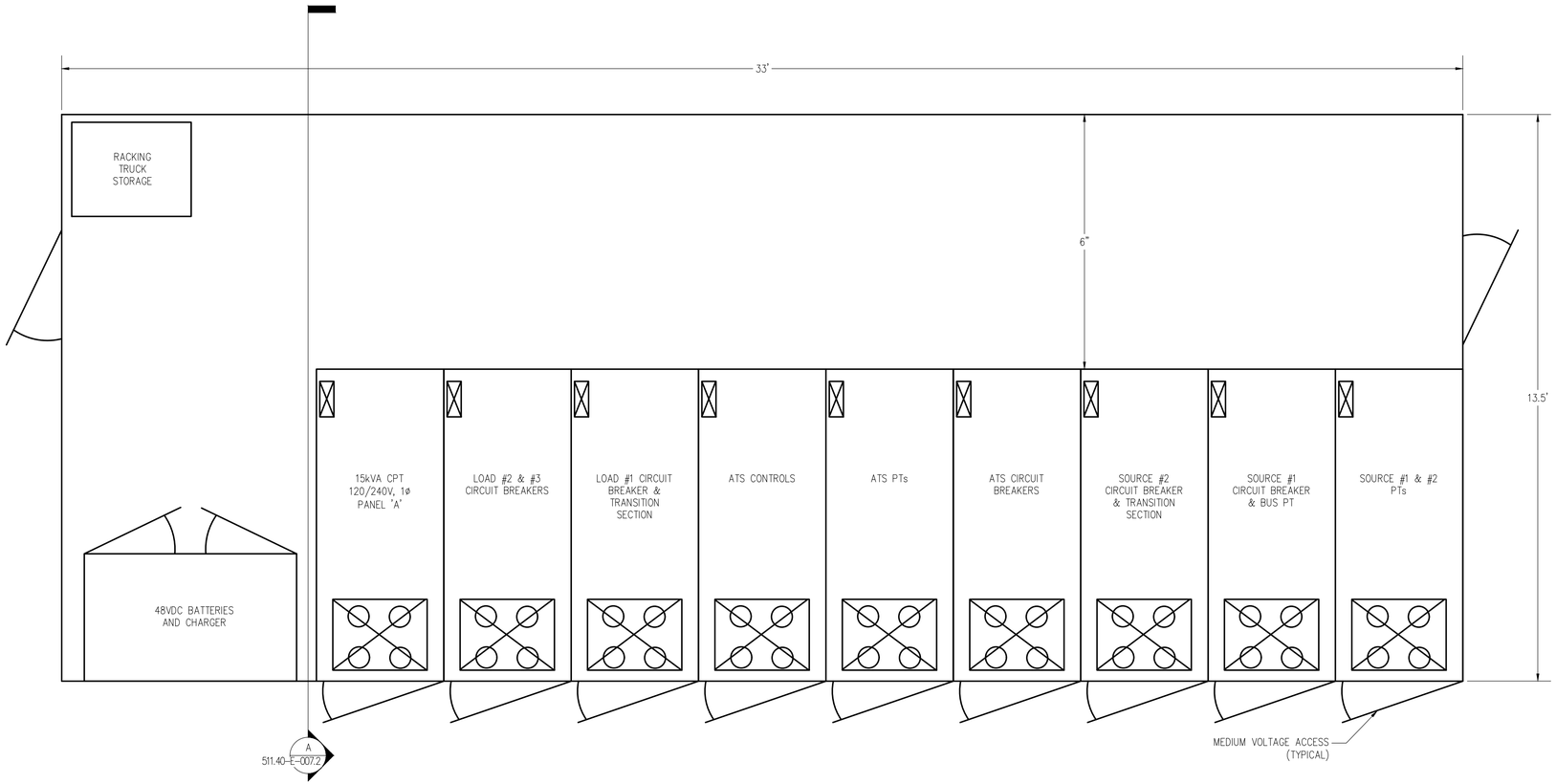
EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

PARDEE DAM POWERLINE AND SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR PLAN & ELEVATION

PROJ NO.	511.40-E-006		0
SCALE AS SHOWN			
DATE	STRUCT.	DISC. NUMBER	REV.

SPEC NO. 2197



SWITCHGEAR ELECTRICAL HOUSE PLAN

NOT TO SCALE

USERKOOSHA TOOFAN
DATE:8/30/2024 2:00 PM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS PROJECT\DRAFTING\1-WORKING\511.40-E-0071 - CHEMICAL PLANT ELECTRICAL HOUSE PLAN.DWG

3" ON ORIGINAL DOCUMENT
0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY	
DESIGN CHECKED BY	
DRAWN BY	
SR. PROJ ENGR. R.P.E. NO.	
APPROVED	
PRINCIPAL IN CHARGE, R.P.E. NO.	

EBMUD REVIEW

PROJECT ENGINEER R.P.E. NO.	
RECOMMENDED SR. R.P.E. NO.	
APPROVED MGR. OF DESIGN R.P.E. NO.	

SIGNATURES NOT VALID

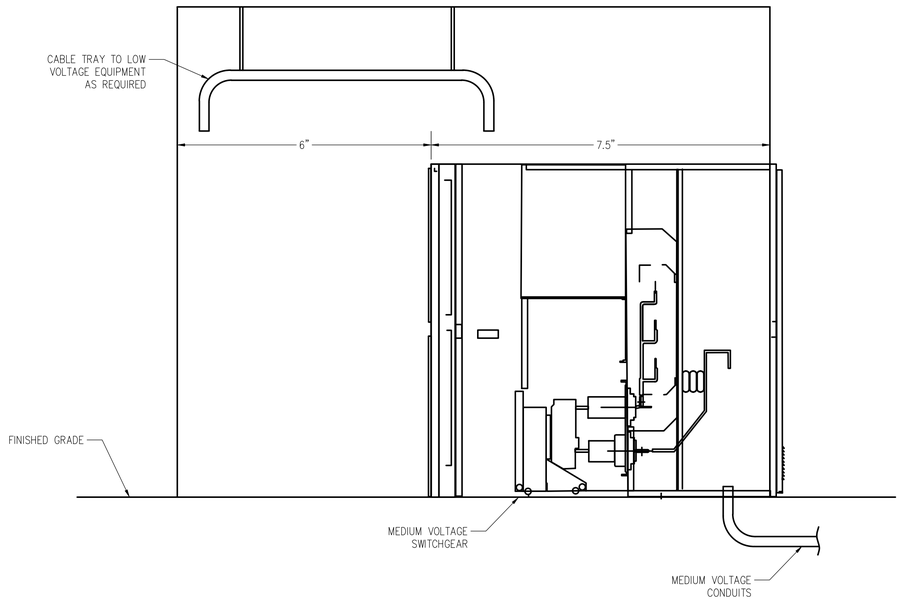
EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

PARDEE DAM POWERLINE AND
SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
ELECTRICAL HOUSE PLAN

PROJ NO.			
SCALE AS SHOWN	511.40-E-007.1		0
DATE	STRUCT.	DISC. NUMBER	REV.

SPEC NO. 2197



SWITCHGEAR ELECTRICAL HOUSE SECTION (SECTION A)

NOT TO SCALE

USERKOOSHA TOOFAN
DATE:5/22/2024 9:18 AM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS\PROJECTS\CONTRACTING\1-WORKING\511.40-E-007.2 - CHEMICAL PLANT ELECTRICAL HOUSE SECTION.DWG

3" ON ORIGINAL DOCUMENT
0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY	
DESIGN CHECKED BY	
DRAWN BY	
SR. PROJ ENGR. R.P.E. NO.	
APPROVED	
PRINCIPAL IN CHARGE, R.P.E. NO.	

EBMUD REVIEW

PROJECT ENGINEER R.P.E. NO.

RECOMMENDED SR. PROJ. ENGR. R.P.E. NO.

APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

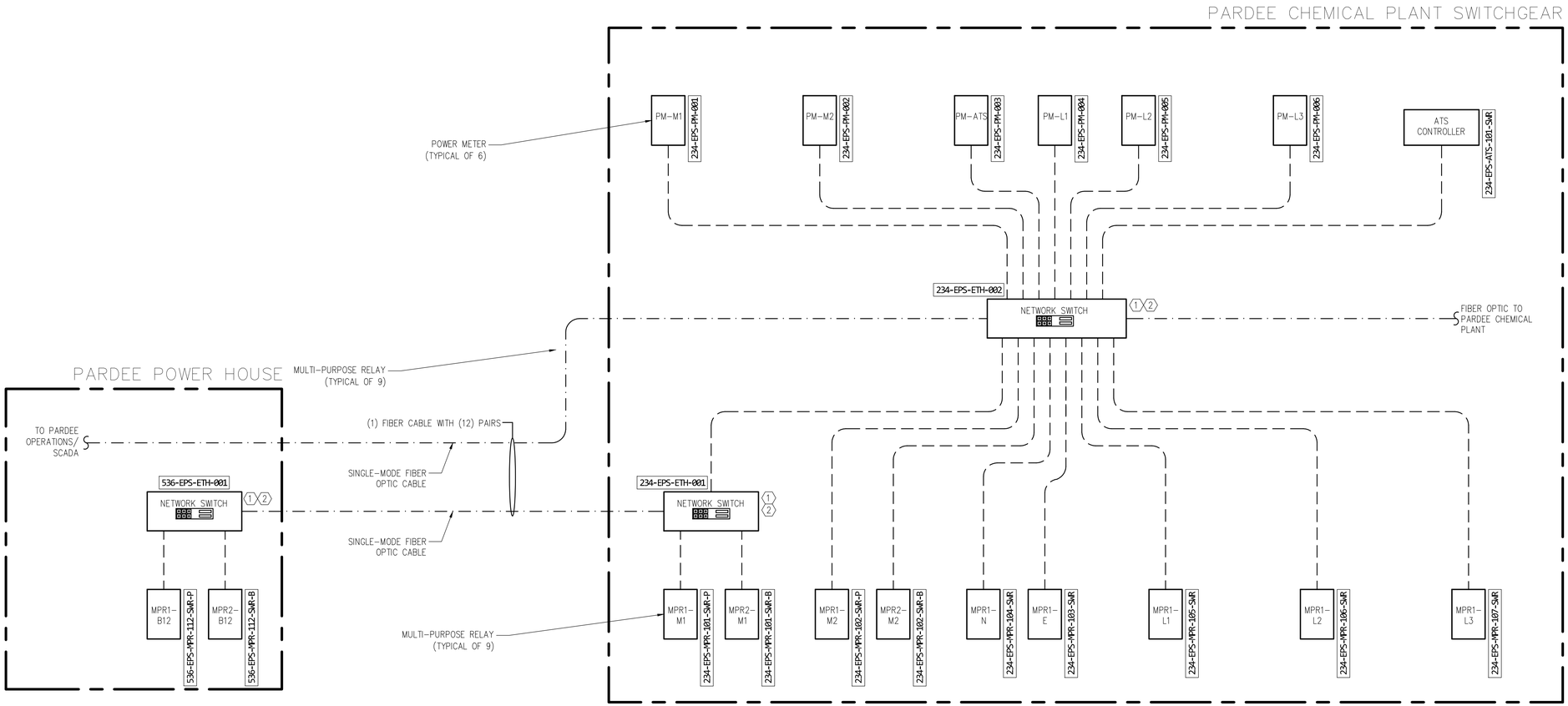
EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

PARDEE DAM POWERLINE AND SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
ELECTRICAL HOUSE SECTION

PROJ NO.			
SCALE AS SHOWN	511.40-E-007.2		0
DATE	STRUCT.	DISC. NUMBER	REV.

SPEC NO. 2197



GENERAL NOTES

1. SEE DRAWING 101.00-E-303 FOR THE OVERALL COMMUNICATION DIAGRAM.
2. COORDINATE WITH DISTRICT OVER SINGLEMODE TO MULTIMODE TRANSITIONS AND INTEGRATIONS INTO COMMUNICATION SYSTEM.

KEY NOTES

1. CONTRACTOR SHALL COORDINATE OVER THE MAKE AND MODEL OF ALL COMMUNICATION EQUIPMENT WITH THE DISTRICT, PRIOR TO ISSUING SHOP DRAWINGS.
2. ETHERNET SWITCH SHALL HAVE REQUIRED AMOUNT OF COPPER (TX) AND FIBER (FX) PORTS TO ACCOMMODATE CONNECTIVITY AS SHOWN PLUS 25% SPARES FOR EACH CONNECTION TYPE. FIBER PORTS SHALL BE SFP PER SPECIFICATION AND SHALL UTILIZE TYPE 'LC' CONNECTORS.

DEVICE LEGEND

DEVICE TAG	DESCRIPTION
MPR1-B12	BREAKER #12 PRIMARY MULTI-PURPOSE RELAY
MPR2-B12	BREAKER #12 BACKUP MULTI-PURPOSE RELAY
MPR1-M1	MAIN BREAKER (POWERHOUSE SOURCE) PRIMARY MULTI-PURPOSE RELAY
MPR2-M1	MAIN BREAKER (POWERHOUSE SOURCE) BACKUP MULTI-PURPOSE RELAY
MPR1-M2	MAIN BREAKER (PG&E SOURCE) PRIMARY MULTI-PURPOSE RELAY
MPR1-M2	MAIN BREAKER (PG&E SOURCE) BACKUP MULTI-PURPOSE RELAY
MPR1-N	ATS NORMAL MULTI-PURPOSE RELAY
MPR1-E	ATS EMERGENCY MULTI-PURPOSE RELAY
MPR1-L1	CAMP PARDEE LOAD MULTI-PURPOSE RELAY
MPR1-L2	PARDEE CHEMICAL PLANT LOAD MULTI-PURPOSE RELAY
MPR1-L3	FUTURE LOAD MULTI-PURPOSE RELAY
PM-M1	MAIN BREAKER (POWERHOUSE SOURCE) POWER MONITOR
PM-M2	MAIN BREAKER (PG&E SOURCE) POWER MONITOR
PM-ATS	ATS POWER MONITOR
PM-L1	CAMP PARDEE LOAD POWER MONITOR
PM-L2	PARDEE CHEMICAL PLANT LOAD POWER MONITOR
PM-L3	FUTURE LOAD POWER MONITOR

PARDEE CHEMICAL PLANT COMMUNICATION DIAGRAM

NOT TO SCALE

LEGEND

DISTRICT FIBER PAIR

CAT 6 ETHERNET

3" ON ORIGINAL DOCUMENT

0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY

DESIGN CHECKED BY

DRAWN BY

SR. PROJ ENGR. R.P.E. NO.

