



HBMWD 12 kV Switchgear Relocation Project

Contract Documents and Technical Specifications



November 2019

www.ghd.com



**HUMBOLDT BAY MUNICIPAL
WATER DISTRICT**

12 kV Switchgear Relocation Project

November 2019

Prepared for

Humboldt Bay Municipal Water District
828 Seventh Street
Eureka, California 95501

BOARD OF DIRECTORS

Sheri Woo, President
Neal Latt, Vice President
J. Bruce Rupp, Secretary-Treasurer
Barbara Hecathorn, Director
Michelle Fuller, Director

John Friedenbach, General Manager

Prepared by

GHD Inc.
718 Third Street, Eureka, CA 95501
(707) 443-8326

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(GHD, Inc. August 2019)

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ADVERTISEMENT FOR BIDS

Humboldt Bay Municipal Water District
Owner

828 Seventh Street
Eureka, CA 95501
Address

Separate sealed bids will be received for the 12 kV Switchgear Relocation Project.

A conditional or qualified bid will not be accepted if it modifies the Plans or Specifications or method of work.

A non-mandatory, but highly recommended, pre-bid meeting will be held to familiarize potential bidders with the project and is scheduled for 10:00 a.m., Thursday, November 21st, 2019, at the HBMWD Essex Office, 7270 West End Road, Arcata, California. A site overview outside of this meeting time can be arranged by contacting Pat Kaspari or Nathan Stevens at GHD Inc. by telephone at (707) 443-8326.

The Humboldt Bay Municipal Water District (HBMWD or District) is a wholesale water supplier that provides potable water to approximately 88,000 residents of Humboldt County via four Ranney collector wells. HBMWD also provides industrial water to users on the Samoa Peninsula with a system that diverts surface water from the Mad River. HBMWD has a 12 kV service feed from Pacific Gas & Electric (PG&E) that comes into switchgear at HBMWD's Essex yard. This switchgear provides power to the Essex yard where much of HBMWD's key operation occurs, including all the pumps on the Ranney collector wells, the surface water diversion facility, and other critical components of HBMWD's infrastructure. The existing switchgear is in the dam break inundation zone, and if the dam on the Mad River at Ruth Lake were to fail, the switchgear would get flooded, rendering HBMWD's system inoperable and preventing HBMWD from providing water to its customers. The work for the 12 kV Switchgear Relocation Project will include installing new switchgear at a new location that is elevated out of the dam break inundation zone, approximately 60 feet southeast of the existing switchgear. Fill will be imported and grading will be performed to allow for the installation of a new concrete pad. The new switchgear will be installed on the new concrete pad, and a new ramp will be constructed from the Essex yard below to allow District staff to access the new switchgear. The new switchgear will be tested, power will be switched over to the new switchgear, and the existing switchgear will be decommissioned. Other miscellaneous work will be required as outlined in the Contract Documents.

Contractors shall submit a Qualifications Statement as a part of their bid. The electrical contractor shall demonstrate at least five (5) years of successful experience installing, repairing, or modifying switchgear on at least three (3) projects with similar scopes to this project. The contractor shall furnish evidence of successful experience by including the project owner, project name, voltage, project description, any problems encountered and how they were resolved, original project bid, final project cost, and any claims presented and how they were resolved. The address, telephone number, and email address of the owner's representative with knowledge of the projects shall also be provided.

The contractor shall employ skilled, experienced superintendent(s), electrician(s), and key personnel. The superintendent(s) and electrician(s) shall have at least three (3) years of successful experience performing switchgear work on at least five (5) projects with similar scopes to this project. Contractors shall provide resumes of the superintendent(s) and electrician(s) with their Qualifications Statement. Personnel experience records shall include project names, locations, voltage, project description, project owner, engineer, and references with names, addresses, email addresses, and telephone numbers. The superintendent(s) and electrician(s) listed in the submittal shall be onsite during all construction related activities required for the new switchgear installation, switchover, and decommissioning of the existing switchgear.

Bids will be received by the General Manager of the Humboldt Bay Municipal Water District at the District

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Office, 828 Seventh Street, Eureka, California, 95501 until 3:00 p.m. Pacific Time, December 10, 2019, and then at said office publicly opened and read aloud. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed to the Owner at Humboldt Bay Municipal Water District, PO Box 95, Eureka, CA 95502-0095 and must be delivered to the District office by the above referenced time and date.

The Contract Documents are available and can be examined at the following locations:

HBMWD Website: www.hbmwd.com
Humboldt Builders Exchange, Eureka
North Coast Builders Exchange, Santa Rosa
Shasta Builders Exchange, Redding
Sacramento Builders Exchange, Sacramento

Contractors may obtain an electronic copy of the Contract Documents from GHD Inc. for free by emailing a request to Pat Kaspari (pat.kaspari@ghd.com) or Nathan Stevens (nathan.stevens@ghd.com). Hardcopies of the Contract Documents can be obtained at the office of GHD Inc., located at 718 Third Street, Eureka, California, 95501, (707) 443-8326 upon a non-refundable payment of \$50.00 for each set.

Each proposal must be submitted on the prescribed form and accompanied by a certified check or Bid Bond in an amount of not less than 10 percent of the amount bid. Successful bidders will be required to furnish both a Payment Bond and Performance Bond in the full amount of the Contract Price. In accordance with Public Contract Code Section 10263, the Contractor will be allowed to substitute securities for monies normally withheld by the owner to insure performance under this contract.

This is a Public Works Project funded with Federal (FEMA) and HBMWD funds. Therefore, both Federal prevailing wage rates and California State prevailing wage rates will be required on this project, whichever wages are higher. This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations, State of California. The general prevailing wage rates applicable to the work are set by the Director of the Department of Industrial Relations.

Humboldt Bay Municipal Water District requires that all contractors and subcontractors working on this project keep certified payroll records in accordance with Labor Code 1776 and submit copies to the District. All contractors and subcontractors must also furnish electronic certified payroll records directly to the Labor Commissioner (Division of Labor Standards Enforcement).

It shall be mandatory upon the contractor herein and upon any subcontractors to pay not less than the said specified rates to all laborers, workers and mechanics employed by them in the execution of the Agreement pursuant to CA Labor Code 1774. The Contractor will be required to comply with any changes in these wage rates as they are updated by the State and/or Federal government at no cost to the Owner.

Attention is directed to the provisions in section 1777.5 and sections 1777.6 of the Labor Code concerning the requirement to employ apprentices by the contractor or any subcontractor under it.

The Contractor shall comply with and shall ensure all subcontractors comply with all laws and regulations governing the contractor's and subcontractors' performance on this project including, but not limited to: anti-discrimination laws, workers' compensation laws, and prevailing wage laws as set forth in CA Labor Code, Sections 1720-1861 et seq. and licensing laws, as well as Federal Labor Standards set forth in the Davis-Bacon Act (40 USC 276(a-a5), the Copeland "Anti-Kickback" Act (40 USC 276(c); and the Contract Work Hours and Safety Standards Act (CWHSSA) (40 USC 327-333). The contractor is required to include the prevailing wage language in all subcontracts pursuant to CA Labor Code 1775(E)(b)(1). The Contractor shall post, at appropriate conspicuous points on the site of the Project, a schedule showing all the determined general prevailing wage rates.

Pursuant to Senate Bill 854, all contractors bidding on public works projects must register with the Department of Industrial Relations. Contractors are subject to a registration and annual renewal fee. No

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contractor or subcontractor may be listed on a bid proposal for a public works project (submitted on or after March 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)]. Accordingly, all Prime and Subcontractors contained in a bid must provide valid Department of Industrial Relations registration number(s). Failure to provide valid DIR registration numbers in the bid documents shall disqualify the bid.

Sheri Woo

President
Humboldt Bay Municipal Water District

November 5, 2019
Date

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PART 1
BID REQUIREMENTS

INFORMATION FOR BIDDERS

Project: HBMWD 12 kV Switchgear Relocation Project

Bids will be received by Humboldt Bay Municipal Water District (herein called the "Owner"), at 828 Seventh Street, Eureka, CA 95501 until the time listed in the Advertisement for Bids, and then at said office publicly opened and read aloud.

Each bid must be submitted in a sealed envelope and addressed to Humboldt Bay Municipal Water District, 828 Seventh Street, Eureka, CA 95501. Each sealed envelope containing a bid must be plainly marked on the outside as **BID FOR: 12 KV SWITCHGEAR RELOCATION PROJECT**, and the envelope shall bear on the outside the name of the bidder, their address, Contractor's license number, and DIR registration number. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed to the Owner at Humboldt Bay Municipal Water District, PO Box 95, Eureka, CA 95502-0095.

Bids received by the Owner after the time specified for bid opening will not be considered. The Bidder is solely responsible for timely delivery of their bid.

A non-mandatory, but highly recommended, pre-bid conference/site visit will be held to familiarize potential Bidders with the project. See the Advertisement for Bids for location, date, and time.

All bids must be made on the required bid form. All blank spaces for bid prices must be filled in, in ink or typewritten, and the bid form must be fully completed and executed when submitted. Only one copy of the bid form is required.

The Owner may waive any informalities or minor defects or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No Bidder may withdraw a bid within six (6) months after the actual date of the opening thereof. Should there be reasons why the Contract cannot be awarded within the specified period, the time may be extended by mutual agreement between the Owner and the Bidder.

Bidders must satisfy themselves of the accuracy of the estimated quantities in the bid schedule by examination of the site and a review of the Plans and Specifications, including addenda. After bids have been submitted, the Bidder shall not assert that there was a misunderstanding concerning the quantities of Work or of the nature of the Work to be done.

The Contract Documents contain the provisions required for the construction of the project. Information obtained from an officer, agent, or employee of the Owner or any other person shall not affect the risks or obligations assumed by the Contractor or relieve the Contractor from fulfilling any of the conditions of the Contract.

Each bid must be accompanied by a bid bond payable to the Owner for ten percent of the total amount of the bid. As soon as the bid prices have been compared, the Owner will return the bonds of all except the three lowest responsible bidders. When the Agreement is executed, the bonds of the two remaining unsuccessful bidders will be returned. The bid bond of the successful Bidder(s) will be retained until the payment bond and performance bond have been executed and approved, after which it will be returned. A certified check may be used in lieu of a bid bond.

A performance bond and a payment bond, each in the amount of 100 percent of the contract price, with a corporate surety approved by the Owner, will be required for the faithful performance of the Contract.

Attorneys-in-fact who sign bid bonds or payment bonds and performance bonds must file with each bond a certified and effective dated copy of their power of attorney.

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The party to whom the Contract is awarded will be required to execute the Agreement and obtain the performance bond, payment bond, and required insurance certificates within twenty one (21) calendar days from the date when Notice of Award is delivered to the Bidder. The Notice of Award shall be accompanied by the necessary Agreement and bond forms. In case of failure of the Bidder to execute the Agreement, the Owner may consider the Bidder in default, in which case the bid bond accompanying the proposal shall become the property of the Owner.

The Owner, within twenty one (21) calendar days of receipt of an acceptable performance bond, payment bond and Agreement signed by the party to whom the Agreement was awarded shall sign the Agreement and return to such party an executed duplicate of the Agreement. Should the Owner not execute the Agreement within such period, the Bidder may submit a written notice to withdraw the signed Agreement. Such notice of withdrawal shall be effective upon receipt of the notice by the Owner.

The Notice to Proceed shall be issued within twenty one (21) calendar days of the execution of the Agreement by the Owner. Should there be reasons why the Notice to Proceed cannot be issued within such period, the time may be extended by mutual agreement between the Owner and Contractor.

If the Notice to Proceed has not been issued within the twenty one (21) day period or within the period mutually agreed upon, the Contractor may terminate the Agreement without further liability on the part of either party.

The Owner may make such investigations as they deem necessary to determine the ability of the Bidder to perform the Work, and the Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the Agreement and to complete the Work contemplated therein.

A conditional or qualified bid will not be accepted if it modifies the Plans or Specifications or method of Work. The intent is to award the entire job (all Schedules thereunder) to such Contractor or Contractors that will result in the lowest overall total cost to the Owner.

Awards will be made to the lowest, responsive, responsible Bidder(s).