APPROVED

PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW

PROJECT ENGINEER R.P.E. NO.

RECOMMENDED SR. R.P.E. NO.

APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

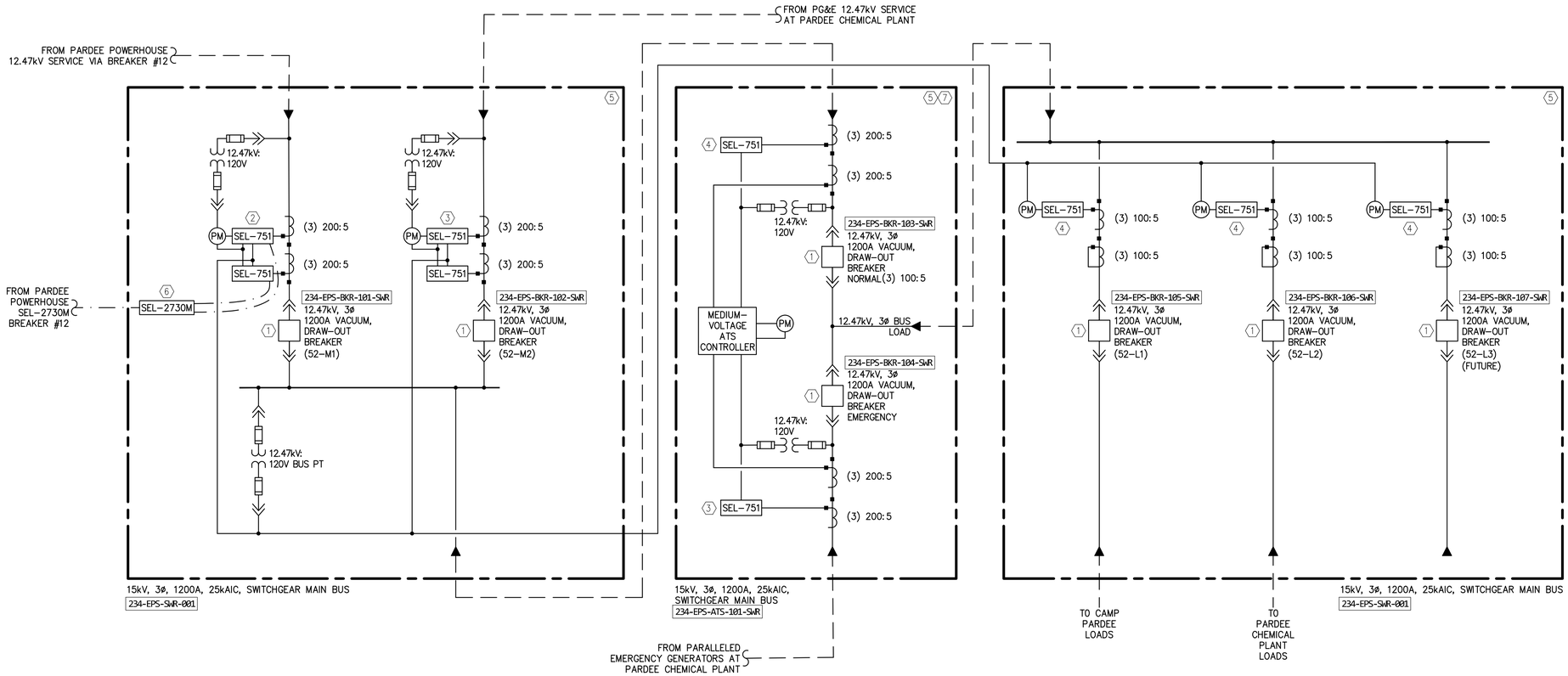
PARDEE DAM POWERLINE AND SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT SWITCHGEAR COMMUNICATION DIAGRAM

PROJ NO.				
SCALE AS SHOWN	511.40-E-300			0
DATE	STRUCT.	DISC.	NUMBER	REV.

USERKOOSHA TOOFAN
DATE9/26/2024 5:10 PM
FILE: Z:\08S 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS\PROJECT\01-DRAFTING\4-WORKING\511.40-E-300 - CHEMICAL PLANT SWITCHGEAR COMMUNICATION DIAGRAM.DWG

SPEC NO. 2197



PARDEE CHEMICAL PLANT SWITCHGEAR ONE-LINE DIAGRAM

NOT TO SCALE

GENERAL NOTES

1. SEE ONE-LINE DIAGRAM ON SHEET 101.00-E-301 FOR CONTINUATION OF SWITCHGEAR CONNECTIONS.
2. SEE SHEET 101.00-E-305 FOR COMPLETE EQUIPMENT ASSET TAG LIST.

KEY NOTES

1. CIRCUIT BREAKER MUST HAVE A PROVISION FOR PADLOCKING IN BOTH THE OPEN AND CLOSED POSITION.
2. PRIMARY AND BACKUP RELAYS PROVISIONED WITH 27/59 (UNDER/OVERVOLTAGE), 50/51 (TIME AND INSTANTANEOUS OVERCURRENT), 25 (SYNC CHECK), AND 50BF (BREAKER FAILURE). BREAKER FAILURE TRANSFER TRIP VIA FIBER OPTIC.
3. PRIMARY AND BACKUP RELAYS PROVISIONED WITH 27/59 (UNDER/OVERVOLTAGE), 50/51 (TIME AND INSTANTANEOUS OVERCURRENT), 25 (SYNC CHECK), AND 32 (DIRECTIONAL POWER).
4. RELAYS PROVISIONED WITH 27/59 (UNDER/OVERVOLTAGE) AND 50/51 (TIME AND INSTANTANEOUS OVERCURRENT).
5. 15kV CLASS, METAL-CLAD, SWITCHGEAR.
6. MANAGED ETHERNET SWITCH WITH (2) FIBER OPTIC PORTS MINIMUM.
7. MEDIUM VOLTAGE ATS INTEGRATED INTO LINEUP OF 15kV CLASS, METAL-CLAD, SWITCHGEAR (KEY NOTE #5).

ATS OPERATING MODES

1. STANDARD AUTOMATIC TRANSFER SCHEME: PARDEE POWERHOUSE (SOURCE #1) AND PG&E (SOURCE #2) SWITCHING ACHIEVED BY CONTROL RELAY LOGIC PER SCHEMATICS 511.40-E-305.1 THRU 511.40-E-305.12.
2. PG&E BACKFEED TO PARDEE POWERHOUSE: ATS SHALL BLOCK OPERATION OF STANDARD AUTOMATIC SWITCHING, BLOCK CLOSING OF 'EMERGENCY' BREAKER, AND BLOCK NON-PROTECTIVE OPENING OF 'NORMAL' BREAKER. THIS MODE ALLOWS SOURCE #2 TO BACKFEED SOURCE #1 WHILE ALSO FEEDING ATS 'LOAD' BUS.

LEGEND

- ABOVE GRADE CONDUIT OR BUS
- UNDERGROUND CONDUIT
- FIBER OPTIC CABLE
- CAT 6 ETHERNET CABLE

3" ON ORIGINAL DOCUMENT
0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW
PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

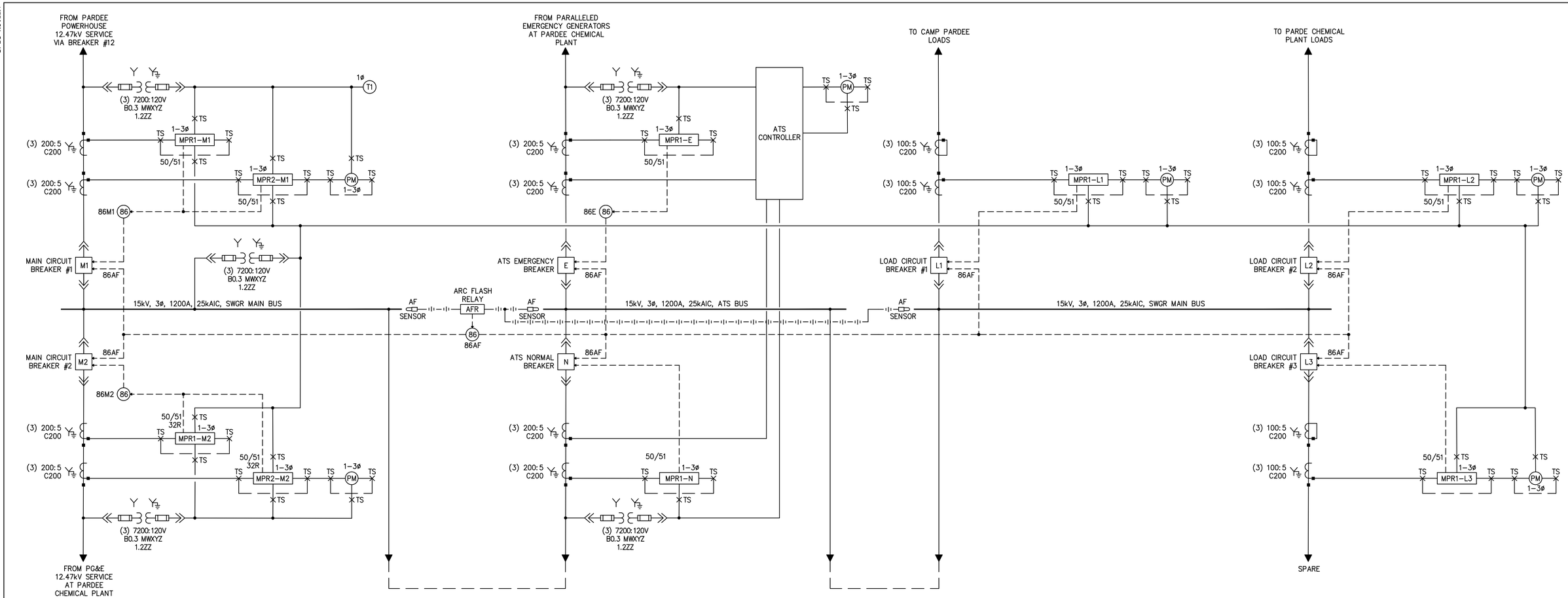
PARDEE DAM POWERLINE AND SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR OVERALL ONE-LINE DIAGRAM - SWITCHING

PROJ NO.				
SCALE AS SHOWN	511.40-E-301			0
DATE	STRUCT.	DISC.	NUMBER	REV.

USERKOOSHA TOOFAN
DATE9/26/2024 4:04 PM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS PROJECT\01-DRAFTING\1-WORKING\511.40-E-301 - CHEMICAL PLANT SWITCHGEAR ONE-LINE DIAGRAM-SWITCHING.DWG

SPEC NO. 2197

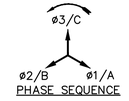


CONTROL & RELAYING ONE–LINE DIAGRAM

NOT TO SCALE

DEVICE	DESCRIPTION	MANUFACTURER	MODEL NUMBER	FUNCTION
MPR1–M1/MPR2–M1	PRIMARY & BACKUP PROTECTION	SCHWEITZER	SEL–751A	TIME & INSTANTANEOUS OVERCURRENT, SYNC CHECK, UNDERVOLTAGE
MPR1–M2/MPR2–M2	PRIMARY & BACKUP PROTECTION	SCHWEITZER	SEL–751A	TIME & INSTANTANEOUS OVERCURRENT, SYNC CHECK, UNDERVOLTAGE, REVERSE POWER
MPR1–E	EMERGENCY BREAKER PROTECTION	SCHWEITZER	SEL–751A	TIME & INSTANTANEOUS OVERCURRENT
MPR1–N	NORMAL BREAKER PROTECTION	SCHWEITZER	SEL–751A	TIME & INSTANTANEOUS OVERCURRENT
MPR1–L1	PRIMARY PROTECTION	SCHWEITZER	SEL–751A	TIME & INSTANTANEOUS OVERCURRENT
MPR1–L2	PRIMARY PROTECTION	SCHWEITZER	SEL–751A	TIME & INSTANTANEOUS OVERCURRENT
MPR1–L3	PRIMARY PROTECTION	SCHWEITZER	SEL–751A	TIME & INSTANTANEOUS OVERCURRENT
86	LOCKOUT RELAY	ELECTROSWITCH	SERIES 24	LATCHING LOCKOUT RELAY WITH MANUAL RESET
PM	POWER METER	–	PER SPEC	POWER, CURRENT, VOLTAGE: DISPLAY & CONTROL SYSTEM INPUT
TS	TEST SWITCH–CURRENT AND OR POTENTIAL (AS REQUIRED)	ABB	FT	PROVISIONS FOR TESTING AND ISOLATION OF DEVICES
T1	TIMER RELAY	AGASTAT	PER SPEC	OPERATOR ADJUSTABLE TIME DELAY FOR SOURCE #1/#2 RESTORE

EQUIPMENT LEGEND



PHASE SEQUENCE

3" ON ORIGINAL DOCUMENT

0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW

PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. ENGR. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

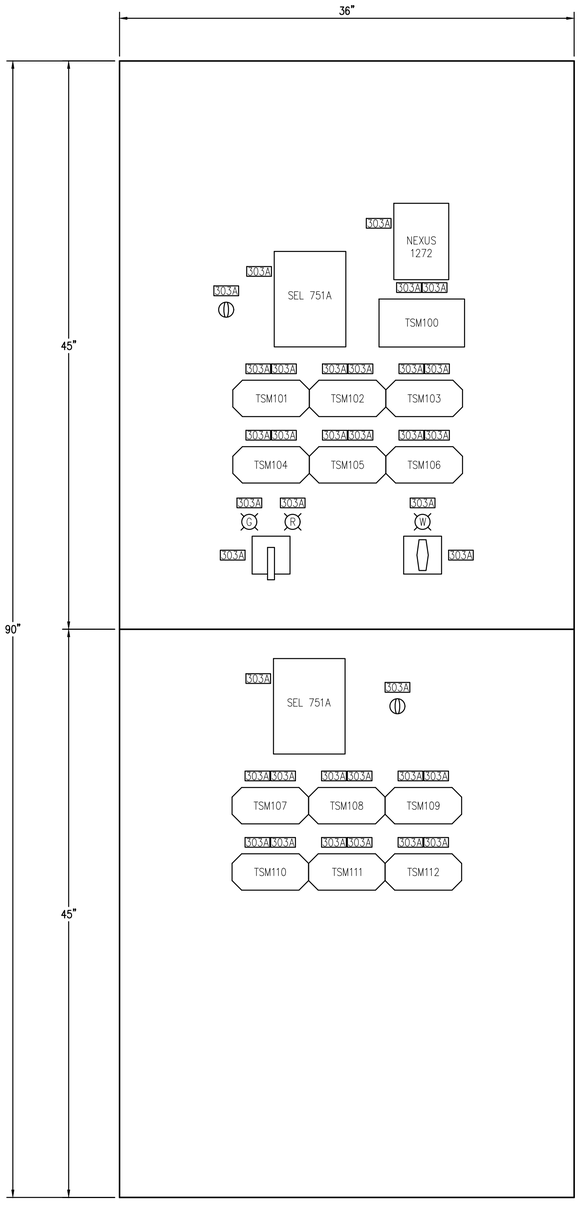
PARDEE DAM POWERLINE AND SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR ONE–LINE DIAGRAM – CONTROL & RELAY

PROJ NO.		
SCALE AS SHOWN	511.40–E–302	0
DATE	STRUCT. DISC. NUMBER	REV.

USERKOOSHA TOOFAN
DATE9/26/2024 4:19 PM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD_PARDEE DAM POWERLINE SAFETY IMPROVEMENTS PROJECT\01-DRAFTING\1-WORKING\511.40-E-302 - CHEMICAL PLANT SWITCHGEAR ONE-LINE DIAGRAM-CONT.DWG

SPEC NO. 2197



TSM100

	PM–M1–SWR PARDEE SOURCE POWER METER										
○	Va	IA Low	IA High	Vb	IB Low	IB High	Vc	IC Low	IC High	Vn	○

TSM101

	MPR1–M1–SWR PARDEE SOURCE CURRENT INPUTS										
○	–	–	IAX (–) Z02	IAX (+) Z01	IBX (–) Z04	IBX (+) Z03	ICX (–) Z06	ICX (+) Z05	–	–	○

TSM102

	MPR1–M1–SWR PARDEE SOURCE VOLTAGE INPUTS										
○	VAX Z09	VBX Z10	VCX Z11	VNX Z12	–	–	–	–	VS E01	VN E02	○

TSM103

	MPR1–M1–SWR PARDEE SOURCE STATUS & CONTROL										
○	–	–	–	–	–	–	VBAT+ E03	VBAT– E04	PS(+) A01	PS(–) A02	○

TSM104

	MPR1–M1–SWR PARDEE SOURCE STATUS & CONTROL										
○	OUT101 A03	OUT102 A05	OUT103 A07	OUT301 C01	OUT302 C03	OUT303 C05	OUT304 C07	–	–	–	○

TSM105

	MPR1–M1–SWR PARDEE SOURCE STATUS & CONTROL										
○	IN101 A10	IN102 A12	IN301 C09	IN302 C11	IN303 C13	IN304 C15	–	–	–	–	○

TSM106

	MPR1–M1–SWR PARDEE SOURCE STATUS & CONTROL										
○	IN401 D01	IN402 D03	IN403 D05	IN404 D07	IN405 D09	IN406 D11	IN407 D13	IN408 D15	–	–	○

TSM107

	MPR2–M1–SWR PARDEE SOURCE CURRENT INPUTS										
○	–	–	IAX (–) Z02	IAX (+) Z01	IBX (–) Z04	IBX (+) Z03	ICX (–) Z06	ICX (+) Z05	–	–	○

TSM108

	MPR2–M1–SWR PARDEE SOURCE VOLTAGE INPUTS										
○	VAX Z09	VBX Z10	VCX Z11	VNX Z12	–	–	–	–	VS E01	VN E02	○

TSM109

	MPR2–M1–SWR PARDEE SOURCE STATUS & CONTROL										
○	–	–	–	–	–	–	VBAT+ E03	VBAT– E04	PS(+) A01	PS(–) A02	○

TSM110

	MPR2–M1–SWR PARDEE SOURCE STATUS & CONTROL										
○	OUT101 A03	OUT102 A05	OUT103 A07	OUT301 C01	OUT302 C03	OUT303 C05	OUT304 C07	–	–	–	○

TSM111

	MPR2–M1–SWR PARDEE SOURCE STATUS & CONTROL										
○	IN101 A10	IN102 A12	IN301 C09	IN302 C11	IN303 C13	IN304 C15	–	–	–	–	○

TSM112

	MPR2–M1–SWR PARDEE SOURCE STATUS & CONTROL										
○	IN401 D01	IN402 D03	IN403 D05	IN404 D07	IN405 D09	IN406 D11	IN407 D13	IN408 D15	–	–	○

SWITCHGEAR RELAYING ARRANGEMENT M1

NOT TO SCALE

3" ON ORIGINAL DOCUMENT

0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ. ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW
PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

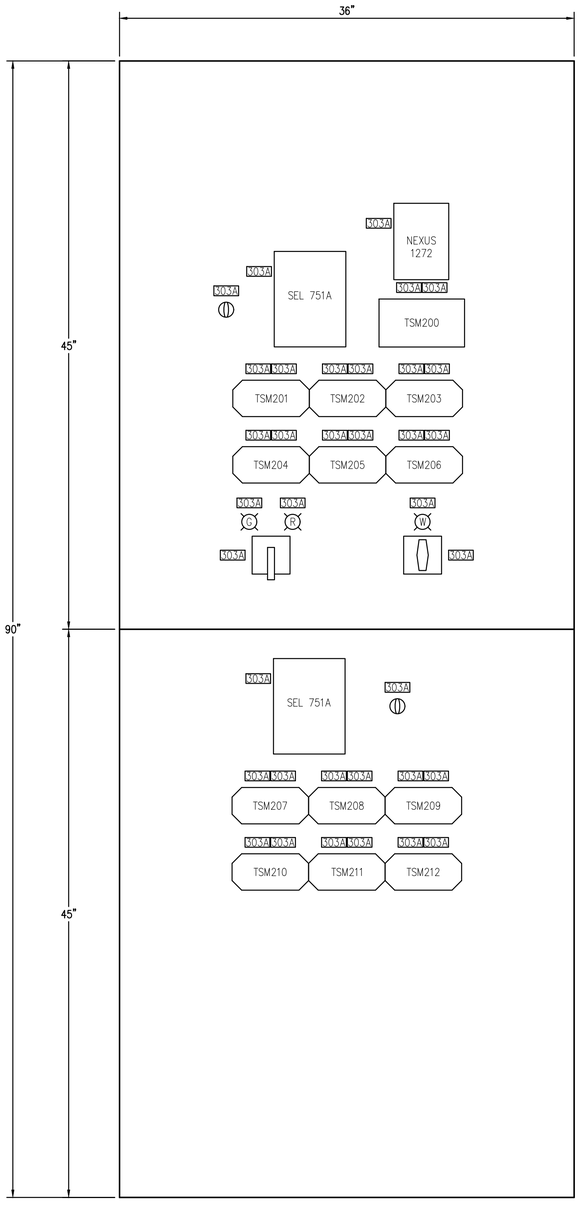
EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

PARDEE DAM POWERLINE AND SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR RELAYING ARRANGEMENT M1

PROJ NO.	511.40–E–303.1	0
SCALE AS SHOWN		
DATE	STRUCT. DISC. NUMBER	REV.

SPEC NO. 2197



TSM200

PM–M2–SWR PG&E SOURCE POWER METER										
Va	IA Low	IA High	Vb	IB Low	IB High	Vc	IC Low	IC High	Vn	

TSM201

MPR1–M2–SWR PG&E SOURCE CURRENT INPUTS										
–	–	IAX (–) Z02	IAX (+) Z01	IBX (–) Z04	IBX (+) Z03	ICX (–) Z06	ICX (+) Z05	–	–	

TSM202

MPR1–M2–SWR PG&E SOURCE VOLTAGE INPUTS										
VAX Z09	VBX Z10	VCX Z11	VNX Z12	–	–	–	–	VS E01	VN E02	

TSM203

MPR1–M2–SWR PG&E SOURCE STATUS & CONTROL										
–	–	–	–	–	–	VBAT+ E03	VBAT– E04	PS(+) A01	PS(–) A02	

TSM204

MPR1–M2–SWR PG&E SOURCE STATUS & CONTROL										
OUT101 A03	OUT102 A05	OUT103 A07	OUT301 C01	OUT302 C03	OUT303 C05	OUT304 C07	–	–	–	

TSM205

MPR1–M2–SWR PG&E SOURCE STATUS & CONTROL										
IN101 A10	IN102 A12	IN301 C09	IN302 C11	IN303 C13	IN304 C15	–	–	–	–	

TSM206

MPR1–M2–SWR PG&E SOURCE STATUS & CONTROL										
IN401 D01	IN402 D03	IN403 D05	IN404 D07	IN405 D09	IN406 D11	IN407 D13	IN408 D15	–	–	

TSM207

MPR2–M2–SWR PG&E SOURCE CURRENT INPUTS										
–	–	IAX (–) Z02	IAX (+) Z01	IBX (–) Z04	IBX (+) Z03	ICX (–) Z06	ICX (+) Z05	–	–	

TSM208

MPR2–M2–SWR PG&E SOURCE VOLTAGE INPUTS										
VAX Z09	VBX Z10	VCX Z11	VNX Z12	–	–	–	–	VS E01	VN E02	

TSM209

MPR2–M2–SWR PG&E SOURCE STATUS & CONTROL										
–	–	–	–	–	–	VBAT+ E03	VBAT– E04	PS(+) A01	PS(–) A02	

TSM210

MPR2–M2–SWR PG&E SOURCE STATUS & CONTROL										
OUT101 A03	OUT102 A05	OUT103 A07	OUT301 C01	OUT302 C03	OUT303 C05	OUT304 C07	–	–	–	

TSM211

MPR2–M2–SWR PG&E SOURCE STATUS & CONTROL										
IN101 A10	IN102 A12	IN301 C09	IN302 C11	IN303 C13	IN304 C15	–	–	–	–	

TSM212

MPR2–M2–SWR PG&E SOURCE STATUS & CONTROL										
IN401 D01	IN402 D03	IN403 D05	IN404 D07	IN405 D09	IN406 D11	IN407 D13	IN408 D15	–	–	

SWITCHGEAR RELAYING ARRANGEMENT M2

NOT TO SCALE

3" ON ORIGINAL DOCUMENT

0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ. ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW
PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

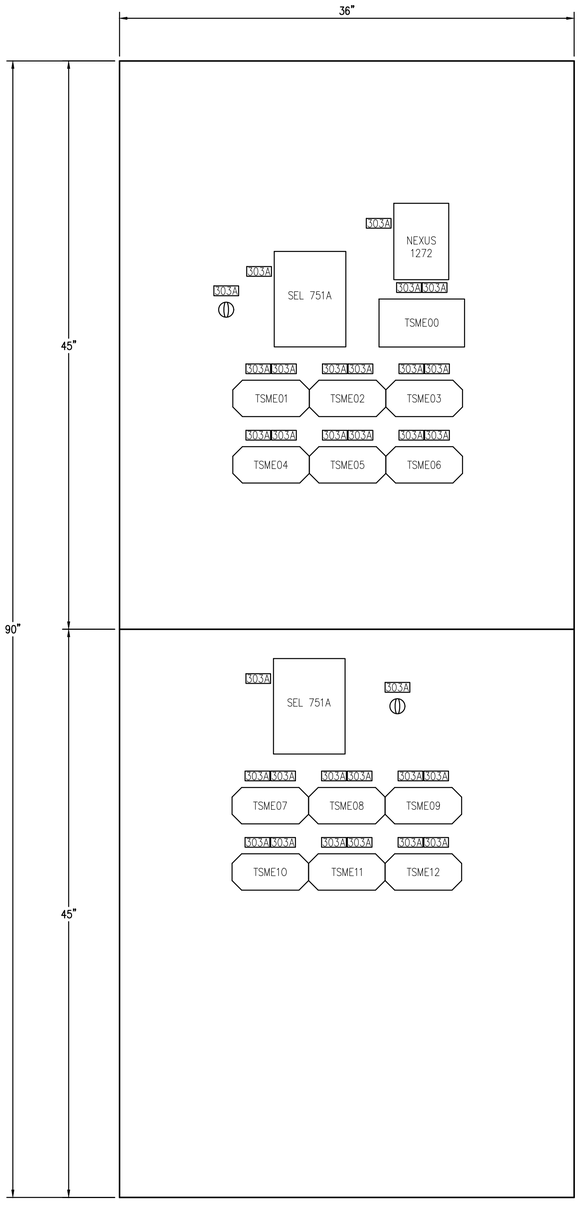
PARDEE DAM POWERLINE AND SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR RELAYING ARRANGEMENT M2

PROJ NO.	511.40–E–303.2	0
SCALE AS SHOWN		
DATE	STRUCT. DISC. NUMBER	REV.