All applicable laws, ordinances, rules and regulations of all Federal, State and local authorities having jurisdiction over construction of the project shall apply to the Contract throughout. In addition, all PG&E requirements, including but not limited to requirements established in the most current edition of PG&E's Electric & Gas Service Requirements (Greenbook) must be satisfied. The contractor is solely responsible for compliance with PG&E requirements.

The Bidder shall supply the names, addresses, and valid DIR registration numbers of major subcontractors, material suppliers (greater than 10% of total contract amount) and/or fabricators with the bid.

The Contract Documents under which it is proposed to execute the Work consist of the Plans and all material bound herewith. These Contract Documents are intended to be mutually cooperative and to provide all details reasonably required for the execution of the proposed Work. Any person contemplating the submission of a Bid shall have thoroughly examined all of the various parts of these Documents, and should there be any doubt as to the meaning or intent of said Contract Documents, the Bidder shall request of the Engineer, in writing at least six (6) working days prior to bid opening, an interpretation thereof. Any interpretation or change in said Contract Documents will be made only in writing, in the form of addenda to the Documents and will be furnished to all Bidders receiving a set of the Documents, issued no later than 72 hours prior to bid opening, who shall submit, or indicate receipt of all addenda with their proposals. The Owner will not be responsible for any other explanation or interpretations of said Documents.

Questions regarding the Plans and Specifications shall be submitted in writing to Engineer: Pat Kaspari at

GHD Inc., 718 Third Street, Eureka, CA, 95501 by email at pat.kaspari@ghd.com. Replies to such inquiries will be in the form of addenda or clarification that will be sent to all plan holders. Requests for clarification regarding various portions may be made by phone to Pat Kaspari, at GHD Inc., 707-443-8326.

Copies of Contract Plans and Specifications may be obtained from the office of GHD Inc., as specified in the Advertisement for Bids. The payment will not be refundable.

The Contract Documents are assembled, arranged, and titled generally in conformance with the 48-division format suggested by the Construction Specifications Institute (CSI). Minor variations to the CSI format may be used herein to suit Owner requirements or to better adapt the Documents to particular types of projects.

Portions of these Contract Documents may contain standard preprinted material. The Bidder's attention is called to the General Conditions of the Contract, which may modify and add to the preprinted material contained herein. Sentences in the Contract Documents which are phrased in mandatory language, but which include no explicit reference to the party who has responsibility for performing the mandated duty, shall be interpreted as imposing responsibility for performance of the duty described on the Contractor. For example, a directive that "the site shall be kept clean" would impose the duty of keeping the site clean on the Contractor.

Each proposal must be submitted on the prescribed form and be accompanied by a certified check or Bid Bond in an amount of not less than 10 percent of the amount bid. Successful bidders will be required to furnish both a Payment Bond and Performance Bond in the full amount of the Contract Price. In accordance with Public Contract Code Section 10263, the Contractor will be allowed to substitute securities for monies normally withheld by the owner to insure performance under this contract.

Where the Bid Proposal is to be submitted on a unit price basis, unit prices will be accepted on all items of Work set forth in the Bid, except those designated to be paid for as a lump sum. The estimate of quantities of Work to be done is tabulated in the Bid and, although stated with as much accuracy as possible, is approximate only and is assumed solely for the basis of calculation upon which the award of Contract shall be made. Payment to the Contractor will be made on the measurement of the Work actually performed by the Contractor as specified on the Contract Documents. The Owner reserves the right to increase or diminish the amount of any class of Work as may be deemed necessary.

When the Bid Proposal is to be submitted on a lump sum basis, a single lump sum price shall be submitted in the appropriate place. The total amount to be paid the Contractor shall be the amount of the lump sum in the Bid, as adjusted for additions or deletions resulting from changes in construction. After award of Contract, the Contractor may be required to break down the lump sum Bid into unit prices for the various portions to be completed.

All blank spaces in the Bid form must be filled in, in ink, in both words and figures where required. No changes shall be made in the phraseology of the forms. Written amounts shall govern in cases of discrepancy between the amounts stated in writing and the amounts stated in figures. In case of discrepancy between unit prices and totals, unit prices will prevail.

Any Bid Proposal shall be deemed informal which contains omissions, erasures, alterations, or additions of any kind, or prices uncalled for, or in which any of the prices are obviously unbalanced, or which in any manner shall fail to conform to the conditions of the published Advertisement for Bids.

The Bidder shall sign the Bid Proposal in the blank space provided therefore. If Bidder is a corporation, the legal name of the corporation shall be set forth above, together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation. Bid proposals signed by a non-corporate officer shall be invalid. If Bidder is a co-partnership, the true name of the firm shall be set forth above, together with the signature of the general partner or general partners authorized to sign contracts on behalf of the co-partnership. If signature is by an agent, other than an officer of a corporation or a general

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partner of a partnership, a Power of Attorney must be on file with the Owner prior to opening of Proposals or submitted with the Proposal, otherwise the Proposal will be regarded as not properly authorized.

State and local sales and use taxes, as required by the laws and statutes of the State and its political subdivisions, shall be paid by the Contractor. Prices quoted in the Proposal shall include sales tax unless provision is made in the Bid Proposal form to separately itemize the tax.

Any Bidder may modify their bid by telegraphic or written communication at any time prior to the scheduled closing time for receipt of bids, provided such communication is received by the Owner prior to the closing time. The telegraphic or written communication should not reveal the bid price, but should state the addition or subtraction or other modification so that the final prices or terms will not be known by the Owner until the sealed bid is opened.

Each Bidder must inform themselves of the conditions relating to the execution of the Work, and it is assumed that Bidders will inspect the site, site access limitations, subsurface conditions, weather, variations of soil moisture and workability with rainfall, and make themselves thoroughly familiar with all the Contract Documents. The Bidder should check with local contractors regarding local site, surface, subsurface and material conditions and variability. Failure to do so will not relieve the successful Bidder of the obligation to enter into a Contract and complete the contemplated Work in strict accordance with the Contract Documents. The Bidder's attention is called to the General Conditions of the Contract Documents in regards to the obligation of Bidders to verify for themselves and to their complete satisfaction all information concerning site and subsurface conditions, and Notice requirements.

No contractor or subcontractor may be listed on a bid proposal for a public works project (submitted on or after March 1, 2015) or be awarded a contract for public work on a public works project (awarded on or after April 1, 2015) unless registered with the State of California Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)]. This project is subject to compliance monitoring and enforcement by the State of California Department of Industrial Relations. Accordingly, all Prime and Subcontractors contained in a bid must provide valid Department of Industrial Relations registration number(s). Failure to provide valid DIR registration numbers in the bid documents shall disqualify the bid.

Both California State prevailing wage rates and Federal prevailing wage rates will be required on this project, whichever wages are higher. The Contractor will be required to comply with any changes in these wage rates as they are updated by the State and/or Federal government at no cost to the Owner.

All contractors and subcontractors must furnish electronic certified payroll records directly to the Labor Commissioner (Division of Labor Standards Enforcement), electronic Certified Payroll Reporting (eCPR) at the DIR, and also directly submit certified payroll and supporting documents to the Humboldt Bay Municipal Water District. The contact information for the Humboldt Bay Municipal Water District is:

Address:	HBMWD Attn: John Friedenbach PO Box 95 Eureka, CA 95502-0095
Business Phone:	(707) 443-5018
Email:	friedenbach@hbmwd.com

Bidders shall inform themselves of, and the Bidder awarded a Contract shall comply with, Federal, State and local laws, statutes, and ordinances related to the execution of the Work. This requirement includes, but is not limited to, grant requirements as they apply to the Contractor's work, applicable regulations concerning employment of labor, protection of public and employee safety and health, environmental protection, the protection of natural resources, permits, fees, and similar subjects.

BIDDERS' CHECKLIST

This checklist has been prepared and furnished to aid bidders in including all necessary supporting information with their bid. Bidders' submittals shall include, but are not limited to the following:

<u>ITEM</u>	<u>PAGE</u>	<u>CHECKED</u>
1. Bid Proposal	1-7 through 1-10	_____
2. List of Subcontractors (Subcontractor Details)	1-11	_____
3. Bid Bond	1-12 through 1-13	_____
4. Authority to Sign Bid Proposal (if applicable)	(Attached to Bid Bond)	_____
5. Power of Attorney	(Attached to Bid Bond)	_____
6. Qualifications Statement as described in the Advertisement for Bids	(Attached to Bid)	_____
7. Prime's and Subcontractor's valid Department of Industrial Relations registration number(s)	(where Requested herein)	_____

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BID PROPOSAL

Proposal of _____
(hereinafter called "Bidder"), organized and existing under the laws of the State of California,

doing business as _____*.

To the Humboldt Bay Municipal Water District, (hereinafter called "Owner").

In compliance with your Advertisement for Bids, Bidder hereby proposes to perform all Work for the 12 kV Switchgear Relocation Project in strict accordance with the Contract Documents, within the time set forth therein, and at the prices stated below.

In the event of a difference between a price quoted in words and a price quoted in figures for the same quotation, the words shall be the amount bid. In the event that the product of a unit price and an estimated quantity does not equal the extended amount quoted, the unit price shall govern and the corrected product of the unit price and the estimated quantity shall be deemed to be the amount bid. If the sum of two or more items in a bidding schedule does not equal the total amounts quoted, the individual item amounts shall govern, and the corrected total shall be deemed to be the amount bid.

By submission of this bid, each Bidder certifies, and in the case of a joint bid, each party certifies as to its own organization, that their bid has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this bid with any other Bidder or with any competitor.

Bidder hereby agrees to commence Work under this Contract on or before a date to be specified in the Notice to Proceed and to fully complete the project and pay the liquidated damages as provided in Articles III and IV of the General Conditions.

*Insert "a corporation," "a partnership," or "an individual" as applicable.

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Bidder agrees to perform all the Work described in the Contract Documents for the following prices. Bidder is advised to carefully review all sections of the Plans and Specifications in order to completely understand the Work and all constraints, including the schedule and material requirements.

The Work generally includes, but is not limited to the following: providing all labor, materials, equipment, and supervision required for relocation, replacement, and modernization of the District's 12 kV switchgear and associated infrastructure; intercepting and extending 12 kV underground feeders; construction staking; site access improvements; grading; sediment and erosion control; slab foundation; access ramp construction; potholing utilities; cutting asphalt, trenching; excavation; vacuum truck services; installing handholes; installing vaults; installing conduits; installing ductbanks; pulling wires; interconnections to existing infrastructure; procuring and installing a fully tested and commissioned integrated power assembly building with switchgear included; procuring and installing switchgear; interconnecting to PG&E; coordination of protective relays; completing systems commissioning, testing, and demonstration; demolition and removal of decommissioned equipment; and all other Work required to complete the modifications as shown on the Plans and described in the Specifications.

The following tables have been provided for the Bidder's convenience to assist Bidder in quantifying the major components of the Work, and shall in no way be interpreted to be comprehensive. The bid shall be comprehensive and shall include all work associated with the project.

BASE BID SCHEDULE

Item No.	Description	Unit	Qty.	Unit Cost	Total Cost
1.	Mobilization/Demobilization	LS	1	\$ _____	\$ _____
2.	Sediment and Erosion Control	LS	1	\$ _____	\$ _____
3.	Gravel Access Road	LS	1	\$ _____	\$ _____
4.	Site Trenching, Backfill, Compaction, Conduit, Wire, Cable Terminations and Capping	LS	1	\$ _____	\$ _____
5.	Precast Handholes/Vaults	LS	1	\$ _____	\$ _____
6.	Concrete Pad for Integrated Power Assembly and Concrete Infill at Northwest End of Ramp	LS	1	\$ _____	\$ _____
7.	Drainage Improvements	LS	1	\$ _____	\$ _____
8.	Concrete Ramp and Retaining Wall	LS	1	\$ _____	\$ _____
9.	Site Grading and Fill Material	CY	195	\$ _____	\$ _____

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Item No.	Description	Unit	Qty.	Unit Cost	Total Cost
10.	Security Fence and Gates	LF	235	\$ _____	\$ _____
11.	Integrated Power Assembly	SF	668	\$ _____	\$ _____
12.	PG&E Interconnection	LS	1	\$ _____	\$ _____
13.	1200 A Utility Metering Compartment	LS	1	\$ _____	\$ _____
14.	1200 A Main Breakers, PTs, CPT, Metering, Relays, and Compartment	EA	2	\$ _____	\$ _____
15.	1200 A Feeder Section/Compartment, with (2) 1200 A Breakers and Relays	EA	5	\$ _____	\$ _____
16.	1200 A Bus Tie Breakers, Relays, and Compartment	EA	2	\$ _____	\$ _____
17.	Switchgear Battery System	LS	1	\$ _____	\$ _____
18.	Relocate Generator Controller, Converter, and Add Remote Interface Panel	LS	1	\$ _____	\$ _____
19.	Testing, Commissioning, Demonstration, and Training	LS	1	\$ _____	\$ _____
20.	Decommissioning of Existing Switchgear and Associated Components	LS	1	\$ _____	\$ _____

TOTAL OF BASE BID (\$ _____)

TOTAL OF BASE BID IN WORDS: _____

The Base Bid Schedule includes Line Item 10 (Security Fence and Gates). However, after evaluating the bids that are received, the Owner may decide that higher security fencing and gates are desired. The additive design measures for a higher security fence and gate are described in Note 4 on the Security Fence and Gate Detail on Sheet C-501. If awarded, Item A-1 in the Additive Bid Schedule would replace Item 10 in the Base Bid Schedule.