USERKOOSHA TOOFAN
DATE:4/22/2024 2:27 PM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS PROJECT\ELECTRICAL\DRAFTING\WORKING\511.40-E-303.2 - CHEMICAL PLANT SWITCHGEAR ARRANGEMENTS M2.DWG

SPEC NO. 2197



TSME00

	PM–ATS–SWR EGEN POWER METER										
○	Va	IA Low	IA High	Vb	IB Low	IB High	Vc	IC Low	IC High	Vn	○

TSME01

	MPR1–E–SWR GENERATOR SOURCE CURRENT INPUTS										
○	–	–	IAX (–) Z02	IAX (+) Z01	IBX (–) Z04	IBX (+) Z03	ICX (–) Z06	ICX (+) Z05	–	–	○

TSME02

	MPR1–E–SWR GENERATOR SOURCE VOLTAGE INPUTS										
○	VAX Z09	VBX Z10	VCX Z11	VNX Z12	–	–	–	–	VS E01	VN E02	○

TSME03

	MPR1–E–SWR GENERATOR SOURCE STATUS & CONTROL										
○	–	–	–	–	–	–	VBAT+ E03	VBAT– E04	PS(+) A01	PS(–) A02	○

TSME04

	MPR1–E–SWR GENERATOR SOURCE STATUS & CONTROL										
○	OUT101 A03	OUT102 A05	OUT103 A07	OUT301 C01	OUT302 C03	OUT303 C05	OUT304 C07	–	–	–	○

TSME05

	MPR1–E–SWR GENERATOR SOURCE STATUS & CONTROL										
○	IN101 A10	IN102 A12	IN301 C09	IN302 C11	IN303 C13	IN304 C15	–	–	–	–	○

TSME06

	MPR1–E–SWR GENERATOR SOURCE STATUS & CONTROL										
○	IN401 D01	IN402 D03	IN403 D05	IN404 D07	IN405 D09	IN406 D11	IN407 D13	IN408 D15	–	–	○

TSME07

	MPR1–N–SWR GENERATOR SOURCE CURRENT INPUTS										
○	–	–	IAX (–) Z02	IAX (+) Z01	IBX (–) Z04	IBX (+) Z03	ICX (–) Z06	ICX (+) Z05	–	–	○

TSME08

	MPR1–N–SWR GENERATOR SOURCE VOLTAGE INPUTS										
○	VAX Z09	VBX Z10	VCX Z11	VNX Z12	–	–	–	–	VS E01	VN E02	○

TSME09

	MPR1–N–SWR GENERATOR SOURCE STATUS & CONTROL										
○	–	–	–	–	–	–	VBAT+ E03	VBAT– E04	PS(+) A01	PS(–) A02	○

TSME10

	MPR1–N–SWR GENERATOR SOURCE STATUS & CONTROL										
○	OUT101 A03	OUT102 A05	OUT103 A07	OUT301 C01	OUT302 C03	OUT303 C05	OUT304 C07	–	–	–	○

TSME11

	MPR1–N–SWR GENERATOR SOURCE STATUS & CONTROL										
○	IN101 A10	IN102 A12	IN301 C09	IN302 C11	IN303 C13	IN304 C15	–	–	–	–	○

TSME12

	MPR1–N–SWR GENERATOR SOURCE STATUS & CONTROL										
○	IN401 D01	IN402 D03	IN403 D05	IN404 D07	IN405 D09	IN406 D11	IN407 D13	IN408 D15	–	–	○

SWITCHGEAR RELAYING ARRANGEMENT ATS

NOT TO SCALE

3" ON ORIGINAL DOCUMENT

0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW

PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

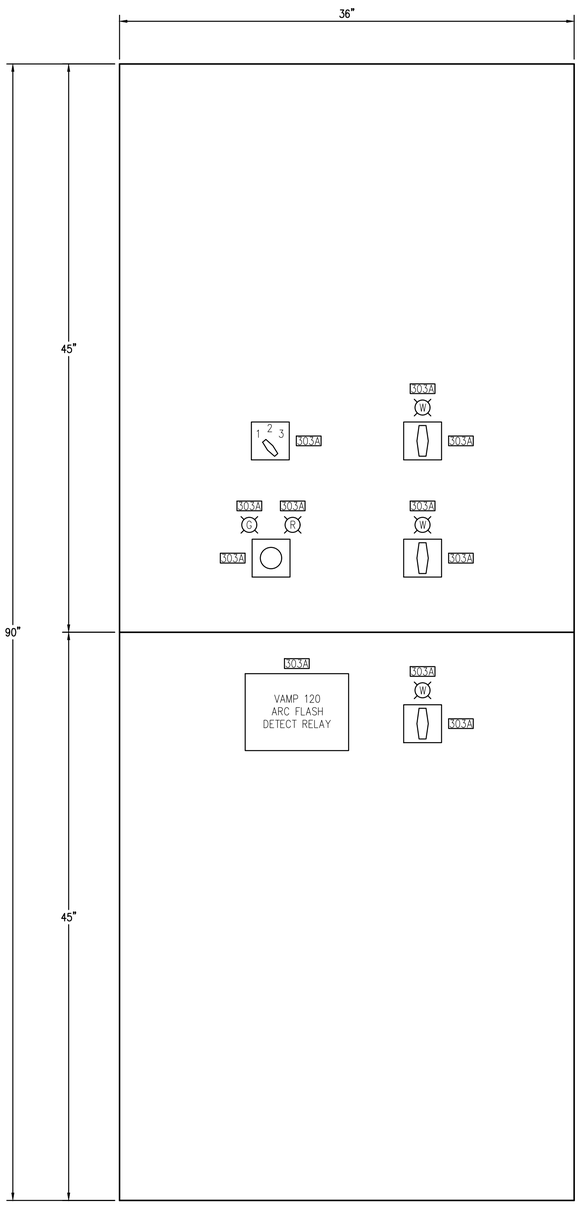
PARDEE DAM POWERLINE AND SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR RELAYING ARRANGEMENT ATS

PROJ NO.	511.40–E–303.3	0
SCALE AS SHOWN		
DATE	STRUCT. DISC. NUMBER	REV.

USERKOOSHA TOOFAN
DATE:7/21/2024 3:59 PM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS-PROJECT\ELECTRICAL\DRAFTING\DWORKING\511.40-E-303.3 - CHEMICAL PLANT SWITCHGEAR ARRANGEMENTS ATS.DWG

SPEC NO.2197



SWITCHGEAR RELAYING ARRANGEMENT BUS & ARC FLASH

NOT TO SCALE

3" ON ORIGINAL DOCUMENT

0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY

DESIGN CHECKED BY

DRAWN BY

SR. PROJ. ENGR. R.P.E. NO.

APPROVED

PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW

PROJECT ENGINEER R.P.E. NO.

RECOMMENDED SR. R.P.E. NO.

APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

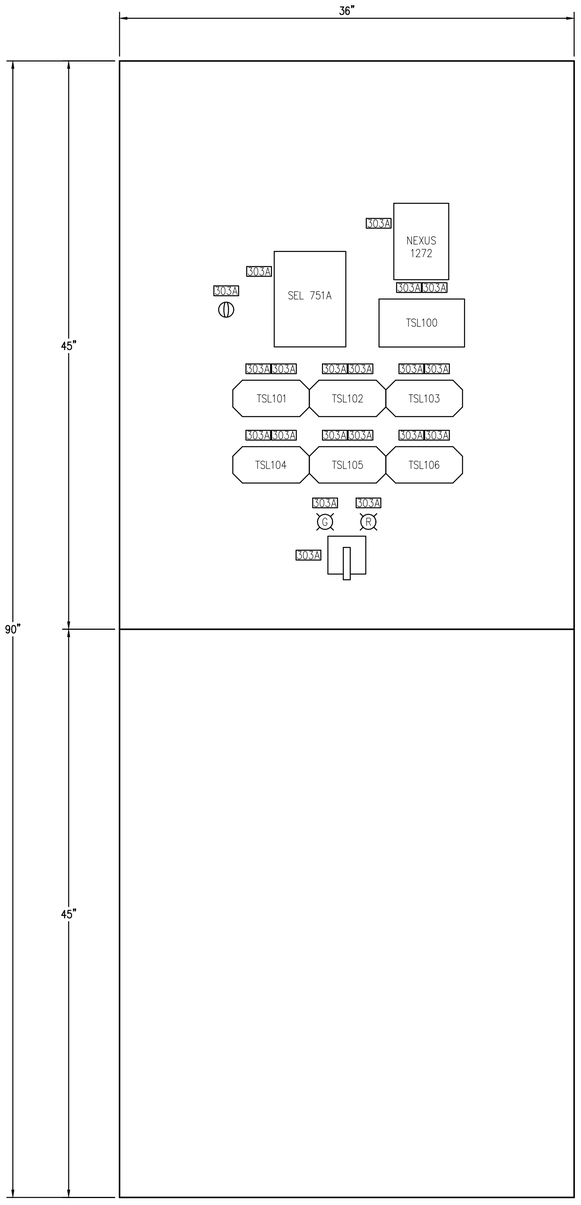
EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

PARDEE DAM POWERLINE AND SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR RELAYING ARRANGEMENT BUS & ARC FLASH

PROJ NO.		
SCALE AS SHOWN	511.40–E–303.4	0
DATE	STRUCT. DISC. NUMBER	REV.

USERKOOSHA TOOFAN
DATE:7/21/2024 4:40 PM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS\PROJECTS\ELECTRICAL\DRAFTING\511-40-E-303.4 - CHEMICAL PLANT SWITCHGEAR ARRANGEMENTS BUS & ARC FLASH.DWG



TSL100

○	PM–L1–SWR CAMP PARDEE LOAD POWER METER										○
	Va	IA Low	IA High	Vb	IB Low	IB High	Vc	IC Low	IC High	Vn	

TSL101

○	MPR1–L1–SWR CAMP PARDEE LOAD CURRENT INPUTS										○
	–	–	IAX (–) Z02	IAX (+) Z01	IBX (–) Z04	IBX (+) Z03	ICX (–) Z06	ICX (+) Z05	–	–	

TSL102

○	MPR1–L1–SWR CAMP PARDEE LOAD VOLTAGE INPUTS										○
	VAX Z09	VBX Z10	VCX Z11	VNX Z12	–	–	–	–	VS E01	VN E02	

TSL103

○	MPR1–L1–SWR CAMP PARDEE LOAD STATUS & CONTROL										○
	–	–	–	–	–	–	VBAT+ E03	VBAT– E04	PS(+) A01	PS(–) A02	

TSL104

○	MPR1–L1–SWR CAMP PARDEE LOAD STATUS & CONTROL										○
	OUT101 A03	OUT102 A05	OUT103 A07	OUT301 C01	OUT302 C03	OUT303 C05	OUT304 C07	–	–	–	

TSL105

○	MPR1–L1–SWR CAMP PARDEE LOAD STATUS & CONTROL										○
	IN101 A10	IN102 A12	IN301 C09	IN302 C11	IN303 C13	IN304 C15	–	–	–	–	

TSL106

○	MPR1–L1–SWR CAMP PARDEE LOAD STATUS & CONTROL										○
	IN401 D01	IN402 D03	IN403 D05	IN404 D07	IN405 D09	IN406 D11	IN407 D13	IN408 D15	–	–	

SWITCHGEAR RELAYING ARRANGEMENT L1

NOT TO SCALE

3" ON ORIGINAL DOCUMENT

0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ. ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW

PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

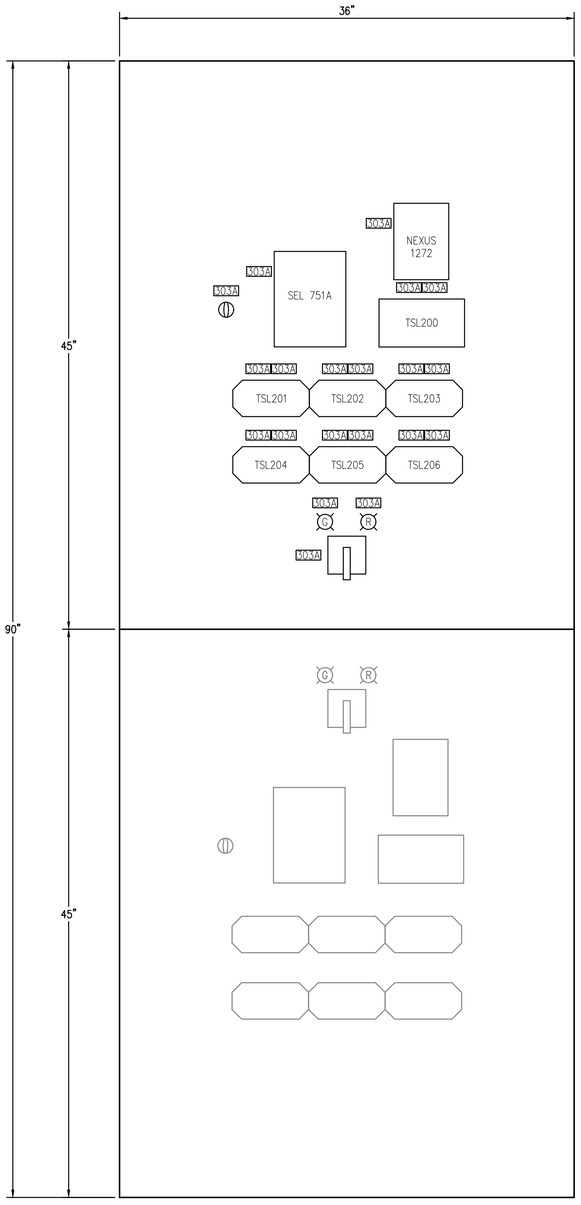
PARDEE DAM POWERLINE AND SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR RELAYING ARRANGEMENT L1

PROJ NO.			
SCALE AS SHOWN	511.40–E–304.1		0
DATE	STRUCT.	DISC. NUMBER	REV.