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ADDITIVE BID SCHEDULE

Item No.	Description	Unit	Qty.	Unit Cost	Total Cost
A-1	Higher Security Fence and Gates	LF	235	\$ _____	\$ _____

Receipt of the following Addenda is acknowledged:

The representations made herein are made under penalty of perjury.

Respectfully submitted:

 Signature

 Title

 License Number

 Date

 License Expiration Date

 DIR Registration Number

(SEAL - If Bid is by Corporation)

BID BOND

KNOW ALL PERSONS BY THESE PRESENTS, that we, the undersigned,

_____ as Principal, and

_____, as Surety, are hereby held and firmly bound unto

Humboldt Bay Municipal Water District _____,

as Owner, in the penal sum of _____ for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns.

Signed this ____ day of _____, 20__.

The Condition of the above obligation is such that whereas the Principal has submitted to _____ a certain bid, attached hereto and hereby made a part hereof to enter into a contract in writing, for the:

_____ 12 kV Switchgear Relocation Project _____

NOW, THEREFORE,

- (a) If said bid shall be rejected, or
- (b) If said bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said Bid), and shall furnish a bond for the faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said bid, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Owner may accept such bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

SEAL:

Principal

By: _____

Title: _____

Surety

By: _____

Title

IMPORTANT - Surety companies executing bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

NOTE: Bidder shall provide current "Power of Attorney" for Attorney-in-fact who signs Bid Bond.

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PART 2
CONTRACT FORMS

CONTRACT AGREEMENT

THIS AGREEMENT, MADE THIS _____ DAY OF _____, 20__, by and

between the Humboldt Bay Municipal Water District, hereinafter called "Owner," and

doing business as _____, hereinafter called "Contractor"
(insert "a corporation," "a partnership," or "an individual" as applicable).

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned:

1. The Contractor will commence and complete the:
12 kV Switchgear Relocation Project
2. The Contractor will furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the project described herein.
3. The Contractor will commence the Work required by the Contract Documents within
21 calendar days after the date of the Notice to Proceed and will complete the same within the time provided in Section B-35 of the General Conditions, unless the period for completion is extended otherwise by the Contract Documents.
4. The Contractor agrees to perform all of the Work described in the Contract Documents and comply with terms therein for the sum of \$_____, or as shown in the Bid Proposal.
5. The Contract Documents consist of the Bid Requirements, Contract Forms, General Conditions, Specifications, Appendices, and the Plans, including all modifications thereof incorporated into the documents before their execution, and including all other requirements incorporated by specific reference thereto. These form the Contract.
6. The Owner will pay to the Contractor in the manner and at such times as set forth in the General Conditions such amounts as required by the Contract Documents.
7. This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in quadruplicate, each of which shall be deemed an original on the date first above written.

Owner

Contractor

Title _____

Title _____

Date _____

Date _____

This page left blank intentionally.

PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS: that

(Name of Contractor)

(Address of Contractor)

a _____, hereinafter
(Corporation, Partnership, or Individual)

called Principal, and _____
(Name of Surety)

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto

Humboldt Bay Municipal Water District
(Name of Owner)

828 Seventh Street, Eureka, CA 95501
(Address of Owner)

hereinafter called Owner, in the penal sum of

_____ Dollars (\$_____)

in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain Contract with the Owner, dated _____ day of _____, 20__, a copy of which is hereto attached and made a part hereof for the construction of:

12 kV Switchgear Relocation Project

NOW, THEREFORE, If the Principal shall well, truly and faithfully perform its duties, all the undertaking, covenants, terms, conditions, and agreements of said Contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety and during one year (minimum) guaranty period, and if he shall satisfy all claims and demands incurred under such Contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the Work to be performed thereunder of the Specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the Work or to the Specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

Humboldt Bay Municipal Water District
12 kV Switchgear Relocation Project

IN WITNESS WHEREOF, this instrument is executed in 4 counterparts, each one of which shall be deemed an original, this _____ day of _____, 20__.

ATTEST:

(Principal) Secretary

Principal

By _____

Address

Witness as to Principal

Address

Surety

ATTEST:

Witness as to Surety

By _____
Attorney-in-Fact

Address

Address

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is Partnership, all partners should execute Bond.

IMPORTANT: Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the project is located.

PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS: that

(Name of Contractor)

(Address of Contractor)

a _____, hereinafter
(Corporation, Partnership, or Individual)

called Principal, and _____
(Name of Surety)

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto

Humboldt Bay Municipal Water District
(Name of Owner)

828 Seventh Street, Eureka, CA 95501
(Address of Owner)

hereinafter called Owner, in the penal sum of

_____ Dollars (\$ _____)
in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain Contract with the Owner, dated _____ day of _____, 20__, a copy of which is hereto attached and made a part hereof for the construction of:

12 kV Switchgear Relocation Project

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, Subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the Work provided for in such Contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such Work, and all insurance premiums of said Work, and for all wages and fringe benefits of labor, performed in such Work, whether by Subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety for value received hereby stipulated and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the Work to be performed thereunder or the Specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the Work or to the Specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

Humboldt Bay Municipal Water District
12 kV Switchgear Relocation Project

IN WITNESS WHEREOF, this instrument is executed in 4 counterparts, each one of which shall be deemed an original, this _____ day of _____, 20__.

ATTEST:

(Principal) Secretary

Principal

By _____

Address

Witness as to Principal

Address

Surety

ATTEST:

Witness as to Surety

By _____
Attorney-in-Fact

Address

Address

NOTE: Date of bond must not be prior to date of Contract. If Contractor is Partnership, all partners should execute bond.

IMPORTANT: Surety companies executing bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the project is located.

NOTICE OF AWARD

TO: _____

PROJECT: 12 kV Switchgear Relocation Project

The Owner has considered the bid submitted by you for the above described work in response to its Advertisement for bids dated _____ and Information for Bidders.

You are hereby notified that your bid has been accepted for items in the amount of _____ Dollars (\$ _____)

You are required by the Information for bidders to execute the Agreement and furnish the required Contractor's certificates of insurance within twenty-one (21) calendar days from the date this Notice is received by you.

If you fail to execute said Agreement and to furnish said insurance within twenty-one (21) calendar days from the date of receipt of this Notice, said Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your Bid as abandoned and as a forfeiture of your bid bond. The Owner will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this Notice of Award to the Owner.

Dated this _____ day of _____, 20__.

Owner: Humboldt Bay Municipal Water District

By: _____ Title: General Manager

ACCEPTANCE OF NOTICE

Receipt of the above Notice of Award is hereby acknowledged by:

(Name of Contractor)

Dated this _____ day of _____, 20__.

By: _____ Title: _____

NOTICE TO PROCEED

TO: _____

PROJECT: 12 kV Switchgear Relocation Project

You are hereby notified to commence Work in accordance with the Agreement on or before the _____ day of _____, 20__, and you are to complete the Work within 330 consecutive calendar days thereafter.

The date of completion of all Work is therefore _____ day of _____, 20__.

You are required to return an acknowledged copy of this Notice to Proceed to the Owner.

Dated this _____ day of _____, 20__.

Owner: Humboldt Bay Municipal Water District

By: _____ Title: General Manager

ACCEPTANCE OF NOTICE

Receipt of the above Notice to Proceed is hereby acknowledged by:

(Name of Contractor)

Dated this _____ day of _____, 20__.

By: _____ Title: _____

PART 3
GENERAL CONDITIONS

**GENERAL CONDITIONS
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**SECTION A
DEFINITIONS AND TERMS**

A-1 General

Wherever the following abbreviations and terms, or pronouns in place of them, are used in these Conditions and other Contract Documents of which these Conditions are a part, the intent and meaning shall be interpreted as provided below.

A-2 Abbreviations

The following abbreviations may be used in the Contract Documents:

AA	Aluminum Association
AASHO	American Association of State Highway Officials
ABMA	American Boiler Manufacturer's Association
ACI	The American Concrete Institute
AGA	American Gas Association
AGC	Associated General Contractors
AGMA	American Gear Manufacturer's Association
AI	The Asphalt Institute
AIA	American Institute of Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ALSC	American Lumber Standards Committee
ANSI	American National Standards Institute, Inc.
API	American Petroleum Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
CCMTC	California Concrete Masonry Technical Committee
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CRSI	Concrete Reinforcement Steel Institute
DFPA	Douglas Fir Plywood Association
DIR	Department of Industrial Relations
ETL	Electrical Testing Laboratory
FEMA	Federal Emergency Management Agency
FS	Federal Specification
HBMWD	Humboldt Bay Municipal Water District
HMGP	Hazard Mitigation Grant Program
ICBO	International Conference of Building Officials
IEEE	The Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IPA	Integrated Power Assembly
IPCEA	Insulated Power Cable Engineers Association
MBMA	Metal Building Manufacturer's Association
MSS	Manufacturers Standardization Society of the Valve and Fitting Industry Standards
NBFU	National Board of Fire Underwriters

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NBS	National Buildings Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NPDES	National Pollution Discharge Elimination System
OSHA	Occupational Safety and Health Act of 1970
PCA	Portland Cement Association
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
SSPC	Steel Structures Painting Council
SSPWC	Standard Specifications for Public Works Construction
UBC	Uniform Building Code
USPHS	United States Public Health Service
UL	Underwriter's Laboratory
UMC	Uniform Mechanical Code
UPC	Uniform Plumbing Code
USAS	The United States of America Standard Institute
USBR	United States Bureau of Reclamation
WCLIB	West Coast Lumber Inspection Bureau
WIC	Woodwork Institute of California

"Bureau" - United States Bureau of Reclamation

"State" - State of California

"State Standard Specifications" - Standard Specifications issued by the State of California Business and Transportation Agency, Department of Transportation, latest edition, unless a specific edition is referenced.

A-3 Definitions

- a) Acceptance - The formal written acceptance by the District of the entire Contract which has been completed in all respects in accordance with the Specifications and any approved modifications.
- b) Addenda - Written or graphic instruments issued prior to the execution of the Agreement which modify or interpret the Contract Documents, Drawings and Specifications by additions, deletions, clarifications or corrections.
- c) As Approved - The words "as approved" unless otherwise qualified, shall be understood to be followed by the words "by the Engineer."
- d) Bid - The offer of the Bidder for the Work when made out and submitted on the prescribed bid form, properly signed and guaranteed. A Bid is also known as a Proposal.
- e) Bid Bond - The cash, cashier's check, certified check, or bidder's bond accompanying the Bid submitted by the bidder, as a guarantee that the Bidder will enter into a Contract with the District for the performance of work herein described.
- f) Bidder - Any individual, firm, partnership or corporation submitting a bid for the work contemplated, and acting directly or through a duly authorized representative.
- g) Change Orders - A written order to the Contractor authorizing an addition, deletion, or revision in the work within the general scope of the Contract Documents or authorizing adjustment in the Contract price or Contract time.
- h) Claim - A separate demand by the Contractor for (i) a time extension, (ii) payment of money or damages arising from work done by or on behalf of the Contractor pursuant to the Contract for a public work and payment of which is not otherwise expressly provided for or the claimant is not

otherwise entitled to, or (iii) an amount the payment of which is disputed by the District.

- i) Contract - The written agreement covering the performance of the work and the furnishing of labor, materials, tools and equipment in the construction of the Work. The Contract shall include all Contract Documents and supplemental agreements amending or extending the work contemplated which may be required to complete the Work in a substantial and acceptable manner. Supplemental agreements are written agreements covering alterations, amendments or extensions to the Contract and include Addenda and Contract Change Orders.
- j) Contract Documents - The Contract Documents are any or all of the documents listed in Article I of the Contract.
- k) Contract Price - Total monies payable to the Contractor under the terms and conditions of the Contract Documents.
- l) Contract Time - The numbers of days stated in the Contract Documents for the completion of the Work.
- m) Contractor - The person or persons, firm, partnership or corporation or other entity that has entered into the Contract with the District to perform the Work.
- n) Contract Drawings - "Contract Drawings" or "drawings" means and includes:
 - (i) all drawings which have been prepared on behalf of the District and which are included in the Contract Documents and all modifying drawings issued by addenda thereto;
 - (ii) all drawings submitted pursuant to the terms of the Contract by the Contractor with his proposal and by the Contractor to the District during the progress of the Work when accepted by the Engineer. Except where a specific type of drawing is indicated, the terms "Drawings" and "Plans" are used interchangeably throughout the Contract Documents and the Plans are Drawings as defined above.
- o) County - County of Humboldt, California.
- p) Date of Execution of the Contract - The date on which the Contract is signed by the District's authorized representative.
- q) Datum - The figures given in the Specifications or upon the Drawings after the word "Elevation" or an abbreviation of it shall mean NAVD 88 datum unless noted otherwise.
- r) Days - Unless otherwise designated, days as used in the Contract Documents shall mean calendar days.
- s) District - The Humboldt Bay Municipal Water District, may also be referred to as the District, HBMWD, or Owner.
- t) Engineer - Wherever in these documents the word "Engineer" appears, it shall be understood to mean GHD Inc. The Engineer will have final authority as regards to contract administration, field inspection, and related items.
- u) Field Order - A written order effecting a change in the Work not involving an adjustment in the Contract Price or an extension of Contract Time, issued by the Engineer to the Contractor during construction.
- v) His - "His" shall include "her" and "its".
- w) Install - "Install" wherever and in whatever manner used shall mean the installation, complete in place of an item.

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- x) Notice of Award - The written notice of the acceptance of the Bid from the District to the successful Bidder.
- y) Notice to Proceed - Written communication issued by the District to the Contractor authorizing him to proceed with the Work and establishing the date of commencement of the Work.
- z) Or Equal - The terms "or equal" or "approved equal" shall be understood to indicate that the "equal" product be the same or better than the product named in function, performance, reliability, quality and general configuration. Determination of equality in reference to the project design requirement will be made by the Engineer.
- aa) District Project Representative – The authorized representative of the District who is assigned to the project site or any part of thereof.
- bb) Plans or Specification Drawings - The term "Plans or Specification Drawings" refers to the official Plans, profiles, cross sections, elevations, details, and other working drawings and supplementary drawings, or reproductions thereof, signed by the Engineer, which show the location, character, dimensions, and details of the work to be performed. Plans may either be bound in the same book as the balance of the Contract Documents or bound in separate sets, and are a part of the Contract Documents, regardless of the method of binding.
- cc) Project - The undertaking performed as provided by the Contract Documents.
- dd) Provide - "Provide" wherever and in whatever manner used shall be understood to mean furnish and install.
- ee) Project Geotechnical Engineer – Geotechnical report was prepared by GHD and is dated August 2019.
- ff) Resident Project Representative - Authorized representative of the Engineer who is assigned to the Project or any part thereof.
- gg) Service of Notice - Any notice from one party to the other under the Contract shall be in writing and shall be dated and signed by the party giving such notice or by a duly authorized representative thereof. Any such notice shall not be effective for any purpose whatsoever unless service in the following manner:
 - (i) If the notice is given to the District by personal delivery thereof, the District's Project Representative or by depositing the notice in the U.S. mail, enclosed in a sealed envelope addressed to Humboldt Bay Municipal Water District, P.O. Box 95, Eureka, CA 95502, postage prepaid, by certified mail return receipt requested.
 - (ii) If the notice is given to the Contractor, by personal delivery to the Contractor or its duly authorized representative at the project site or by depositing in the U.S. mail, enclosed in a sealed envelope address to the Contractor on the Contract Form, postage prepaid, by certified mail, return receipt request.
 - (iii) If the notice is given to the Surety or any other person, by personal delivery to such Surety or other person by personal delivery to such Surety or other person by depositing in the U.S. mail, enclosed in a sealed envelope, addressed to the surety or other person at the address of such Surety or other person last communicated to the party giving the notice, postage prepaid, by certified mail return receipt requested.
- hh) Shall or Will - "Shall," or "Will," whenever used to stipulate anything, means shall or will be done or be performed by either the Contractor or the District and means that the Contractor or the District has thereby entered into a covenant with the other party to do or perform the same.
- ii) Shop Drawing - All drawings, diagrams, illustrations, brochures, schedules and other data which

are prepared by the Contractor, a Subcontractor, manufacturer, supplier or distributor, which illustrate how specific portions of the Work shall be fabricated or installed.

- jj) Shown - "Shown," "indicated," "detailed," and words of like import, wherever and in whatever manner used, with or without reference to the drawings, means shown, indicated or detailed on the Drawings or Plans.
- kk) Specifications - A part of the Contract Documents consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship, including the General Conditions.
- ll) Specified - "Specified," "described," or "noted," wherever and in whatever manner used, means as specified, described or noted in the Contract Documents.
- mm) Subcontractors - The term "Subcontractor", as employed herein, includes only those having a direct contract with the Contractor and it includes one who furnishes material worked to a special design according to the Plans or Specifications of this Work, but does not include one who merely furnishes material not so worked and would be considered a supplier only.
- nn) Substantial Completion - That date as certified by the Engineer when the construction of the Project or a specified part thereof is sufficiently completed, in accordance with the Contract Documents, so that the Project or specified part can be utilized for the purposes for which it is intended.

The Engineer may, at its sole discretion, issue a written notice of substantial completion for the purpose of establishing the starting date for specific equipment guarantees, and to establish the date that the District will assume the responsibility for the cost of operating such equipment. Said notice shall not be considered as final acceptance of any portion of the Work or relieve the Contractor from completing the remaining work within the specified time and in full compliance with the Contract Documents.

- oo) Sufficient - "Sufficient," "necessary," or "proper," "acceptable," "satisfactory," "desirable," and words of like import, wherever and in whatever manner used, with or without reference to the Engineer, means sufficient, necessary, proper, acceptable, satisfactory and desirable in the judgment of the Engineer.
- pp) Supplementary Conditions (not included for this project) - Modifications to General Conditions required by a Federal Agency for participation in the PROJECT and approved by the Agency in writing prior to inclusion in the Contract Documents, or such requirements that may be imposed by applicable State laws.

References to "Supplemental General Conditions" in the General Conditions and elsewhere in the Contract Documents shall be construed to read "Supplementary Conditions."

- qq) Supplier - Any person or organization who supplies materials or equipment for the Work, including that fabricated to a special design, but who does not perform labor at the site.
- rr) Time Limits - All time limits stated in the Contract Documents are of the essence of the Contract.
- ss) Work - All the work specified, indicated, shown or contemplated in the Contract to construct the improvements, including all alterations, amendments or extensions thereto made by Contract Change Order or other written orders of the Engineer.
- tt) Written Notice - "Written Notice" shall be deemed to have been duly served when delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended or if delivered at or sent by registered mail to the last business address known to it who

gives the notice, or sent by email.

- uu) Whenever in the Specifications or upon the Drawings the words DIRECTED, REQUIRED, PERMITTED, ORDERED, DESIGNATED, PRESCRIBED, or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation or prescription of the Engineer is intended, and similarly the words APPROVED, ACCEPTABLE, SATISFACTORY, or words of like import, shall mean approved or acceptable to, or satisfactory to the Engineer, unless otherwise expressly stated.

SECTION B GENERAL CONDITIONS

ARTICLE I. SCOPE OF WORK

B-1 Intent of Contract Documents

The intent of the Contract Documents is to prescribe the details for the construction and completion of the Work which the Contractor undertakes to perform in accordance with the terms of the Contract. Where the Specifications and Plans describe portions of the Work in general terms, but not in complete detail, it is understood that only the best general practice is to prevail and that only materials and workmanship of the first quality are to be used. Unless otherwise specified, the Contractor shall furnish all labor, materials, tools, equipment and incidentals and do all the work involved in performing the Contract in a satisfactory and workmanlike manner, ready for use occupancy or operation by the District.

The technical provisions are presented in sections for convenience. However, this presentation does not necessarily delineate trades or limits of responsibility. All sections of the Specifications and Plans are interdependent and applicable to the Project as a whole.

The Contract Documents are complementary, and what is called for in any one shall be as binding as if called for in all.

Anything shown on the Drawings and not mentioned in the Specifications or mentioned in the Specifications and not shown on the Drawings shall have the same effect as if shown or mentioned respectively in both. Any work shown on one drawing shall be construed to be shown in all drawings and the Contractor will coordinate the Work and the Drawings. If any portion of the Contract Documents shall be in conflict with any other portion, the various documents comprising the Contract Documents shall govern in the following order of precedence: The District-Contractor Contract; the Bid; any Supplementary or Special Conditions; Instructions to Bidders; the General Conditions; the Specifications; the Drawings. Technical Specifications take priority over general Specifications and detail Drawings take precedence over general Drawings. As between schedules and information given on Drawings, the Schedules shall govern. As between figures given on Drawings and the scales measurements, the figures shall govern. As between large-scale Drawings and small-scale Drawings, the larger scale shall govern. Any conflict or inconsistency between or in the Drawings shall be submitted to the Engineer through the District's Project Representative or Resident Project Representative in writing. Work done by the Contractor after their discovery of such discrepancies, inconsistencies or ambiguities shall be done at the Contractor's own risk.

B-2 Contractor's Understanding

It is understood and agreed that the Contractor has, by careful examination, satisfied itself as to the nature and location of the Work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the Work, the general and local conditions, and all other matters which can in any way affect the Work under this Contract. No verbal agreement or conversation with any officer, agent or employee of the District, either before or after the execution of this Contract, shall affect or modify any of the terms or obligations herein contained.

Contractor shall comply with all Federal, State, and Local laws and regulations applicable to this scope of work and said project, as well as all permits and environmental conditions established for this project (see section B-13). Contractor is responsible for obtaining all necessary permits for construction except for those permits already obtained by the District prior to construction. If a Contractor materially fails to comply with any term of this award, whether stated in a Federal statute or regulation, an assurance, in a State plan or application, a notice of award, or elsewhere, FEMA and/or the District may take one or more of the actions outlined in 2 CFR Section 200.338, including termination of the project. Project awards may be terminated for convenience through the procedures outlined in 2 CFR Section 200.339.

B-3 Changes in the Work

The District may, at any time, by written order make changes in the Work including but not limited to: (a) changes in the Specifications or Drawings; (b) changes in the sequence, method or manner of performance of the Work; (c) changes in the owner-furnished facilities, equipment, materials, services or site; or (d) changes directing acceleration of the Work. If such changes cause an increase or decrease in the Contractor's cost of, or time required for, performance of the Contract an equitable adjustment will be made and the Contract modified in writing accordingly.

Such modification will be in the form of a Contract Change Order which will set forth the work to be done or the method by which the change and cost adjustment, if any, will be determined, and the time of completion of the Work.

To comply with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), material additions or amendments to this scope of work (SOW) may have to be reviewed by all State and Federal agencies participating in the NEPA/CEQA process. NEPA/CEQA compliance for all SOW additions or amendments is essential before the revised SOW can be approved by FEMA or implemented by the District. Any construction activities associated with a SOW change, prior to FEMA approval, may be ineligible for reimbursement or match. The Contractor shall obtain approval in writing from the District prior to proceeding with any changes of work.