USERKOOSHA TOOFAN
DATE:7/8/2024 3:42 PM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS\PROJECTS\ELECTRICAL\DRAFTING\WORKING\511.40-E-304.1 - CHEMICAL PLANT SWITCHGEAR ARRANGEMENTS L1.DWG

SPEC NO. 2197



TSL200

○	PM–L2–SWR CHEMICAL PLANT LOAD POWER METER										○
	Va	IA Low	IA High	Vb	IB Low	IB High	Vc	IC Low	IC High	Vn	

TSL201

○	MPR1–L2–SWR CHEMICAL PLANT LOAD CURRENT INPUTS										○
	–	–	IAX (–) Z02	IAX (+) Z01	IBX (–) Z04	IBX (+) Z03	ICX (–) Z06	ICX (+) Z05	–	–	

TSL202

○	MPR1–L2–SWR CHEMICAL PLANT LOAD VOLTAGE INPUTS										○
	VAX Z09	VBX Z10	VCX Z11	VNX Z12	–	–	–	–	VS E01	VN E02	

TSL203

○	MPR1–L2–SWR CHEMICAL PLANT LOAD STATUS & CONTROL										○
	–	–	–	–	–	–	VBAT+ E03	VBAT– E04	PS(+) A01	PS(–) A02	

TSL204

○	MPR1–L2–SWR CHEMICAL PLANT LOAD STATUS & CONTROL										○
	OUT101 A03	OUT102 A05	OUT103 A07	OUT301 C01	OUT302 C03	OUT303 C05	OUT304 C07	–	–	–	

TSL205

○	MPR1–L2–SWR CHEMICAL PLANT LOAD STATUS & CONTROL										○
	IN101 A10	IN102 A12	IN301 C09	IN302 C11	IN303 C13	IN304 C15	–	–	–	–	

TSL206

○	MPR1–L2–SWR CHEMICAL PLANT LOAD STATUS & CONTROL										○
	IN401 D01	IN402 D03	IN403 D05	IN404 D07	IN405 D09	IN406 D11	IN407 D13	IN408 D15	–	–	

SWITCHGEAR RELAYING ARRANGEMENT L2

NOT TO SCALE

3" ON ORIGINAL DOCUMENT

0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ. ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW

PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

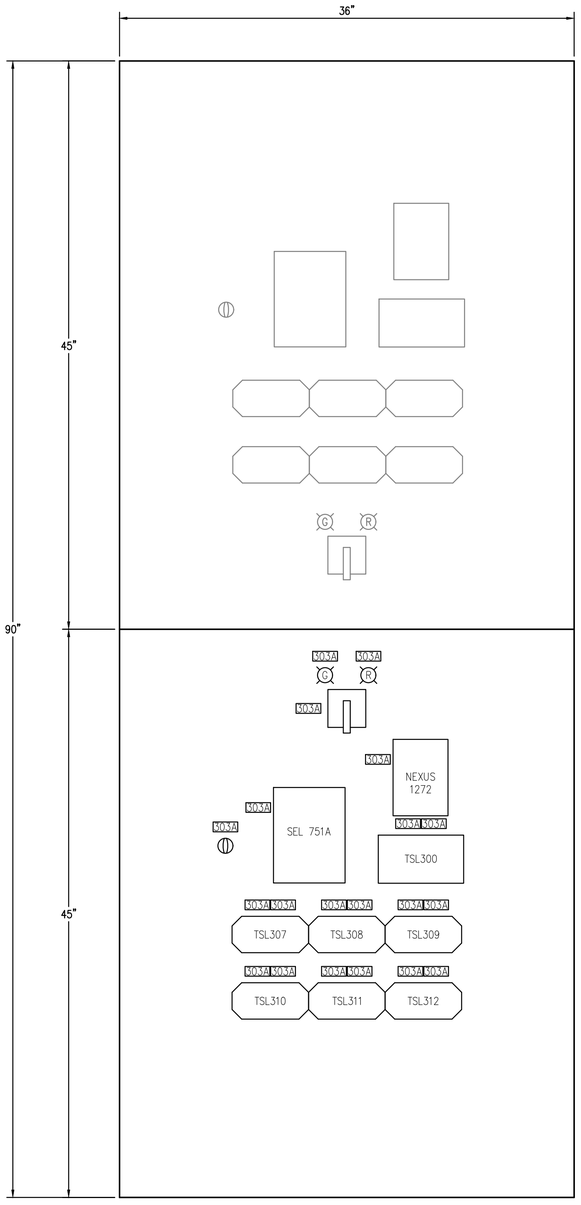
PARDEE DAM POWERLINE AND SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR RELAYING ARRANGEMENT L2

PROJ NO.			
SCALE AS SHOWN	511.40–E–304.2		0
DATE	STRUCT.	DISC. NUMBER	REV.

USERKOOSHA TOOFAN
DATE:7/8/2024 3:43 PM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS\PROJECT\ELECTRICAL\DRAFTING\WORKING\511.40-E-304.2 - CHEMICAL PLANT SWITCHGEAR ARRANGEMENTS L2.DWG

SPEC NO. 2197



TSL300

	PM-L3-SWR FUTURE LOAD POWER METER										
○	Va	IA Low	IA High	Vb	IB Low	IB High	Vc	IC Low	IC High	Vn	○

TSL301

	MPR1-L3-SWR FUTURE LOAD CURRENT INPUTS										
○	–	–	IAX (–) Z02	IAX (+) Z01	IBX (–) Z04	IBX (+) Z03	ICX (–) Z06	ICX (+) Z05	–	–	○

TSL302

	MPR1-L3-SWR FUTURE LOAD VOLTAGE INPUTS										
○	VAX Z09	VBX Z10	VCX Z11	VNX Z12	–	–	–	–	VS E01	VN E02	○

TSL303

	MPR1-L3-SWR FUTURE LOAD STATUS & CONTROL										
○	–	–	–	–	–	–	VBAT+ E03	VBAT– E04	PS(+) A01	PS(–) A02	○

TSL304

	MPR1-L3-SWR FUTURE LOAD STATUS & CONTROL										
○	OUT101 A03	OUT102 A05	OUT103 A07	OUT301 C01	OUT302 C03	OUT303 C05	OUT304 C07	–	–	–	○

TSL305

	MPR1-L3-SWR FUTURE LOAD STATUS & CONTROL										
○	IN101 A10	IN102 A12	IN301 C09	IN302 C11	IN303 C13	IN304 C15	–	–	–	–	○

TSL306

	MPR1-L3-SWR FUTURE LOAD STATUS & CONTROL										
○	IN401 D01	IN402 D03	IN403 D05	IN404 D07	IN405 D09	IN406 D11	IN407 D13	IN408 D15	–	–	○

SWITCHGEAR RELAYING ARRANGEMENT L3

NOT TO SCALE

3" ON ORIGINAL DOCUMENT

0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW

PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

PARDEE DAM POWERLINE AND SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR RELAYING ARRANGEMENT L3

PROJ NO.			
SCALE AS SHOWN	511.40-E-304.3		0
DATE	STRUCT.	DISC. NUMBER	REV.

USERROOSHA TOOFAN
DATE:7/8/2024 3:44 PM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS\PROJECT\ELECTRICAL\DRAFTING\WORKING\511.40-E-304.3 - CHEMICAL PLANT SWITCHGEAR ARRANGEMENTS L3.DWG

SPEC NO. 2197

CB1
30A–2P
(+)

48V FROM
DC PANEL 'B'
CIRCUITS #1/3
(SHEET
511.40–E–306)

52a
M1

52a
M2

SS SINGLE SOURCE MODE

AUTO TRANSFER ENABLED MODE

R

86
AF

86
M1

SS AUTO TRANSFER ENABLED

CS M1 T

W

TO MPR2–M1

TO MPR2–M1
DC +

B 511.40–E–305.2

TSM103

18 R 17

A01 POWER SUPPLY

GROUND A02

A11 IN 101

A10

IN 102

A12

19 R 20

TSM105

6 BL 5

C09 IN 301

C10

8 BL 7

C11 IN 302

C12

10 BL 9

C13 IN 303

C14

12 BL 11

C15 IN 304

C16

TSM103

14 R 13

E03 (+) V BATT (–)

E04

TSM106

2 BL 1

D01 IN 401

D02

4 BL 3

D03 IN 402

D04

6 BL 5

D05 IN 403

D06

8 BL 7

D07 IN 404

D08

10 BL 9

D09 IN 405

D10

12 BL 11

D11 IN 406

D12

14 BL 13

D13 IN 407

D14

16 BL 15

D15 IN 408

D16

TSM104

2 BL 1

A03 OUT 101 25 LL–DB

A04

4 BL 3

A05 L OUT 102 25 DL–DB

A06

6 BL 5

A07 OUT 103 RELAY P.S. FAIL

A08

A09

8 BL 7

C01 OUT 301 27 DL

C02

10 BL 9

C03 OUT 302 27 DL

C04

12 BL 11

C05 OUT 303 50/51

C06

14 BL 13

C07 OUT 304

C08

XXXX

REDUNDANT RELAY SEL 751A

1 RCO1–M1 3

CSM1
C

86M1

SS AUTO TRANSFER ENABLED

BACKFEED ENABLED

86AF

52b
E

52b
M2

SS BACK FEED ENABLE MODE

TO MPR2–M1 OUT303
TO MPR2–M1 OUT301
TO MPR2–M1 DC (–)
TO MPR2–M1 IN403
TO MPR2–M1 OUT101 & 102
FROM MPR2–M1 OUT103
TO MPR2–M1 OUT101
TO MPR2–M1
TO MPR2–M1
TO MPR2–M1
TO MPR2–M1 OUT103

C 511.40–E–305.2

TO MPR1–M2

D 511.40–E–305.3

TSM105

1 BL 2

3 BL 4

TO MPR2–M1 IN401
TO MPR2–M1 IN402
TO MPR2–M1 IN304
TO MPR2–M1 IN303
TO MPR2–M1 IN302
TO MPR2–M1 IN301
TO MPR2–M1 IN102
TO MPR2–M1 IN101

511.40–E–305.2 A

BACK FEED ENABLE MODE

SINGLE SOURCE MODE

AUTO TRANSFER ENABLE MODE

MASTER SELECTOR SWITCH 'SS'

52a
M1

86
M1

86
AF

G

52b
M1

(+)

(–)

CLOSE

TRIP

BREAKER M1 (PARDEE POWERHOUSE)

86
M1

86
M1

86
M1

(–)

CB3

SWITCHGEAR RELAYING SCHEMATICS MPR1–M1

NOT TO SCALE

3" ON ORIGINAL DOCUMENT

0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY

DESIGN CHECKED BY

DRAWN BY

SR. PROJ. ENGR. R.P.E. NO.

APPROVED

PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW

PROJECT ENGINEER R.P.E. NO.

RECOMMENDED SR. ELEC. R.P.E. NO.

APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

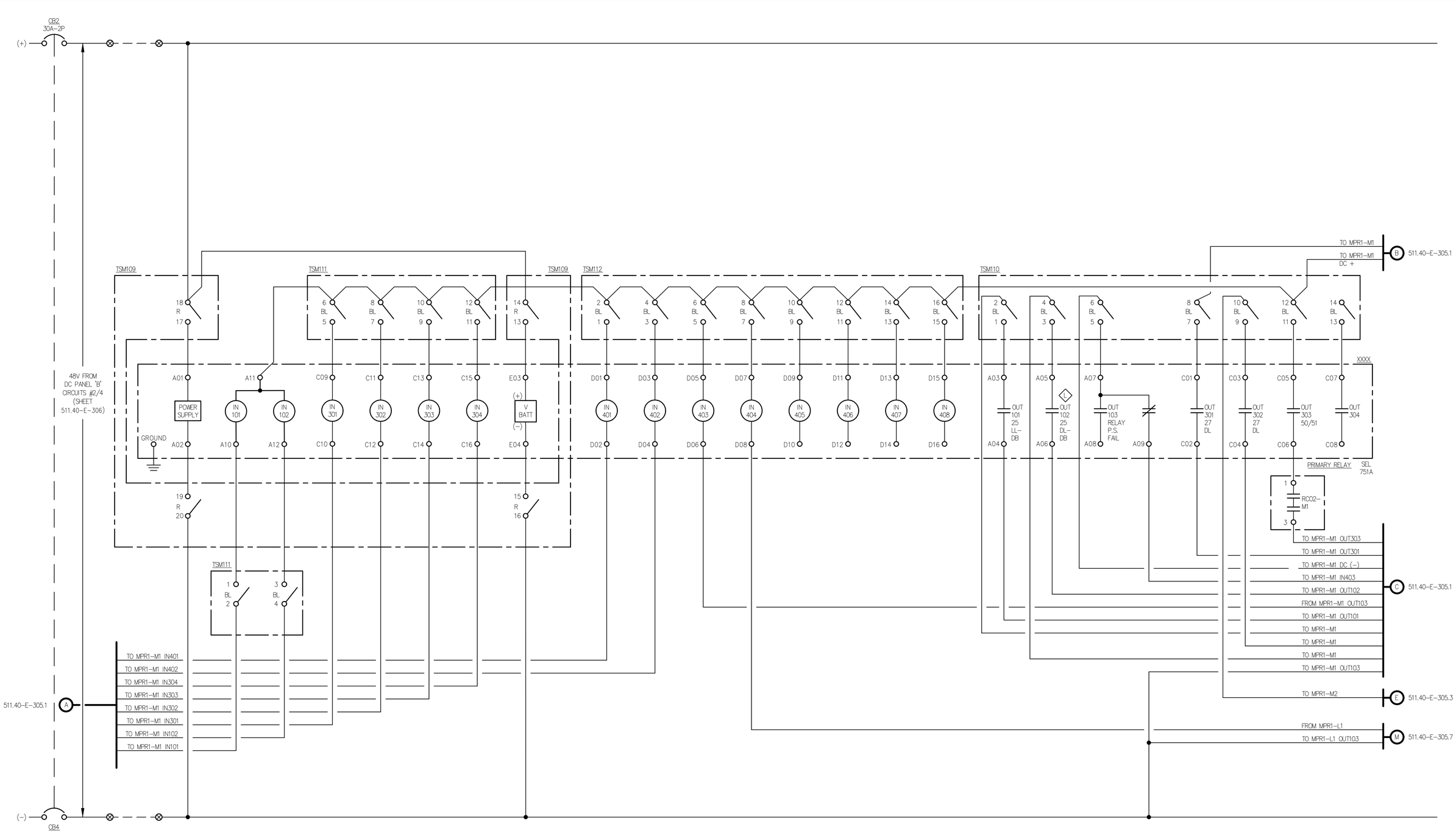
PARDEE DAM POWERLINE AND
SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR RELAYING SCHEMATICS MPR1–M1

PROJ NO.			
SCALE AS SHOWN	511.40–E–305.1		0
DATE	STRUCT.	DISC.	NUMBER / REV.

USERKOOSHA TOOFAN
DATE7/8/2024 3:45 PM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS\PROJECTS\ELECTRICAL\DRAFTING\1-WORKING\511.40-E-305.1 - CHEMICAL PLANT SWITCHGEAR SCHEMATICS MPR1-M1.DWG

SPEC NO. 2197



USERKOOSHA TOOFAN
DATE7/23/2024 8:25 AM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS PROJECT\01-DRAFTING\1-WORKING\511.40-E-305.2 - CHEMICAL PLANT SWITCHGEAR SCHEMATICS MPR2-M1.DWG

SWITCHGEAR RELAYING SCHEMATICS MPR2–M1

NOT TO SCALE

3" ON ORIGINAL DOCUMENT
0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW
PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. ENGR. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

PARDEE DAM POWERLINE AND
SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR RELAYING SCHEMATICS MPR2–M1

PROJ NO.		
SCALE AS SHOWN	511.40–E–305.2	0
DATE	STRUCT. DISC. NUMBER	REV.