The compensation to be paid for any extra work or change shall be determined in one or more of the following ways or at District's sole election:

- a) By unit prices previously approved (unit prices previously approved shall be used in all cases for similar units unless mutually agreed that for some reason they are not applicable);
- b) By estimate and acceptance of an agreed upon lump sum; or
- c) On a time and materials basis involving the actual necessary expenses and other services necessary to complete the Work. In addition, there shall be added an amount to be agreed upon but not to exceed fifteen (15) percent of the actual necessary expense to cover the cost of general overhead, general superintendence, other expenses and profit. In the events that items (a) and (b) above are not applicable, then this latter method (c) shall be used. Markup by Subcontractors on their work shall not exceed fifteen percent. Contractor's markup on Subcontractor's work shall not exceed five (5) percent.

The Contractor shall keep full and complete records of the actual cost of such work in the form and manner prescribed by the Engineer and shall permit the Engineer to have access to such records as may be necessary to assist in the determination of the compensation payable for such work.

The Engineer also may at any time by issuing a Field Order make changes in the details of the Work. The Contractor shall proceed with the performance of any change in the Work so ordered by the Engineer unless the Contractor believes that such Field Order entitles it to a change in the Contract Price or Time, or both in which event the Contractor shall give the Engineer written notice thereof within seven (7) calendar days after the receipt of the ordered change. The Contractor shall not execute such changes pending the receipt of an executed change order or further instruction from the District.

If the Contractor is delayed in completing by reason of any change made pursuant to this section, the time for completion of the Work shall be extended by change order for a period agreed to, commensurate with such delay. The Contractor shall not be subjected to any claim for liquidated damages for this period of time, but the Contractor shall have no claim for any other compensation for any such delay.

B-4 Procedures and Allowable Costs on Changes

- a) No indirect costs of a Contractor are separately eligible for reimbursement, in compliance with 2 CFR Section 200.410. Such costs are covered by the Subgrantee Administrative Cost allowance formula provided by 44 CFR Section 206.439(b)(1)(ii).
- b) Contractors are referred to the State HMGP administrative plan for project cost overrun regulations. If project costs exceed the approved federal share, the District must contact the Governor's Authorized Representative (GAR). The GAR will evaluate requests for cost overruns. Written determination of cost overrun eligibility in accordance with 2 CFR 328 shall be submitted by the GAR to the FEMA Regional Director. Contractor is hereby notified that such notifications and approvals may necessitate project delays, which will be reviewed and approved with the Contractor via a contract Change Order.
- c) All changes which affect the cost or time of the construction of the project must be authorized by means of a Change Order. The Change Order will include extra work, work for which quantities have been altered from those shown in the bidding schedule, as well as decreases or increases in the quantities of installed units which are different than those shown in the bidding schedule because of final measurements. All changes should be recorded on a Change Order as they occur. Each Change Order must contain complete and detailed justification for all items addressed by the Change Order.
- d) If the change in or addition to the Work will result in an increase in the contract sum, the District shall have the right to require the performance thereof in any of the following ways, at District's sole election:
 - (i) By unit prices previously approved (unit prices previously approved shall be used in all cases for similar units unless mutually agreed that for some reason they are not applicable);
 - (ii) By estimate and acceptance of an agreed upon lump sum; or
 - (iii) On a time and materials basis involving the actual necessary expenses and other services necessary to complete the work. In addition, there shall be added an amount to be agreed upon but not to exceed fifteen (15) percent of the actual necessary expense to cover the cost of general overhead, general superintendence, other expenses and profit. In the events that items (a) and (b) above are not applicable, then this latter method (c) shall be used. Markup by Subcontractors on their work shall not exceed fifteen percent. Contractor's markup on Subcontractor's work shall not exceed five percent (5%).
- e) If the District elects to have the Change in the Work performed on a lump sum basis, such election shall be based on a lump sum proposal which shall be submitted by the Contractor within ten (10) calendar days of the District's request therefor. Request for a lump sum proposal shall not be deemed an election to have the Work performed on a lump sum basis. The Contractor's proposal shall be itemized and segregated by labor and materials for the various components of the change (no aggregate labor total will be acceptable) and shall be accompanied by signed proposals of any Subcontractors which will perform any portion of the change, and of any persons who will furnish materials or equipment for incorporation therein. The proposal shall also include the Contractor's estimate of the time required to perform said changes or additional work.

The portion of the proposal relating to labor, whether by the Contractor's forces or the forces of any of its Subcontractors, may include reasonably anticipated gross wages of Job Site labor, including foremen, who will be directly involved in the Change in the Work (for such time as they

will be so involved), plus payroll costs (including premium costs of overtime labor, if overtime is anticipated, social security, Federal or State unemployment insurance taxes and fringe benefits required by collective bargaining agreements entered into by the Contractor or any such Subcontractor in connection with such labor) and up to fifteen percent (15%) of such anticipated gross wages, but not payroll costs, as overhead and profit for the Contractor or any such Subcontractor, as applicable (such overhead and profit to include all supervision except foremen.)

The portion of the proposal relating to materials may include the reasonably anticipated direct costs to the Contractor or to any of its Subcontractors of materials to be purchased for incorporation in the Change in the Work, plus transportation and applicable sales or use taxes and up to fifteen percent (15%) of said direct material costs as overhead and profit for the Contractor or any such Subcontractor (such overhead and profit to include all small tools), and may further include the Contractor's and any of its Subcontractors' reasonably anticipated rental costs in connection with the Change in the Work (either actual rates or discounted local published rates), plus up to five percent (5%) thereof as overhead and profit for the Contractor or any such Subcontractors, as applicable. If any of the items included in the lump sum proposal are covered by unit prices contained in the Contract Document, the District may, if it requires the Change in the Work to be performed on a lump sum basis, elect to use these unit prices in lieu of the similar items included in the lump sum proposal in which event and appropriate deduction will be made in lump sum amount prior to the application of any allowed overhead and profit percentages. No overhead and profit shall be applied to any unit prices.

The lump sum proposal may include up to five percent (5%) of the amount which the Contractor will pay to any of its Subcontractors for the Change in the Work as a commission to the Contractor.

- f) In the event that the Contractor fails to submit its proposal within the designated period, the Engineer may direct the Contractor to proceed with the Change or Addition to the Work and the Contractor shall so proceed. The Engineer shall determine the reasonable costs and time to perform the Work in question, which determination when approved by District shall be final and binding upon the Contractor.
- g) In the event that the parties are unable to agree as to the reasonable costs and time to perform the change in or addition to the Work based upon the Contractor's proposal and the Engineer and District do not elect to have the change in the Work performed on a time and material basis, the Engineer and District shall make a determination of the reasonable cost and time to perform the Change in the Work, based upon their own estimates, the Contractor's submission or combination thereof. A Change Order shall be issued for the amount of costs and time determined by the Engineer and the District and shall become binding upon the Contractor unless the Contractor submits its protest in writing to the District within thirty (30) calendar days of the issuance of the Change Order. The District has the right to direct the Contractor in writing to perform the Change in the Work which is the subject of the Change Order. Failure of the parties to reach agreement regarding the costs and time of the performing the Change in the Work and/or any pending protest shall not relieve the Contractor from performing the Change in the Work promptly and expeditiously.
- h) If the District elects to have the Change in the Work performed on a time and material basis, the same shall be performed, whether by the Contractor's forces or the forces of any of its Subcontractors or Sub-subcontractors, at actual costs to the entity or entities performing the Change in the Work (without any charge for administration, clerical expense, supervision or superintendence of any nature whatsoever, including foremen, or the costs, use or rental of tools or plant), plus fifteen percent (15%) thereof as the total overhead and profit to the entity or entities actually performing the change (except that this fifteen percent (15%) shall not be applied against any payroll costs, defined herein with respect to lump sum proposals). If the entity or entities actually performing the work are Subcontractors or Sub-subcontractors, the Contractor shall be

allowed five percent (5%) of the total charge of the performing entity or entities (including mark-up) as Contractor's mark-up. No other mark-ups shall be allowed hereunder. The Contractor shall submit to the District daily work and material tickets, to include the identification number assigned to the Change in the Work, the location and description of the Change in the Work, the classification of labor employed (and names and social security numbers), the material used, the equipment rented (not tools) and such other evidence of cost as the District may require. The District may require authentication of all time and material tickets and invoices by persons designated by the District for such purpose. The failure of the Contractor to secure any required authentication shall, if the District elects to treat it as such, constitute a waiver by the Contractor of any claim for the cost of that portion of the Change in the Work covered by a non-authenticated ticket or invoice; provided, however, that the authentication of any such ticket or invoice by the District shall not constitute an acknowledgment by the District that the items thereon were reasonably required for the Change in the Work.

- i) No overhead and profit will be paid by the District on account of a Change in the Work except as specifically provided in this Section B-4. Overhead and Profit, as allowed under this paragraph, shall be deemed to include all costs and expenses which the Contractor or any of its Subcontractors may incur in the performance of the Change in the Work and which are not otherwise specifically recoverable by them pursuant to this paragraph.
- j) The Contractor shall not be entitled to any amount for indirect costs, damages or expenses of any nature, including, but not limited to, so-called "impact" costs, labor inefficiency, wage, material or other escalations beyond the prices upon which the proposal is based and to which the parties have agreed pursuant to the provisions of this section, and which the Contractor, its Subcontractors and Sub-subcontractors or any other person may incur as a result of delays, interferences, suspensions, changes in sequence or the like, for whatever cause, whether reasonable or unreasonable, foreseeable or unforeseeable, or avoidable or unavoidable, arising from the performance of any and all Changes in the Work performed pursuant to this section. It is understood and agreed that the Contractor's sole and exclusive remedy in such event shall be recovery of its direct costs as compensable hereunder and an extension of the time of the Contract, but only in accordance with the provisions of the Contract Documents.

The Contractor agrees that it shall not be entitled to claim damages for anticipated profits on any portion of work that may be deleted. The amount of any adjustment for work deleted shall be estimated at the time deletion of work is ordered and the estimated adjustment will be deducted for the subsequent monthly pay estimates.

The District reserves the right to contract with any person or firm other than the Contractor for any or all extra work.

B-5 Unilateral Change in or Addition to the Work

Notwithstanding the above, the District, directly or through the Engineer, may direct the Contractor in writing to perform changes in or additions to the scope of the Contract. The Contractor shall perform such work and the parties shall proceed pursuant to the provisions of Section B-4.

B-6 Differing Site Conditions

The Contractor shall promptly, and before the following conditions are disturbed, notify the District in writing of any:

- a) Material that the Contractor believes may be material that is hazardous waste, as defined in Section 25118 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law; or
- b) Subsurface or latent physical conditions at the site differing from those indicated in the Contract

Documents; or

- c) Unknown conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.

The Engineer shall thereupon promptly investigate the conditions. If the Engineer finds that they do involve hazardous waste, or do materially differ and cause any decrease or increase in the Contractor's cost or time of performance, it will issue a Change Order as appropriate. Any increase or decrease in the cost of the Work or the time for performance shall be adjusted in the manner provided herein for adjustments as to extra and/or additional work and changes. The procedures applicable to claims per extra costs shall then apply.

In accordance with 36 CFR Part 800, in the event a potential historic property or cultural resource is discovered during construction activities, the Contractor must cease work in the vicinity of the discovery and take all reasonable measures to avoid or minimize harm to the discovered property/resource. Construction activities in the area of the discovery shall not resume until the District concludes consultation with the State Historic Preservation Officer (SHPO) for treatment of the discovery.