SPEC NO. 2197

CB5
30A–2P
(+)

48V FROM
DC PANEL 'B'
CIRCUITS #5/7
(SHEET
511.40–E–306)

SS AUTO TRANSFER ENABLED

CS M2 T

R — 86 AF — 86 M2 — T1–M1 TDPU 5 MIN — W

TO MPR2–M2
TO MPR2–M2
DC +
F → 511.40–E–305.4

TSM203 | TSM205 | TSM203 | TSM206 | TSM204

18 R 17 — 6 BL 5 — 8 BL 7 — 10 BL 9 — 12 BL 11 — 14 R 13 — 2 BL 1 — 4 BL 3 — 6 BL 5 — 8 BL 7 — 10 BL 9 — 12 BL 11 — 14 BL 13

XXXX

A01 POWER SUPPLY — GROUND A02
A11 — IN 101 A10 — IN 102 A12
C09 IN 301 C10 — C11 IN 302 C12 — C13 IN 303 C14 — C15 IN 304 C16
E03 (+) V BATT (–) E04
D01 IN 401 D02 — D03 IN 402 D04 — D05 IN 403 D06 — D07 IN 404 D08 — D09 IN 405 D10 — D11 IN 406 D12 — D13 IN 407 D14 — D15 IN 408 D16
A03 OUT 101 25 LL–DB A04 — A05 L OUT 102 25 LL–DB A06
A07 OUT 103 RELAY P.S. FAIL A08 — A09
C01 OUT 301 27 DL C02 — C03 OUT 302 27 DL C04 — C05 OUT 303 50/51 32R C06 — C07 OUT 304 C08

REDUNDANT RELAY SEL 751A
1 RCO1–M2 3

19 R 20 — 15 R 16

TSM205
1 BL 2 — 3 BL 4

TO MPR2–M2 IN401
TO MPR2–M2 IN402
TO MPR2–M2 IN304
TO MPR2–M2 IN303
TO MPR2–M2 IN302
TO MPR2–M2 IN301
TO MPR2–M2 IN102
TO MPR2–M2 IN101
511.40–E–305.4 H

52a M2 — 86 M2 — 86 AF

BACK FEED ENABLE MODE — SINGLE SOURCE MODE — AUTO TRANSFER ENABLE MODE
MASTER SELECTOR SWITCH 'SS'

G — 52b M2 — (+) — (–)

CSM2 C — 86M2 — 86AF — 52b E — 52b M1 — CLOSE
86M1 — SS AUTO TRANSFER ENABLED — BACKFEED ENABLED
SS BACK FEED ENABLE MODE — TRIP

BREAKER M2 (PG&E)

TO MPR2–M2 OUT303
TO MPR2–M2 OUT301
TO MPR2–M2 DC (–)
TO MPR2–M2 IN403
TO MPR2–M2 OUT102
FROM MPR2–M2 OUT103
TO MPR2–M2 OUT101
TO MPR2–M2
TO MPR2–M2
TO MPR2–M2 OUT103
G → 511.40–E–305.4
TO MPR1–M1
TO MPR2–M1
D → 511.40–E–305.1
E → 511.40–E–305.2

86 M2 — 86 M2 — 86 M2
TO MPR2–M2
DC –

(–) CB7

SWITCHGEAR RELAYING SCHEMATICS MPR1–M2

NOT TO SCALE

3" ON ORIGINAL DOCUMENT
0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ. ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW
PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. ENGR. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.
SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

PARDEE DAM POWERLINE AND SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

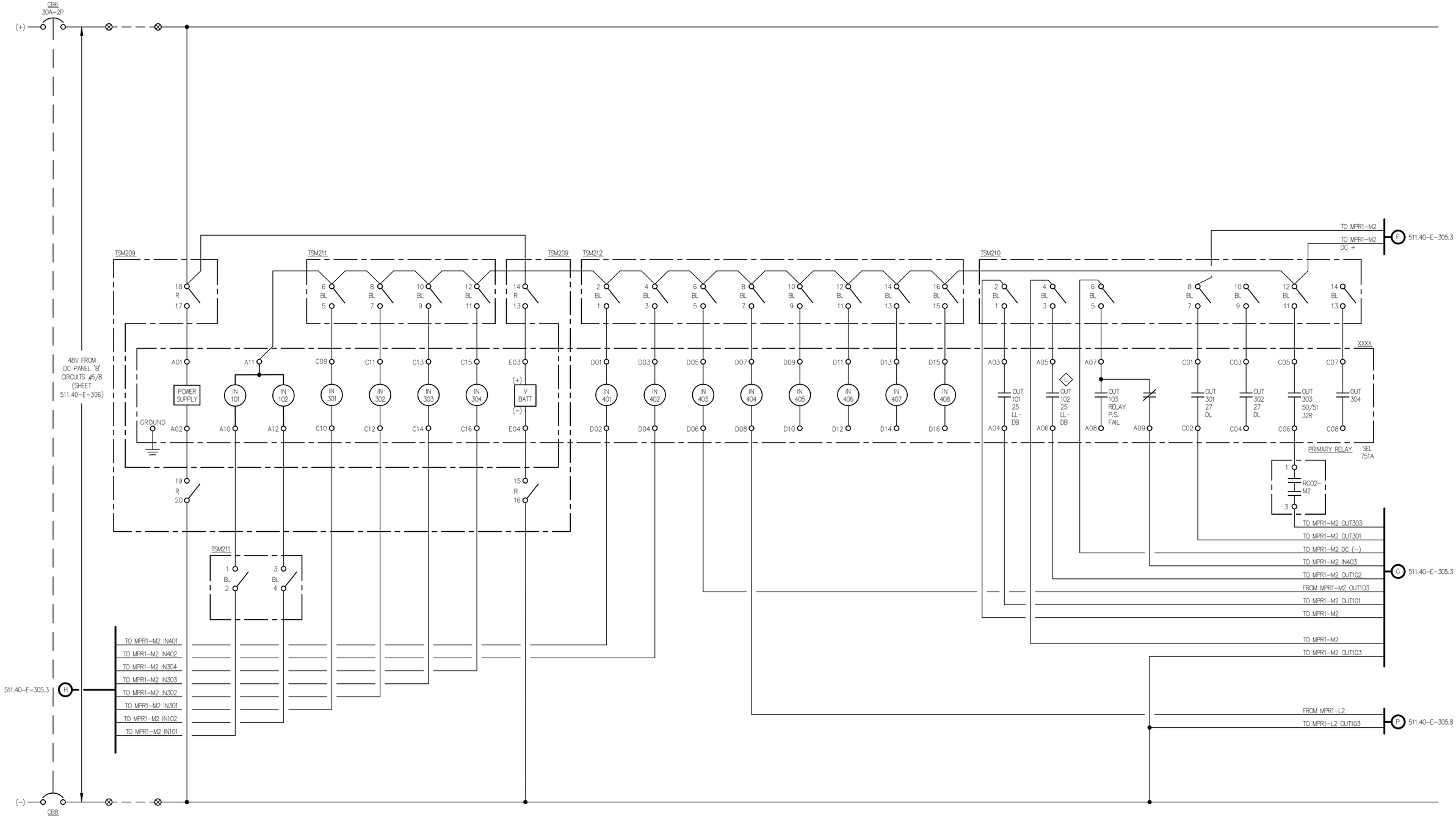
PARDEE CHEMICAL PLANT
SWITCHGEAR RELAYING SCHEMATICS MPR1–M2

PROJ NO.
SCALE AS SHOWN
DATE

511.40–E–305.3 | 0
STRUCT. DISC. NUMBER REV.

USERKOOSHA TOOFAN
DATE7/8/2024 3:46 PM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS PROJECT\ELECTRICAL\DRAFTING\WORKING\511.40-E-305.3 - CHEMICAL PLANT SWITCHGEAR SCHEMATICS MPR1-M2.DWG

SPEC NO. 2197



USERKOOSHA TOOFAN
DATE7/8/2024 3:47 PM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS PROJECT\DRAFTING\WORKING\511.40-E-305.4 - CHEMICAL PLANT SWITCHGEAR SCHEMATICS MPR2-M2.DWG

SWITCHGEAR RELAYING SCHEMATICS MPR2–M2

NOT TO SCALE

3" ON ORIGINAL DOCUMENT
0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW
PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. ENGR. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

PARDEE DAM POWERLINE AND
SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR RELAYING SCHEMATICS MPR2–M2

PROJ NO.		
SCALE AS SHOWN	511.40–E–305.4	0
DATE	STRUCT. DISC. NUMBER	REV.

SPEC NO. 2197

CB9
30A–2P
(+)

48V FROM
DC PANEL 'B'
CIRCUITS #9/11
(SHEET
511.40–E–306)

"PB"
EMERGENCY
TRIP
W

TSN03
18 R 17
A01 POWER SUPPLY GROUND A02
A11
IN 101 A10
IN 102 A12
19 R 20

TSN05
6 BL 5
8 BL 7
10 BL 9
12 BL 11
C09 IN 301 C10
C11 IN 302 C12
C13 IN 303 C14
C15 IN 304 C16

TSN03
14 R 13
E03 (+) V BATT (–) E04
15 R 16

TSN06
2 BL 1
4 BL 3
6 BL 5
8 BL 7
10 BL 9
12 BL 11
14 BL 13
16 BL 15
D01 IN 401 D02
D03 IN 402 D04
D05 IN 403 D06
D07 IN 404 D08
D09 IN 405 D10
D11 IN 406 D12
D13 IN 407 D14
D15 IN 408 D16

TSN04
2 BL 1
4 BL 3
6 BL 5
8 BL 7
10 BL 9
12 BL 11
14 BL 13
A03 OUT 101 CLOSE ATS–E BKR A04
A05 OUT 102 OPEN ATS–E BKR A06
A07 OUT 103 RELAY P.S. FAIL A08
A09
C01 OUT 301 CLOSE ATS–N BKR C02
C03 OUT 302 OPEN ATS–N BKR C04
C05 OUT 303 50/51 C06
C07 OUT 304 C08

XXXX

PRIMARY RELAY SEL 751A
7 9
5 6
1 RCO1–N 3

TSN05
1 BL 2
3 BL 4

BACK FEED ENABLE MODE
SINGLE SOURCE MODE
AUTO TRANSFER ENABLE MODE
MASTER SELECTOR SWITCH 'SS'

52a E
86 N
86 AF
86 E
52a N

TO MPR1–E DC (–)
TO MPR1–E IN403
TO MPR1–E OUT103
FROM MPR1–E OUT103
TO MPR1–E ATS TRIP 'N'
TO MPR1–E ATS TRIP 'N'
TO MPR1–E ATS CLOSE 'N'
TO MPR1–E ATS CLOSE 'N'
J 511.40–E–305.6
TO MPR1–E ATS TRIP 'E'
TO MPR1–E ATS TRIP 'E'
TO MPR1–E ATS CLOSE 'E'
TO MPR1–E ATS CLOSE 'E'
FROM MPR1–L3
TO MPR1–L3 OUT103
S 511.40–E–305.9

86 N
86 N
86 N

(–)
CB11

USERKOOSHA TOOFAN
DATE5/22/2024 9:50 AM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS\PROJECT\DRAFTING\WORKING\511.40-E-305.5 - CHEMICAL PLANT SWITCHGEAR SCHEMATICS MPR1-N.DWG

SWITCHGEAR RELAYING SCHEMATICS MPR1–N

NOT TO SCALE

3" ON ORIGINAL DOCUMENT
0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW
PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. ENGR. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

PARDEE DAM POWERLINE AND
SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR RELAYING SCHEMATICS MPR1–N

PROJ NO.		
SCALE AS SHOWN	511.40–E–305.5	0
DATE	STRUCT. DISC. NUMBER	REV.

SPEC NO. 2197

CB10
30A–2P

(+)

48V FROM
DC PANEL 'B'
CIRCUITS #10/12
(SHEET
511.40–E–306)

"PB"
EMERGENCY
TRIP

W

TSE03

18 R 17

A01 POWER SUPPLY

GROUND A02

A11 IN 101 A10

IN 102 A12

19 R 20

TSE05

1 BL 2

3 BL 4

52a N

86 E

86 AF

TSE05

6 BL 5

8 BL 7

10 BL 9

12 BL 11

C09 IN 301 C10

C11 IN 302 C12

C13 IN 303 C14

C15 IN 304 C16

BACK FEED ENABLE MODE

SINGLE SOURCE MODE

AUTO TRANSFER ENABLE MODE

MASTER SELECTOR SWITCH 'SS'

TSE03

14 R 13

E03 (+) V BATT (–) E04

15 R 16

TSE06

2 BL 1

4 BL 3

6 BL 5

8 BL 7

10 BL 9

12 BL 11

14 BL 13

16 BL 15

D01 IN 401 D02

D03 IN 402 D04

D05 IN 403 D06

D07 IN 404 D08

D09 IN 405 D10

D11 IN 406 D12

D13 IN 407 D14

D15 IN 408 D16

86 N

511.40–E–306

52b M1

52b M2

86 AF

86 E

52b M1

52b M2

86 AF

86 N

52a E

TSE04

2 BL 1

4 BL 3

6 BL 5

8 BL 7

10 BL 9

12 BL 11

14 BL 13

A03 OUT 101 CLOSE ATS–E BKR A04

A05 OUT 102 OPEN ATS–E BKR A06

A07 OUT 103 RELAY P.S. FAIL A08

A09

C01 OUT 301 CLOSE ATS–N BKR C02

C03 OUT 302 OPEN ATS–N BKR C04

C05 OUT 303 50/51 C06

C07 OUT 304 C08

XXXX

PRIMARY RELAY SEL 751A

7 9

5 6

1 3 RCO1–E

TO MPR1–N DC (–)
TO MPR1–N IN403
TO MPR1–N OUT103
FROM MPR1–N OUT103
TO MPR1–N ATS TRIP 'N'
TO MPR1–N ATS TRIP 'N'
TO MPR1–N ATS CLOSE 'N'
TO MPR1–N ATS CLOSE 'N'
TO MPR1–N ATS TRIP 'E'
TO MPR1–N ATS TRIP 'E'
TO MPR1–N ATS CLOSE 'E'
TO MPR1–N ATS CLOSE 'E'

J 511.40–E–305.5

86 E

86 E

86 E

(–)

CB12

52b M1 52b M2 86 AF 86 E

SWITCHGEAR RELAYING SCHEMATICS MPR1–E

NOT TO SCALE

3" ON ORIGINAL DOCUMENT

0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ. ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW

PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. ELEC. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

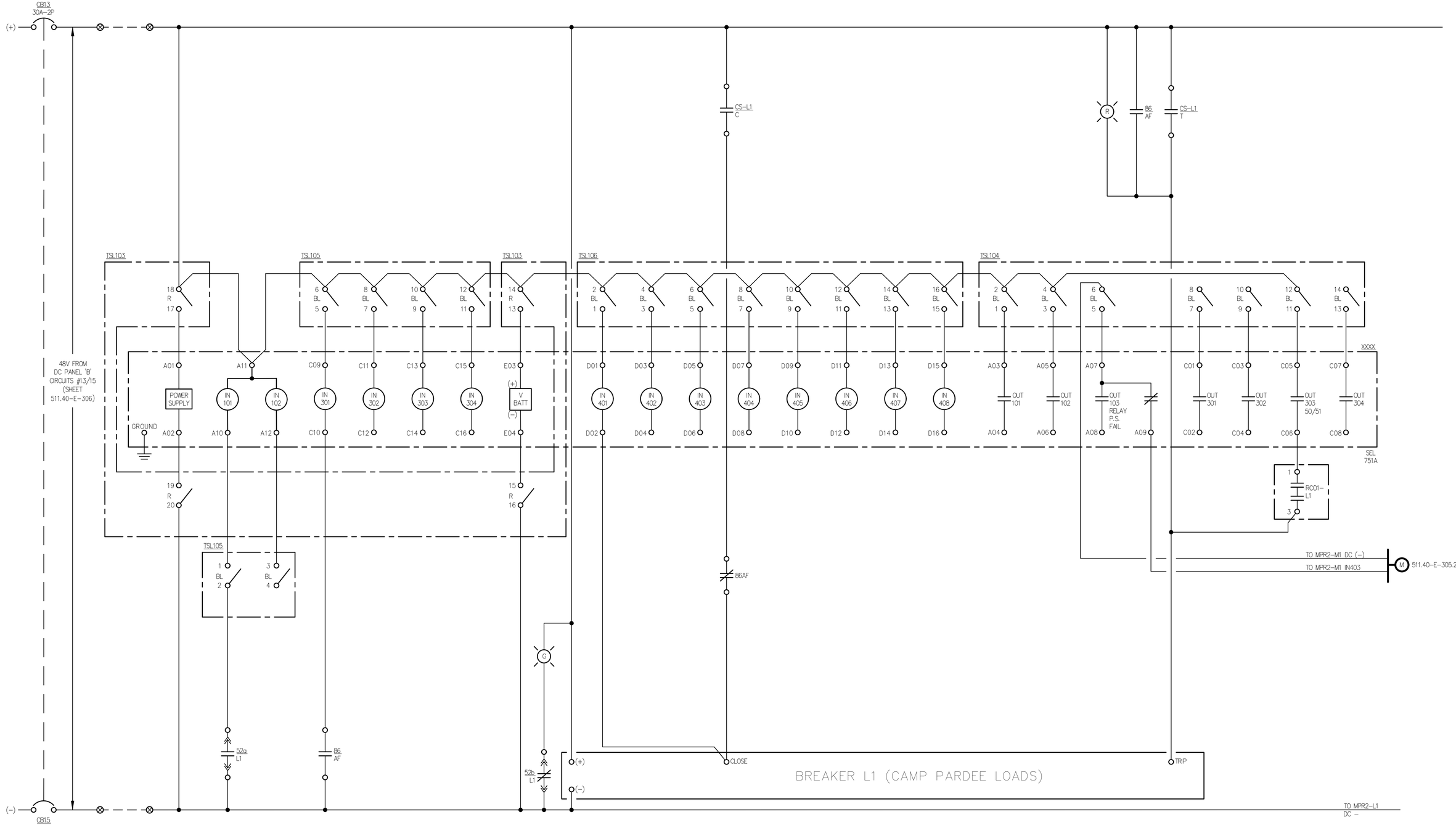
PARDEE DAM POWERLINE AND
SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR RELAYING SCHEMATICS MPR1–E

PROJ NO.			
SCALE AS SHOWN	511.40–E–305.6		0
DATE	STRUCT.	DISC. NUMBER	REV.

USERKOOSHA TOOFAN
DATE:5/22/2024 9:46 AM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS PROJECT\ELECTRICAL\DRAFTING\E-WORKING\511.40-E-305.6 - CHEMICAL PLANT SWITCHGEAR SCHEMATICS MPR1-E.DWG

SPEC NO. 2197



USERKOOSHA TOOFAN
DATE7/23/2024 3:58 PM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS PROJECT\01-DRAFTING\1-WORKING\511.40-E-305.7 - CHEMICAL PLANT SWITCHGEAR SCHEMATICS MPR1-L1.DWG

SWITCHGEAR RELAYING SCHEMATICS MPR1–L1

NOT TO SCALE

3" ON ORIGINAL DOCUMENT
0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY	
DESIGN CHECKED BY	
DRAWN BY	
SR. PROJ ENGR. R.P.E. NO.	
APPROVED	
PRINCIPAL IN CHARGE, R.P.E. NO.	

EBMUD REVIEW

PROJECT ENGINEER R.P.E. NO.	
RECOMMENDED SR. ELEC. R.P.E. NO.	
APPROVED MGR. OF DESIGN R.P.E. NO.	

SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

PARDEE DAM POWERLINE AND
SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR RELAYING SCHEMATICS MPR1–L1

PROJ NO.			
SCALE AS SHOWN	511.40–E–305.7		0
DATE	STRUCT.	DISC. NUMBER	REV.

SPEC NO. 2197

CB17
30A–2P

(+)

48V FROM
DC PANEL 'B'
CIRCUITS #17/19
(SHEET
511.40–E–306)

CS–L2
C

R

86
AF

CS–L2
T

TSL203

18 R 17

A01 POWER SUPPLY GROUND A02

A11 IN 101 A10

IN 102 A12

19 R 20

TSL205

6 BL 5

C09 IN 301 C10

8 BL 7

C11 IN 302 C12

10 BL 9

C13 IN 303 C14

12 BL 11

C15 IN 304 C16

TSL203

14 R 13

E03 (+) V BATT (–) E04

15 R 16

TSL206

2 BL 1

D01 IN 401 D02

4 BL 3

D03 IN 402 D04

6 BL 5

D05 IN 403 D06

8 BL 7

D07 IN 404 D08

10 BL 9

D09 IN 405 D10

12 BL 11

D11 IN 406 D12

14 BL 13

D13 IN 407 D14

16 BL 15

D15 IN 408 D16

TSL204

2 BL 1

A03 OUT 101 A04

4 BL 3

A05 OUT 102 A06

6 BL 5

A07 OUT 103 RELAY P.S. FAIL A08

A09

8 BL 7

C01 OUT 301 C02

10 BL 9

C03 OUT 302 C04

12 BL 11

C05 OUT 303 50/51 C06

14 BL 13

C07 OUT 304 C08

XXXX

SEL 751A

1 RCO1–L2 3

TO MPR2–M2 DC (–)

TO MPR2–M2 IN403

P 511.40–E–305.4

TSL205

1 BL 2

3 BL 4

52a L2

86 AF

86AF

52b L2

G

(+) CLOSE

(–)

TRIP

BREAKER L2 (CHEMICAL PLANT LOADS)

(–)

CB19

TO MPR2–L2
DC –

USERKOOSHA TOOFAN
DATE5/22/2024 10:11 AM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY
IMPROVEMENTS PROJECT\ELECTRICAL\DRAFTING\WORKING\511.40-E-305.8 - CHEMICAL
PLANT SWITCHGEAR SCHEMATICS MPR1-L2.DWG

SWITCHGEAR RELAYING SCHEMATICS MPR1–L2

NOT TO SCALE

3" ON ORIGINAL DOCUMENT
0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW
PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. ENGR. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

PARDEE DAM POWERLINE AND
SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR RELAYING SCHEMATICS MPR1–L2

PROJ NO.			
SCALE AS SHOWN	511.40–E–305.8		0
DATE	STRUCT.	DISC. NUMBER	REV.

SPEC NO. 2197

CB21
30A–2P
(+)

48V FROM
DC PANEL 'B'
CIRCUITS #21/23
(SHEET
511.40–E–306)

CS–L3
C

R
86
AF
CS–L3
T

TSL303
18 R
17
A01
POWER SUPPLY
GROUND
A02
19 R
20

TSL305
6 BL
5
C09
IN 301
C10
8 BL
7
C11
IN 302
C12
10 BL
9
C13
IN 303
C14
12 BL
11
C15
IN 304
C16

A11
IN 101
A10
IN 102
A12

TSL303
14 R
13
E03
(+)
V BATT
(–)
E04
15 R
16

TSL306
2 BL
1
D01
IN 401
D02
4 BL
3
D03
IN 402
D04
6 BL
5
D05
IN 403
D06
8 BL
7
D07
IN 404
D08
10 BL
9
D09
IN 405
D10
12 BL
11
D11
IN 406
D12
14 BL
13
D13
IN 407
D14
16 BL
15
D15
IN 408
D16

TSL304
2 BL
1
A03
OUT 101
A04
4 BL
3
A05
OUT 102
A06
6 BL
5
A07
OUT 103
RELAY P.S. FAIL
A08
A09
8 BL
7
C01
OUT 301
C02
10 BL
9
C03
OUT 302
C04
12 BL
11
C05
OUT 303
50/51
C06
14 BL
13
C07
OUT 304
C08

XXXX
SEL 751A

1
RCO1–L3
3

TO MPR1–N DC (–)
TO MPR1–N IN403
S
511.40–E–305.5

TSL305
1 BL 2
3 BL 4

86AF

52a L3
86 AF
52b L3

G
(+)
(–)
CLOSE
TRIP

BREAKER L3 (SPARE)

TO MPR2–L3
DC –

(–)
CB23

USERKOOSHA TOOFAN
DATE5/22/2024 10:11 AM
FILE: Z:\JOBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY
IMPROVEMENTS PROJECT\ELECTRICAL\DRAFTING\1-WORKING\511.40-E-305.9 - CHEMICAL
PLANT SWITCHGEAR SCHEMATICS MPR1-L3.DWG

SWITCHGEAR RELAYING SCHEMATICS MPR1–L3

NOT TO SCALE

3" ON ORIGINAL DOCUMENT
0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW
PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. ENGR. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

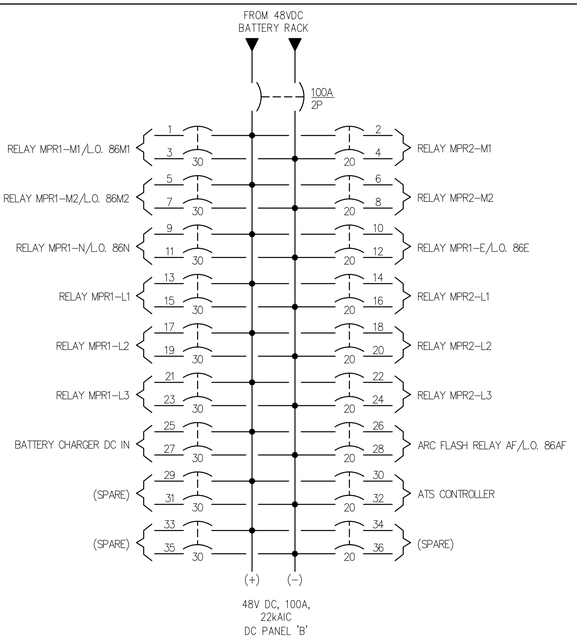
EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

PARDEE DAM POWERLINE AND
SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

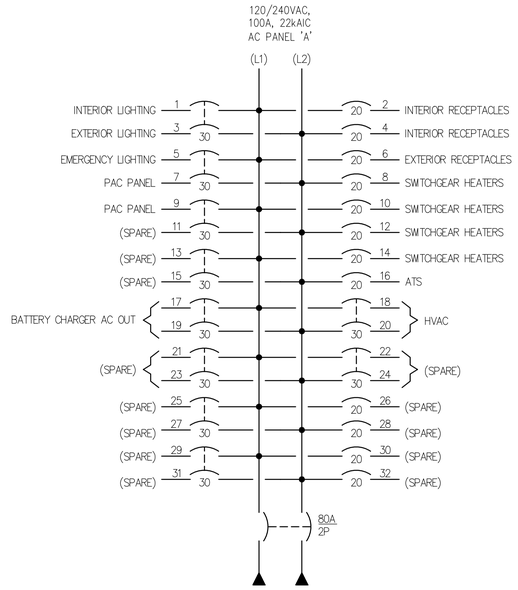
PARDEE CHEMICAL PLANT
SWITCHGEAR RELAYING SCHEMATICS MPR1–L3

PROJ NO.			
SCALE AS SHOWN	511.40–E–305.9		0
DATE	STRUCT.	DISC. NUMBER	REV.