B-7 Claims for Extra Costs

- a) The Plans for Work show the conditions as they are supposed or believed by the Engineer to exist, but it is neither intended nor to be inferred that the conditions as shown thereon constitute a representation by the District or its officers that such conditions are universally existent nor shall the District or any of its officers or representatives be liable for any loss sustained by the Contractor as a result of any variance between conditions as shown on the Plans and alternate conditions revealed during the progress of the Work, or otherwise.
- b) The District assumes no responsibility for any representations made by any of its officers or agents during or prior to the execution of this Contract, unless (1) such representations are expressly stated in the Contract, and (2) the Contract expressly provides that the responsibility therefor is assumed by the District.
- c) It is hereby mutually agreed that the Contractor shall not be entitled to the payment of any additional compensation for any cause, including any act, or failure to act, by the Engineer or the District, or the happening of any event, thing or occurrence, unless the Contractor shall have given the Engineer due written notice of potential claims as hereinafter specified.
- d) The written notice of potential claims shall set forth the reasons for which the Contractor believes additional compensation will or may be due, the nature of the costs involved, and, insofar as possible, the amount of the potential claim. Except as provided in Section B-6, the notice as above required shall be given to the Engineer at least 48 hours prior to the time that the Contractor commences performance of the work giving rise to the potential claim for additional compensation. If such notice is not given, the Contractor shall be barred from making any such claim for extra compensation.
- e) The Contractor may submit a claim to the Engineer concerning any matter for which a protest under Section B-3 or a notice of potential claim is filed within sixty (60) calendar days following the submission of said protest or notice, unless, due to the nature of the claim or the uncompleted state of the work, it is impracticable to determine the amount or the extent of the claim within such period, in which case a claim may be submitted at the earliest time thereafter that such determination can be made, but in no event later than the final release by the Contractor provided for in Section B-71. The claims shall set forth clearly and in detail, for each item of additional compensation claimed, the reasons for the claim, reference to applicable provisions of the Specifications, the nature and the amount of the cost involved, the computations used in

determining such costs, and all pertinent factual data. The Contractor shall maintain complete and accurate records of the cost or any portion of the Work for which additional compensation is claimed, and shall provide the Engineer with copies thereof, as required.

- f) The Engineer will, within a reasonable time after submission of the Contractor's claim, make decisions in writing on all claims of the Contractor. All such decisions of the Engineer shall be final unless the Contractor shall within ten (10) calendar days after receipt of the Engineer's decision, file with the Engineer a written protest, stating clearly and in detail the basis thereof. Such protest will be forwarded promptly by the Engineer to the District, which will issue a decision upon each such protest, and the District's decision will be final. Pending such decision, the Contractor shall proceed with its work in accordance with the determination or instructions of the Engineer. It is hereby agreed that the Contractor's failure to protest the Engineer's determination or instructions, within ten (10) calendar days from and after the Engineer's determinations or instructions, shall constitute a waiver by the Contractor of all its rights to further protest, judicial or otherwise.
- g) It is the intention of this Section that the differences between the parties, arising under and by virtue of the Contract, be brought to the attention of the Engineer at the earliest possible time in order that such matters may be settled, if possible or other appropriate action promptly taken. The Contractor hereby agrees that it shall have no right to additional compensation for any claim that may be based on any act, failure to act, event, thing or occurrence for which no written notice of potential claim as herein required was timely filed.
- h) In the event of an emergency endangering life or property, the Contractor shall act as stated in Section B-62 herein, and after execution of the emergency work shall present an accounting of labor, materials and equipment in connection therewith. The procedure for any payment that may be due for emergency work will be as specified in Section B-3 herein.

B-8 Disputes

Except as otherwise specifically provided in the Contract Documents, the Engineer will initially decide all claims of the Contractor and all disputes arising under and by virtue of the Contract. Such claim or dispute will be processed and decided by the Engineer as soon as practicable after its submission and the submission or availability of any additional information necessary to its decision. If the Contractor is dissatisfied with the Engineer's decision, the Contractor may, within 15 calendar days from the date of the Engineer's decision, follow the procedures set forth in Section B-55. If the Contractor fails to follow the procedures set forth in Section B-55 within the 15 calendar day period, then the Engineer's decision shall be final, conclusive, and binding on the Contractor.

B-9 Guarantee

- a) In addition to warranties, representations and guarantees stated elsewhere in the Contract Documents, the Contractor unconditionally guarantees all materials and workmanship furnished hereunder, and agrees to replace at its sole cost and expense, and to the satisfaction of the Engineer and the District, any and all materials which may be defective or improperly installed.
- b) The Contractor shall repair or replace to the satisfaction of the Engineer any or all such work that may prove defective in workmanship or materials, ordinary wear and tear excepted, together with any other work which may be damaged or displaced in so doing.
- c) In the event of failure to comply with the above stated conditions within a reasonable time, the District is authorized to have the defect repaired and made good at the expense of the Contractor who will pay the costs and charges therefor immediately upon demand, including any reasonable management and administrative costs, and engineering, legal and other consultant fees incurred to enforce this section.
- d) The signing of the Contract by the Contractor shall constitute execution of the above guarantees.

Except as otherwise provided in this Contract, the guarantees and warranties shall remain in effect through the one-year maintenance warranty period specified in the Performance Bond.

ARTICLE II. CONTROL OF WORK

B-10 Authority of the Engineer

- a) The Engineer is the representative of the District and has full authority to interpret the Contract Documents, to conduct the construction review and inspection of the Contractor's performance, and to decide questions which arise during the course of the work and its decisions on these matters shall be final and conclusive. The Engineer has the authority to reject all work and materials which do not conform to the Contract Documents, and has the authority to stop the work whenever such stoppage may be necessary to ensure the proper execution of the Contract.
- If at any time the Contractor's work force, tools, plant or equipment appear to the Engineer to be insufficient or inappropriate to secure the required quality of work or the proper rate of progress, the Engineer may order the Contractor to increase their efficiency, improve their character, to augment their number or to substitute other personnel, new tools, plant or equipment, as the case may be, and the Contractor shall comply with such order.
- b) Neither the failure of the Engineer to demand such increase of efficiency, number, or improvement, nor the compliance by the Contractor with the demand, shall relieve the Contractor of its obligation to provide quality work at the rate of progress necessary to complete the Work within the specified time.
- c) The Engineer shall have the authority to make minor changes in the Work, not involving extra costs, and not inconsistent with the purposes of the Work.
- d) Any order given by the Engineer, not otherwise required by the Contract Documents to be in writing shall, on request of the Contractor, be given or confirmed by the Engineer in writing.
- e) Whenever work, methods of procedure, or any other matters are made subject to direction or approval, such direction or approval will be given by the Engineer.
- f) The Engineer shall not be responsible for the construction means, controls techniques, sequences procedures or construction safety.
- g) It is expressly agreed and understood that GHD Inc. will have no liability whatsoever resulting from the obligations entered into under the Contract except as provided in any scope of work agreement between GHD Inc. and the District; that the District must look solely to the Contractor for the furnishing of the Work; that the Contractor must look solely to the District for payment; and that the District and the Contractor must look solely to each other for the enforcement of any claims or liabilities arising under or by reason of the Contract.

B-11 Drawings

- a) Drawings furnished herewith are for bidding purposes. The Engineer will furnish the Contractor additional copies of the Contract Documents and full-size plans. Additional copies may be obtained by paying the actual cost of reproduction. The Contractor shall have no claim for excusable delay on account of the failure of the Engineer to deliver such drawings unless the Engineer shall have failed to deliver the same within fourteen (14) calendar days after receipt of written demand therefor from the Contractor. The Contractor shall keep one copy of said drawings, in good order, available to the Engineer and its representatives, and convenient to the working site. The Contractor shall maintain on the job site and make available to the Engineer on request, one current full-sized marked-up set of design drawings which accurately indicate all variations in the completed work that differ from the design information shown on the Plans. If the Contractor, in the course of the Work, finds any discrepancy between the Drawings and the physical condition of the locality, or any errors or omissions in the Drawings, or in the layout as given by points and instructions, it shall be the Contractor's duty to inform the Engineer in writing, and the Engineer will

promptly verify the same. Any work done after such discovery, until authorized, will be done at the Contractor's risk. All Drawings, Specifications, and copies thereof furnished by the Engineer are the property of the Engineer and shall not be reused on other work and, with the exception of the signed Contract sets, are to be returned to the Engineer, on request, at the completion of the Work. All models are the property of the District. The Contractor may be furnished additional instructions and detail drawings by the Engineer as necessary to carry out the work required by the Contract Documents.

The additional drawings and instructions thus supplied, will become part of the Contract Documents. The Contractor shall carry out the Work in accordance with the additional detail drawings and instructions.

- b) The Drawings shall be supplemented by such shop drawings prepared by the Contractor as are necessary to adequately control the Work. No changes shall be made by the Contractor in any shop drawings after they have been reviewed by the Engineer.
- c) Shop Drawings for any structure shall include, but not be limited to: stress sheets, anchor bolt layouts, shop details, conduit and wire schedules, elevations, panel schedules, equipment inventory, seismic calculations, and mounting plans, which shall be reviewed and accepted by the Engineer before any such work is performed.
- d) Contractor agrees that shop drawings processed by the Engineer are not Contract Change Orders; that the purpose of shop drawings submitted by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept, that it demonstrates its understanding by indicating which equipment and material it intends to furnish and by detailing the fabrication methods it intends to use.
- e) It is expressly understood, however, that favorable review of the Contractor's shop drawings shall not relieve the Contractor of any responsibility for accuracy of dimensions and details, or for mutual agreements of dimensions and details. It is mutually agreed that the Contractor shall be responsible for agreement and conformity of its shop drawings with the Specifications. Contractor further agrees that if deviations, discrepancies or conflicts between shop drawings and Specifications are discovered either prior to or after shop drawings are processed by the Engineer, the Specifications shall control and shall be followed.
- f) Unless otherwise stated, the Engineer shall have thirty (30) calendar days from the date of receipt of shop drawings for review.
- g) Full compensation for furnishing all shop drawings shall be considered as included in the prices paid for the Contract items of Work to which such drawings relate and no additional compensation will be allowed therefor. Any cost related to the Engineer's review of any particular set of shop drawings more than twice, due to incompleteness or unacceptability, shall be borne by the Contractor, and the District reserves the right to withhold such costs from payments due the Contractor.
- h) When submitted for the Engineer's review, Shop Drawings shall bear the Contractor's certification that they have reviewed, checked and approved the Shop Drawings and that they are in conformance with the requirements of the Contract Documents.
- i) That portion of the Work requiring a shop drawing or sample submission shall not begin until the shop drawing or submission has been approved by the Engineer. A copy of each approved shop drawing and each approved sample shall be kept in good order by the Contractor at the site and shall be available to the Engineer.
- j) Acceptance by the Engineer of any drawing, method of work, or any information regarding materials and equipment the Contractor proposes to furnish shall not relieve the Contractor of his

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responsibility for any errors therein and shall not be regarded as an assumption of risks or liability by the Engineer or District, or any officer or employee thereof, and the Contractor shall have no claim under the Contract on account of the failure or partial failure or inefficiency or insufficiency of any plan or method or work or material and equipment so accepted. Such acceptance shall be considered to mean merely that the Engineer has no objection to the Contractor using, upon his own full responsibility, the plan or method of work proposed, or furnishing the materials and equipment proposed.

B-12 Construction Staking and Surveys

The Contractor shall furnish land surveys deemed necessary for locating the principal component parts of the Work.

B-13 Permits and Regulations

Permits, licenses, and easements of a temporary or permanent nature, necessary for the prosecution of the Work shall be secured and paid for by the Contractor, except as noted in Section B-32, and herein.

The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the Work as shown on the Plans and described in the Specifications. The Contractor shall promptly notify the Engineer in writing of any specification at variance therewith and any necessary changes shall be adjusted as provided in the Contract for Changes in the Work. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules, and regulations and without such notice to the Engineer, it shall bear all costs arising therefrom.

B-14 Conformity with Contract Documents and Allowable Deviations

Work and materials shall conform to the lines, grades, cross sections, dimensions and material requirements, including tolerances, shown on Contract Documents. Although measurement, sampling, and testing may be considered evidence as to such conformity, the Engineer shall be the sole judge as to whether the work or materials deviate from the Specifications and Plans, and its decision as to any allowable deviations therefrom shall be final and conclusive.

Whenever a material, article or piece of equipment is identified on the Drawings or Specifications by reference to brand name or catalogue number, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality and function shall be considered as described in Section B-28. The Contractor may recommend the substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the Contract Documents by reference to brand name or catalogue number, and if, in the opinion of the Engineer, such material, article, or piece of equipment is of equal substance and function to that specified, the Engineer may approve its substitution and use by the Contractor. Any cost differential shall be deductible from the Contract Price and the Contract Documents shall be appropriately modified by Change Order. The Contractor warrants that if substitutions are approved, no major changes in the function or general design of the Project will result. Incidental changes or extra component parts required to accommodate the substitution will be made by the Contractor without a change in the Contract Price or Contract Time.