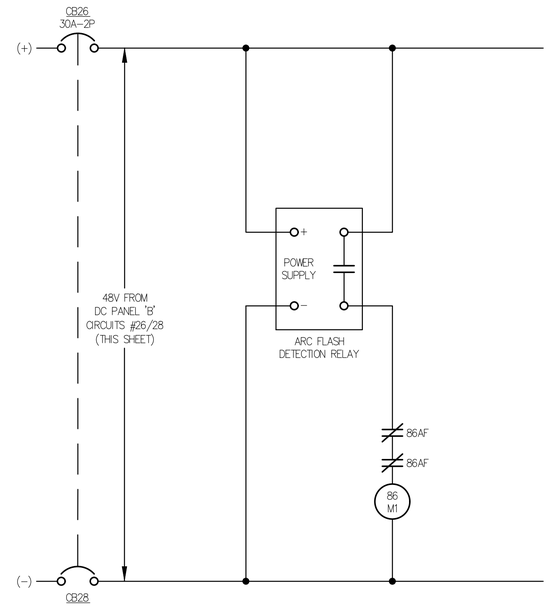
SPEC NO. 2197



DC PANEL SCHEMATIC
NOT TO SCALE

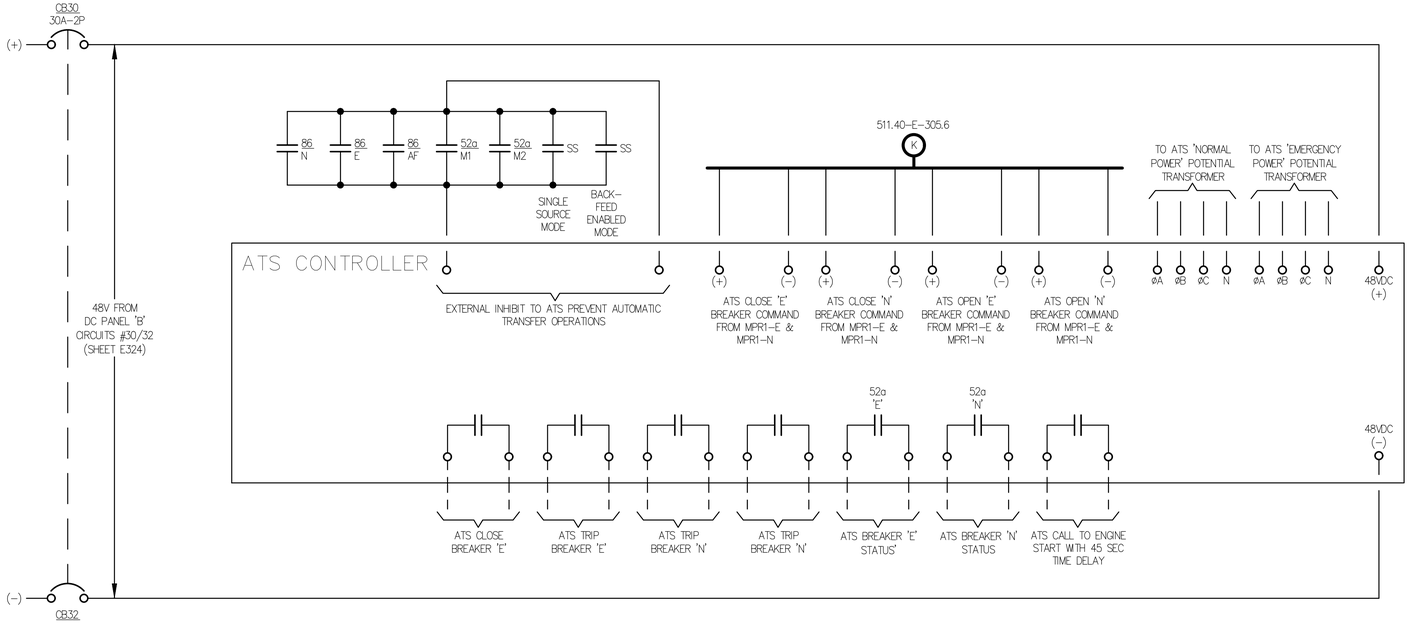


AC PANEL SCHEMATIC
NOT TO SCALE



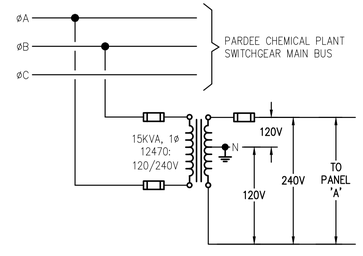
ARC FLASH RELAY SCHEMATIC
NOT TO SCALE

NOTE: MANUFACTURER TO DETERMINE THE REQUIRED NUMBER OF OPTICAL SENSORS TO FULLY PROTECT THE MAIN BUS SEGMENTS FOR CONNECTION TO THE ARC FLASH DETECTION RELAY.

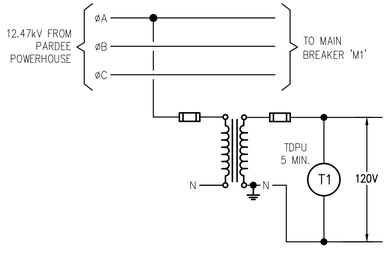


NOTE: ATS TO RETRANSFER BACK TO NORMAL AFTER STABLE NORMAL VOLTAGE FOR AT LEAST 15 MINUTES. ATS TO MANAGE GENERATOR ENGINE COOL DOWN CYCLE BEFORE ENGINE SHUTDOWN AFTER RETRANSFER TO NORMAL.

ATS CONTROLLER SCHEMATIC
NOT TO SCALE



CONTROL POWER TRANSFORMER SCHEMATIC
NOT TO SCALE



TIMER 'T1' CONTROL SCHEMATIC
NOT TO SCALE

3" ON ORIGINAL DOCUMENT
0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY
DESIGN CHECKED BY
DRAWN BY
SR. PROJ ENGR. R.P.E. NO.
APPROVED
PRINCIPAL IN CHARGE, R.P.E. NO.

EBMUD REVIEW
PROJECT ENGINEER R.P.E. NO.
RECOMMENDED SR. R.P.E. NO.
APPROVED MGR. OF DESIGN R.P.E. NO.

SIGNATURES NOT VALID

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

PARDEE DAM POWERLINE AND SWITCHGEAR SAFETY IMPROVEMENTS PROJECT
ELECTRICAL

PARDEE CHEMICAL PLANT
SWITCHGEAR RELAYING SCHEMATICS OVERALL

PROJ NO.			
SCALE AS SHOWN	511.40–E–306		0
DATE	STRUCT.	DISC.	NUMBER / REV.

USER\OOSHA TOOFAN
DATE\5/22/2024 10:21 AM
FILE: Z:\OBS 2023\4TH QUARTER\23-401_EBMUD PARDEE DAM POWERLINE SAFETY IMPROVEMENTS_PROJECT\01-DRAFTING\1-WORKING\511.40-E-306 — CHEMICAL PLANT SWITCHGEAR SCHEMATICS OVERALL.DWG

EBMUD

SUBMITTAL LOG

SPEC NO.	PROJECT TITLE	DATE
1234	xxxxxxxx	

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
EADOC Submittal No.	SPEC. SECTION	SPEC ARTICLE	DWG NO.	Dwg.Section/ Detail No.	Submittal Title/Description	Planned Submit Date	Actual Submit Date	Date Returned by EBMUD	Submittal Status	Reviewer	Notes
8	03 11 00	1.3A	2116-S-010	Section A	Reservoir Roof Shoring Design & Calculations	9/30/2012	10/25/2012	11/15 12	AR	PF	CA PE Stamped
12	33 12 16.11	1.2B1a1-3	2116-M-012	Item #5	Resilient Seated Gate Valves	12/19/2012	1/3/2013	1/20/2013	RR	MT	NSF Cert required
15	01 29 00	1.2A	N/A	N/A	Initital Subcontractor Payment Report P-47	8/15/2012	9/9/2012	9/16/2012	AAN	TK	Update and submit monthly on the 25th
22	23 09 33	1.2A	2116-E-002, 202 Rev 1	Section A & B	HVAC Control Panel	4/15/2012	4/30/2012	5/12/2012	RR	PG	Clearly mark proposed enclosure

M-113.2/14

FIELD FUNCTIONAL TEST DATA FORM

EBMUD Project Title: _____ Test Date(s): _____

Equipment Name: _____ Section No.: _____

Tag No.: _____ P&ID No. _____

I. Pretest Documentation/Setup

Documents:	Yes	No	NA	Comments:
a) Interconnection & Loop diagrams provided	☐	☐	☐	
b) Mfr Cert of Proper Installation provided	☐	☐	☐	
c) Technical Submittal complete (contractor show EDOCs record)	☐	☐	☐	
d) Spare Parts provided	☐	☐	☐	
e) Final O&Ms provided (contractor show final O&Ms)	☐	☐	☐	
f) Pipe pressure tests completed for adjacent piping (contractor to show test records).	☐	☐	☐	

Field Test Setup (Identify any test instrument, special setups like tanks, hoses, etc)**:**

II. Field Functional Test

1. Calibration/Loop/Electrical	Yes	No	NA	Comments:
1.1 Instrument commissioning complete	☐	☐	☐	
1.2 Loop Checks complete	☐	☐	☐	
1.3 Electrical commissioning complete	☐	☐	☐	

2. Installation Check	Pass	Fail	NA	Comments:
2.1 Correct equipment tags have been installed (tags shall match P&IDs)	☐	☐	☐	
2.2 All fields on Asset List Spreadsheet completed for device (Contractor shall show inspector at the time of the test that the asset list is complete and accurate for this system)	☐	☐	☐	

FIELD FUNCTIONAL TEST DATA FORM

EBMUD Project Title: _____ Test Date(s): _____

Equipment Name: _____ Section No.: _____

Tag No.: _____ P&ID No. _____

2.1	☐ ☐ ☐	
3. Operations Check	Pass Fail NA	Comments:
3.1	☐ ☐ ☐	
3.2	☐ ☐ ☐	
4. Controls Check	Pass Fail NA	Comments:
4.1	☐ ☐ ☐	
4.2	☐ ☐ ☐	
5. Alarms Check	Pass Fail NA	Comments:
5.1	☐ ☐ ☐	
5.2	☐ ☐ ☐	
6. Run Check	Pass Fail NA	Comments:
6.1 Operate the system for . System operated as expected, without unexpected noise, or vibration.	☐ ☐ ☐	
7. Other Tests and Checks	Pass Fail NA	Comments:
7.1	☐ ☐ ☐	
7.2	☐ ☐ ☐	

FIELD FUNCTIONAL TEST DATA FORM

EBMUD Project Title: _____ Test Date(s): _____

Equipment Name: _____ Section No.: _____

Tag No.: _____ P&ID No. _____

III. Participants/Witness

Test conducted:

By (signature): _____ Date: _____

Title: _____ Company Name: _____

By (signature): _____ Date: _____

Title: _____ Company Name: _____

EBMUD Witness:

By (signature): _____ Date: _____

Title: _____

O&M MANUAL REVIEW CHECKLIST

(Manufacturer's Representative to complete one form per submittal)

SPEC. SECTION TITLE & NO:	
MFR Name, Address, Phone:	
Local Rep Name, Address, Phone:	

GENERAL FORMAT (See Section 01 33 00 for additional details)			
DESCRIPTION	**PROVIDED?**		**COMMENTS**
	YES	**NO**	
Specified copies provided			
Binder cover clearly labeled			
Spine Label			
System/Equipment type clearly identified			
District facility or facilities name(s) identified			
Specification number & title shown			
Title page provided			
Equipment tag numbers correctly shown			
Manufacturer's name, address, phone number provided			
Local Representative's name, address, phone number provided			
Table of contents provided			
Heavy section dividers w/ numbered or lettered plastic tabs provided			
Pages punched for 3-ring binder			
Info larger than 8-1/2 x 11 folded showing title block			
Original quality copies provided			

TECHNICAL CONTENT (See Section 01 33 00 for details)				
DESCRIPTION	**LOCATION IN O&M**			**COMMENTS**
	TAB#	**PAGES**	**N/A**	
Equipment Descriptions				
• Equipment names, model numbers & tag numbers				
• Equipment & major component functions				
• Drawings, diagrams & illustrations				
• Equipment Specification				
• Bill of materials				
• Legend, Abbreviation, and Acronym List				
Performance Information				
• Nameplate data				
• Performance test data/curves				

TECHNICAL CONTENT (See Section 01 33 00 for details)				
DESCRIPTION	LOCATION IN O&M			COMMENTS
	TAB#	PAGES	N/A	
Installation Instructions				
• Installation procedures & drawings				
• Equipment tolerances				
• Adjustment procedures				
Operating Instructions				
• Startup procedures				
• Normal & routine operations				
• Control functions				
• Alarms description and settings				
• Shutdown procedures				
• Emergency operations				
Electrical Information				
• Nameplate data				
• Relay, control, alarm contact settings				
• Motor test data				
Electrical Drawings				
• Single-line diagrams, three-line diagrams				
• Interconnection wiring diagram				
• Schematic and elementary diagrams				
• Panel layout drawings				
Instrumentation & Control				
• Control diagrams				
• Panel layout drawings				
• Instrument data sheets (specification forms)				
• Calibration Procedures				
• Final settings for adjustable control devices				
• Block diagrams and riser diagrams				
• Loop diagrams				
• Pneumatic/Hydraulic piping drawings				
• Hard copy printouts of control programs				
• Field calibration data sheets				
• Programming software (licensed to EBMUD) with user manuals				
Shipping and Storage Instructions				
Testing				
• Factory Test Report (procedures and results)				
• Field Test Procedures				
• Manufacturer's Certificate of Proper Installation (where specified)				
• Field Test Results				
Troubleshooting guide				

TECHNICAL CONTENT (See Section 01 33 00 for details)				
DESCRIPTION	LOCATION IN O&M			COMMENTS
	TAB#	PAGES	N/A	
Safety				
• Safety procedures/Lockout discussion				
• CAUTION, WARNING, DANGER text				
• Material Safety Data Sheets (MSDS)				
• Special safety equipment				
Preventive Maintenance				
Maintenance Summary Forms				
Lubrication Information				
• Location of lube points & frequency				
• Recommended type & grade, state specific MFR				
• Recommended viscosity & temperature range				
Overhaul Instructions				
• Detailed assembly drawings w/OEM part numbers				
• Tear down/rebuild instructions				
Spare Parts for Equipment & Components				
• Predicted life of parts subject to wear or aging				
• Recommended spare parts list w/ part numbers				
• Complete instructions for obtaining parts				
• Long-term storage requirements				
• Special tools				
Long-term Shutdown/Lay-up Instructions				
Warranty/Guarantee				

TYPICAL MAINTENANCE SUMMARY FORM

(Use as many pages as necessary. MS Word file available upon request)

1. Equipment Name: _____
2. Manufacturer: _____
3. Identification Numbers:

   Tag: _____

   Model: _____

   Serial: _____

4. Nameplate Data (HP, voltage, speed, flow rate, head, etc.): _____

   _____

5. Manufacturer's Local Representative:

   Name: _____

   Telephone: _____

   Address: _____

6. LUBRICANT LIST

Reference Symbol List symbols used in Item 8 below	Lubricant Description List equivalent lubricants: brand name(s), type, grade, viscosity, etc.

7. SPARE PARTS (Recommendation spare parts with part numbers; if any.)

8. Equipment Replacement Cost [$] _____

9. MAINTENANCE REQUIREMENTS

Maintenance Task Briefly list each required preventive maintenance activity	Frequency List required frequency of each operation (daily, weekly, monthly, annual, etc)	Task Duration Time needed to complete each task (with units: hours, days, weeks, etc)	Lubricant Refer by symbol to lubricant list (Item 6)	Task Details Location List O&M Manual Tab and page number which provides additional details on the maintenance activity

I, _____ certify that the information on this form is an accurate and complete summary of all typical, routine, and preventive maintenance tasks required to ensure satisfactory performance during warranty period and the overall longevity of the equipment or systems.

_____ _____

(Manufacturer's Representatives Signature) (Date)