B-15 Coordination and Interpretation of Contract Documents

- a) The Contract Documents are complementary and a requirement occurring in one is as binding as though occurring in all.
- b) In the event of conflict between the Plans and the Technical Specifications, the Technical Specifications shall govern, except that, where items are shown on the Plans and are not specifically included in the Technical Specifications, the Plans shall govern.

- c) Should it appear that the work to be done or any of the matters relative thereto are not sufficiently detailed or explained in the Specifications or Plans, the Contractor shall apply to the Engineer for such further explanations as may be necessary and shall conform to them as part of the Contract. In the event of any doubt or question arising respecting the true meaning of the Specifications and Plans, reference shall be made to the Engineer, whose decision thereon shall be final and conclusive.
- d) In the event of any discrepancy between any plans and the figures written thereon, the figures shall be taken as correct. Detailed drawings shall prevail over general drawings.
- e) Any reference made in these Specifications or on the plans to any Specification, standard, method, or publication of any scientific or technical society or other organization shall, in the absence of a specific designation to the contrary, be understood to refer to the Specification, standard, method, or publication in effect as of the date that the Work is advertised for Bids.

B-16 Subcontracts

- a) In accordance with 2 CFR Section 200.213, the Contractors must not make any award or permit any award (subgrant or contract) at any tier to any party which is debarred or suspended or is otherwise excluded from or ineligible for participation in Federal assistance programs under Executive Order 12549, "Debarment and Suspension."
- b) The attention of the Contractor is directed to the provisions of Public Contract Code sections 4100-4113, regarding subcontracting and said provisions are by this reference incorporated herein and made a part hereof.
- c) Each Subcontract shall contain a suitable provision for the suspension or termination thereof should the Work be suspended or terminated or should the Subcontractor neglect or fail to conform to every provision of the Contract Documents insofar as such provisions are relevant. No Subcontractor or supplier will be recognized as such, and all persons engaged in work will be considered as employees of the Contractor, and the Contractor will be held responsible for their work, which shall be subject to the provisions of the Contract Documents. The Contractor shall be fully responsible to the District for the acts or omissions of its Subcontractors and of the persons either directly or indirectly employed by him. Nothing contained in the Contract Documents shall create any contractual relationship between any Subcontractor and the District. If a legal action, including arbitration and litigation, against the District is initiated by a Subcontractor or Supplier, the Contractor shall reimburse the District for the amount of legal, engineering and all other expenses incurred by the District in defending itself in said action.
- d) The District and the Engineer reserve the right to approve all Subcontractors. Such approval shall be a consideration to the awarding of the Contract and unless notification to the contrary is given to the Contractor prior to the signing of the Contract, the list of Subcontractors which is submitted with its proposal will be deemed to be acceptable.

B-17 Cooperation of Contractors

- a) Should construction be under way by other forces or by other contractors within or adjacent to the limits of the work specified or should work of any other nature be under way by other forces within or adjacent to said limits, the Contractor shall cooperate with all such other contractors or other forces to the end that any delay or hindrance to their work will be avoided. The right is reserved to perform other or additional work at or near the site (including material sources) at any time, by the use of other forces.
- b) When two or more contractors are employed on related or adjacent work, each shall conduct its operation in such a manner as not to cause any unnecessary delay or hindrance to the other. Each contractor shall be responsible to the other for all damage to work, to persons or property caused

to the other by its operations, and for loss caused the other due to its unnecessary delays or failure to finish the Work within the time specified for completion.

B-18 Superintendence

- a) The Contractor shall designate in writing before starting work an individual as authorized representative who shall have the authority to represent and act for the Contractor. This authorized representative shall be present at the site of the work at all times while work is actually in progress on the Contract. When work is not in progress and during periods when work is suspended, arrangements acceptable to the Engineer shall be made for any emergency work which may be required.
- b) The Contractor is solely responsible, at all times, for the superintendence of the Work and for its safety and progress.
- c) Whenever the Contractor or its authorized representative is not present on any particular part of the Work where it may be desired to give direction, orders will be given by the Engineer, which shall be received and obeyed by the superintendent or foreman who may have charge of the particular work in reference to which the orders are given.
- d) Any order given by the Engineer, not otherwise required by the Specifications to be in writing, will on request of the Contractor, be given or confirmed by the Engineer in writing.

B-19 Inspection of Work

- a) Unless otherwise provided, all equipment, materials, and work shall be subject to inspection and testing by the Engineer. The Engineer will observe the progress and quality of the Work and determine, in general, if the Work is proceeding in accordance with the intent of the Contract Documents. The Engineer shall not be required to make comprehensive or continuous inspections to check the quality of the Work, and it shall not be responsible for construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work. Visits and observations made by the Engineer shall not relieve the Contractor of its obligation to conduct comprehensive inspections of the Work and to furnish proper materials, labor, equipment and tools, and perform acceptable work, and to provide adequate safety precautions, in conformance with the intent of the Contract.
- b) Whenever the Contractor varies the period during which work is carried on each day, it shall give due notice to the Engineer so that proper inspection may be provided. Any work done in the absence of the Engineer shall be subject to rejection. Proper facilities for safe access for inspection to all parts of the Work shall at all times be maintained for the necessary use of the Engineer and other agents of the District, and agents of the Federal, State, or Local governments at all reasonable hours for inspection by such agencies to ascertain compliance with laws and regulations.
- c) One or more inspectors may be assigned to observe the Work and to act in matters of construction under this Contract. It is understood that inspectors shall have the power to issue instructions and make decisions within the limitations of the authority of the Engineer. Such inspection shall not relieve the Contractor of its obligation to conduct comprehensive inspections of the work, to furnish proper materials, labor, equipment and tools, and perform acceptable work, and to provide adequate safety precautions in conformance with the intent of the Contract.
- d) The Engineer and its representatives and the District and its representatives shall at all times have access to the Work wherever it is in preparation or progress, and the Contractor shall provide safe and convenient facilities for such access and for inspection. If the Specifications, the Engineer's instructions, laws, ordinances, or any public authority require any material, equipment or work to be specifically tested or approved, the Contractor shall give the Engineer timely notice of its

readiness for inspection, and if the inspection is by an authority other than the District, of the time fixed for inspection. Inspections by the Engineer will be made promptly.

- e) Work performed without inspection may be required to be removed and replaced under proper inspection and the entire cost of removal and replacing, including the cost of District-furnished materials used in the Work, shall be borne by the Contractor, regardless of whether or not the Work exposed is found to be defective. Examination of questioned work, other than that installed without inspection, may be ordered by the Engineer and, if so ordered, the work must be uncovered by Contractor. If such work is found to be in accordance with the Contract Documents, the District will pay the cost of re-examination and replacement. If such work is found to be not in accordance with the Contract Documents, the Contractor shall pay such cost.
- f) The inspection of the Work shall not relieve the Contractor of its obligation to fulfill the Contract as herein prescribed, or in any way alter the standard of performance provided by the Contractor, and defective work shall be made good and unusable materials may be rejected, notwithstanding that such work and materials have been previously overlooked by the Engineer and accepted or estimated for payment. If the Work or any part thereof shall be found defective, Contractor shall, within ten (10) calendar days, make good such defect in a manner satisfactory to the Engineer. If the Contractor shall fail or neglect to make ordered repairs of defective work or to remove the condemned materials from the Work within ten (10) calendar days after direction by the Engineer in writing, the District may make the ordered repairs, or remove the condemned materials, and deduct the cost thereof from any monies due the Contractor.
- g) The Contractor shall furnish promptly without additional charge all facilities, labor and materials reasonably needed by the Engineer for performing all inspection and tests. Contractor shall be charged with any additional cost of inspection when material and workmanship are not ready at the time specified by the Contractor for its inspection.
- h) Where any part of the Work is being done under an encroachment permit or building permit, or is subject to Federal, State, County or City codes, laws, ordinances, rules or regulations, representatives of the government agency shall have full access to the Work and shall be allowed to make any inspection or tests in accordance with such permits, codes, laws, ordinances, rules, or regulations. If advance notice of the readiness of the Work for inspection by the governing agency is required, the Contractor shall furnish such notice to the appropriate agency.
- i) The Engineer may inspect production of the material, or the manufacture of products at the source of supply. Plant inspection, however, will not be undertaken until the Engineer is assured of the cooperation and assistance of both the Contractor and the material producer. The Engineer or its authorized representative shall have free entry at all times to such parts of the plant as concerns the manufacture or production of the materials. Adequate facilities shall be furnished free of charge to make the necessary inspection. The District assumes no obligation to inspect materials at the source of supply.
- j) Forty-eight (48) hours prior to work being accomplished, the Contractor will notify the Engineer of the proposed working hours to accomplish the work for that day. Overtime and shift work may be established as a regular procedure by the Contract and with the written permission of the Engineer. Such permission may be revoked at any time. No work other than overtime and shift work established as a regular procedure shall be done between the hours of 7 p.m. and 7 a.m., nor on Sundays or legal holidays, except for such work as is necessary for the proper care and protection of the work already performed, or in case of an emergency.

If required, nighttime work periods shall be coordinated with the Engineer in advance, and approval shall be given by the Engineer prior to any work occurring outside the hours described above.

All costs for the overtime inspection, including those occurring as a result of overtime and shift work established as a regular procedure, shall be paid for by the Contractor. Overtime inspection shall include inspection required during holidays, Saturdays, Sundays, and any weekday between the hours of 7 p.m and 7 a.m. Such costs will include, but will not necessarily be limited to, engineering, inspection, general supervision and other expenses which are directly chargeable to the overtime work. All such charges shall be deducted by the District from payment due the Contractor.

- k) A prefinal inspection of the Work will be made by the District and the Engineer. This inspection shall be made as soon as practical after Contractor has notified the District in writing that the Work is ready for this inspection. The prefinal inspection shall be made prior to acceptance of any portion of the Work as being substantially complete and prior to filing the Notice of Completion.

A final inspection of all the Work will be made by the District, Engineer, and Contractor.

B-20 Tests

The District shall perform or witness all tests specified or required by the Technical Specifications. The responsibility for payment for these tests is also outlined in the Technical Specifications. In general, and unless explicitly stated otherwise, the Contractor is responsible for the performance of all tests required, and the payment for such tests is to be included in the Bid Item to which it relates. No additional payment will be made for the required testing. The Engineer will direct the Contractor to perform such tests as it deems necessary to determine the quality of work or compliance with Contract Documents. The Contractor shall furnish promptly without additional charge all facilities, labor, and material reasonably required for performing safe and convenient tests as may be required by the Engineer. The Contractor shall not be required to reimburse the District for tests performed by the District or Engineer above and beyond those outlined in the plans or specifications. If samples of materials are submitted which fail to pass the specified tests, the Contractor shall pay for all subsequent tests.

B-21 Removal of Rejected and Unauthorized Work and Materials

- a) All work or materials which have been rejected shall be remedied, or removed and replaced by the Contractor in an acceptable manner and no compensation will be allowed for such removal, replacement, or remedial work.
- b) Any work done beyond the lines and grades shown on the plans or established by the Engineer or any extra work done without written authority will be considered as unauthorized work and will not be paid for. Upon order of the Engineer, unauthorized work shall be remedied, removed, or replaced at the Contractor's expense.
- c) Upon failure of the Contractor to comply with any order of the Engineer made under this Section, the District may cause rejected or unauthorized work to be remedied, removed or replaced, and may deduct the costs therefor from any monies due or to become due the Contractor.
- d) If following the installation of any equipment furnished hereunder, defects requiring correction by the Contractor are found, the District shall have the right to operate such unsatisfactory equipment and make reasonable use thereof until the equipment can be shut down for correction of defects without injury to the District.

B-22 Deductions for Uncorrected Work

If the Engineer deems it inexpedient to correct work damaged or not done in accordance with the Contract, an equitable deduction from the Contract price shall be made therefor, and such sum may be withheld by District from Contractor's payment.

B-23 Equipment and Plants

- a) If equipment is acquired by the contractor under this project and paid for by the District, the use and disposition of the equipment shall be in compliance with 2 CFR Section 200.313.
- b) Only equipment and plants suitable to produce the quality of work and materials required will be permitted to operate on the project.
- c) Plants will be designed and constructed in accordance with general practice for such equipment and shall be of sufficient capacity to insure the production of sufficient material to carry the Work to completion within the time limit.
- d) The Contractor shall provide adequate and suitable equipment and plants to meet the above requirements, and when ordered by the Engineer, shall remove unsuitable equipment from the Work and discontinue the operation of unsatisfactory plants.
- e) The Contractor shall identify each piece of its equipment, other than hand tools, by means of an identifying number plainly stenciled or stamped on the equipment at a conspicuous location, and shall furnish to the Engineer a list giving the description of each piece of equipment and its identifying number. In addition, the make, model number and empty gross weight of each unit of compacting equipment shall be plainly stamped or stenciled in a conspicuous place on the unit. The gross weight shall be either the manufacturer's rated weight or the scale weight.
- f) In the case of termination of this Contract before completion from any cause whatever, the Contractor, if notified to do so by the District, shall promptly remove any part or all of its equipment and supplies from the property of the District. If the Contractor fails to do so, the District shall have the right to remove such equipment and supplies at the expense of the Contractor.

B-24 Character of Worker

The Contractor shall employ only competent Subcontractors or skillful workers to do the work. If any Subcontractor, or person employed by the Contractor or any Subcontractor shall fail or refuse to carry out the directions of the District or its agents or shall appear to the District or its agents to be incompetent or to act in a disorderly or improper manner, it shall be removed from the project Work immediately on the requisition of the District or its agents, and such person shall not again be employed on the Work. Such discharge shall not be the basis for any claim for compensation or damages against the District, or any of its officers or agents.

B-25 Separate Contracts

The District reserves the right to let other contracts in connection with this work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate its work with the other contractor's work.

If any part of the Contractor's work depends for proper execution or results upon the work of any other contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such work that render it unsuitable for such proper execution and results. The Contractor's failure to inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of its work, except as to defects which may develop in the other contractor's work after the execution of its work.

To ensure the proper execution of its subsequent work, the Contractor shall measure work already in place and shall at once report to the Engineer any discrepancy between the executed work and the Drawings.

The District may perform additional Work related to the Project itself, or it may let other contracts

containing provisions similar to these. The Contractor will afford the other contractors who are parties to such contracts (or the District, if the District is performing the additional Work itself), reasonable opportunity for the introduction and storage of materials and equipment and the execution of Work and shall properly connect and coordinate his Work with theirs.

If the performance of additional Work by other contractors or the District is not noted in the Contract Documents prior to the execution of the Contract, written notice thereof shall be given to the Contractor prior to starting any such additional Work. If the Contractor believes that the performance of such additional Work by the District or others involves him in additional expense or entitles him to an extension of the Contract Time, he may make a claim therefore as provided in Section B-7 of this Contract.

B-26 Materials, Services and Facilities

- a) Unless otherwise specifically stated in the Contract Documents, the Contractor shall furnish all materials, labor, tools, equipment, water, light, power, transportation, supervision, temporary construction of any nature on all of the facilities necessary for the execution and completion of the Work. Unless otherwise specified, all materials shall be new and shall be manufactured, handled, and installed in a workmanlike manner to ensure completion of the Work in accordance with the Contract Documents. The Contractor shall, upon request of the Engineer, furnish satisfactory evidence as to the kind and quality of materials.
- b) Where materials are to be furnished by the District, the type, size, quantity and location at which they are available will be stated in the Contract Documents.
- c) Manufacturers' warranties, guarantees, instruction sheets and parts listed, which are furnished with certain articles or materials incorporated in the Work, shall be delivered to the Engineer before acceptance of the Contract.
- d) Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.
- e) Materials, supplies and equipment shall be in accordance with samples submitted by the Contractor and approved by the Engineer.
- f) Materials, supplies or equipment to be incorporated into the Work shall not be purchased by the Contractor or the Subcontractor subject to a chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller.
- g) The completed Work shall include all necessary permanent safety devices, such as machinery guards and similar ordinary safety items required by the State and Federal (OSHA) industrial safety authorities and applicable local and national codes. Further, any features of the Work subject to such safety regulations shall be fabricated, furnished, and installed in compliance with these requirements. Prior to performing Work specified herein, the Contractor shall request an inspection by a State Industrial Safety representative for the purpose of determining that the facilities provided are in compliance with the State and Federal safety requirements. Any facilities which are deemed necessary by official response following the above safety inspection shall be added or corrected as required as a part of the Contract Work. However, no payment will be made to the Contractor for such changes or additions to equipment furnished under this Contract since it is a requirement of these Specifications that such equipment be manufactured or fabricated in such a manner as to be in conformance with all Federal, State, and local safety requirements. The Contractor shall notify all manufacturers, equipment suppliers, and Subcontractors of the provisions of this article.
- h) In approving equipment for installation in the project, the District and Engineer assume no responsibility for injury or claims resulting from failure of the equipment to comply with applicable National, State, and local safety codes or requirements, or the safety requirements of a recognized agency, or failure due to faulty design concepts, or defective workmanship and materials.

- i) All materials incorporated into the job shall be new, especially purchased for the project unless otherwise specified or agreed in writing. Unless otherwise noted, any equipment offered shall be current modifications which have been in successful regular operation under comparable conditions for a period sufficient to determine the reliability of the product. This time requirement, however, does not apply to minor details nor to thoroughly demonstrated improvements in design or in materials of construction.
- j) Whenever the Contractor shall furnish materials or manufactured articles or shall do work for which no detailed specifications are set forth, the materials or manufactured articles shall be of the best grade in quality and workmanship obtainable in the market from firms of established good reputation, or, if not ordinarily carried in stock, shall conform to the usual standards of first-class materials or articles of the kind required with due consideration of the use to which they are to be put. In general, the work performed shall be in full conformity and harmony with the intent to secure the best standard of construction and equipment of the work as a whole or in part.
- k) If there is a residual inventory of unused supplies exceeding \$5,000 in total fair market value upon completion of the Project, and if the supplies are not needed for any other federally sponsored programs or projects, the Contractor shall notify the District and provide unused supplies to the location and at the time arranged, for unloading and storage. The District shall compensate the grant awarding agency for its share (2 CFR Section 200.314).

B-27 Storage of Materials

Materials shall be so stored as to ensure the preservation of their quality and fitness for the Work. When considered necessary, they shall be placed on wooden platforms or other hard, clean surfaces, and not on the ground, and they shall be placed under cover. Stored materials shall be located so as to facilitate prompt inspection. Private property shall not be used for storage purposes without the written permission of the owner or lessee.

Electrical equipment, devices, and motors shall be placed in dry and warm storage as approved by the Engineer.

All equipment and materials which are not to be painted (such as aluminum and stainless steel) and all factory finished or coated equipment and materials which are not to be painted, that are installed prior to completion of adjacent work, shall be completely covered and protected.

Articles or materials to be incorporated in the Work shall be stored in such a manner as to ensure the preservation of their quality and fitness for the Work, and to facilitate inspection.

B-28 Trade Names and Alternatives

For convenience in designation in the Specifications and Plans, certain articles or materials to be incorporated in the Work may be designated under a trade name or the name of a manufacturer and its catalog information. The use of an alternative article or material which is of equal quality and of the required characteristics for the purpose intended will be permitted, subject to the following requirements:

- a) The burden of proof as to the quality and suitability of alternatives shall be upon the Contractor and it shall furnish all information necessary as required by the Engineer. The Engineer shall be the sole judge as to the quality and suitability of alternative articles or materials and its decision shall be final.
- b) Whenever the Specifications and Plans permit the substitution of a similar or equivalent material or article, no tests or action relating to the approval of such substitute material or article will be made until the request for substitution is made in writing by the Contractor accompanied by complete data as to the equality of the material or article proposed. Such request by the Contractor must be made within thirty-five (35) calendar days after award of Contract.

B-29 Certificate of Compliance

- a) A Certificate of Compliance shall be furnished prior to the use of any materials for which the Technical Specifications require that such a certificate be furnished. In addition, when so authorized in the Specifications, the Engineer may permit the use of certain materials or assemblies prior to sampling and testing if accompanied by a Certificate of Compliance. The Certificate shall be signed by the manufacturer of the material or the manufacturer of assembled materials and shall state that the materials involved comply in all respects with the requirements of the Contract. A Certificate of Compliance shall be furnished with each lot of material delivered to the Work and the lot so certified shall be clearly identified in the Certificate.
- b) All materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The fact that material is used on the basis of a Certificate of Compliance shall not relieve the Contractor of responsibility for incorporating material in the Work which conforms to the requirements of the Contract Documents and any such material not conforming to such requirements will be subject to rejection whether in place or not.
- c) The District reserves the right to refuse to permit the use of material on the basis of a Certificate of Compliance.
- d) The form of the Certificate of Compliance and its disposition shall be as directed by the Engineer.

B-30 Assignment

The Contractor shall not assign the Contract or sublet it as a whole or in part without the prior written consent of the District, nor shall the Contractor assign any monies due, or to become due to it hereafter, without the prior written consent of the District.

B-31 Use of Completed Portions, Right to Operate Unsatisfactory Equipment or Facilities

- a) The District may, at any time, and from time to time, during the performance of the Work, enter the work site for the purpose of installing any necessary work by the District labor or other contracts, and for any other purpose in connection with the installation of facilities. In doing so, the District shall endeavor not to interfere with the Contractor and the Contractor shall not interfere with other work being done by or on behalf of the District.
- b) If, prior to completion and final acceptance of all the Work, the District takes possession of any structure or facility (whether completed or otherwise) comprising a portion of the Work with the intent to retain possession thereof (as distinguished from temporary possession contemplating the return to the Contractor), then, while the District is in possession of the same, the Contractor shall be relieved of liability for loss or damage to such structure other than that resulting from the Contractor's fault or negligence. Such taking of possession by the District shall not relieve the Contractor from any provisions of this Contract respecting such structure, other than to the extent specified in the preceding sentence, nor constitute a final acceptance of such structure or facility.
- c) If, following installation of any equipment or facilities furnished by the Contractor, defects requiring correction by the Contractor are found, the District shall have the right to operate such unsatisfactory equipment or facilities and make reasonable use thereof until the equipment or facilities can be shut down for correction of defects without injury to the District.

B-32 Lands for Work, Right-of-Way Construction Roads

- a) The District will provide the lands, easements, and/or rights-of-way necessary or other rights to enter and work on lands necessary for the performance of the Work. Other permits and licenses are addressed by sections B-13 and B-49. Should the Contractor find it advantageous to use any additional land for any purpose whatsoever, the Contractor shall provide for the use of such land at

its expense. The Engineer shall be furnished with a copy of written agreements or otherwise be notified in writing of additional working space which is acquired. Nothing herein contained and nothing marked on the Plans shall be interpreted as giving the Contractor exclusive occupancy of the territory provided by the District. When two or more contracts are being executed at one time on the same or adjacent land in such a manner that work on one contract may interfere with that on another, the Engineer shall decide which contractor shall cease work, and which shall continue, or whether the work on both contracts shall progress at the same time and in what manner, and the decision of the Engineer shall be final and binding. When the territory of one contract is the necessary or convenient means of access for the performance of another contract, such privilege of access or any other reasonable privilege may be granted by the Engineer to the contractor so desiring, to the extent, amount, in the manner, and at the time permitted. No such decision as to the method or time of conducting the work or the use of territory shall be the basis of any claim for delay or damage.

- b) Lands, easements or rights-of-way to be furnished by the District for construction operations will be defined by the District or shown on the Plans prior to the start of work.
- c) The Contractor shall construct and maintain all roads necessary to reach the various parts of the Work and for the transportation thereto of construction material and personnel. The cost of constructing and maintaining such roads shall be borne by the Contractor.

B-33 District's Right to Audit and Preservation of Records

- a) The District is responsible for obtaining audits in accordance with the Single Audit Act of 1996, in compliance with 2 CFR Section 200 Subpart F. The Contractor shall facilitate the completion of such an audit as it relates to the Contractor's work on this project.
- b) The Contractor shall maintain books, records and accounts of all costs in accordance with generally accepted accounting principles and practices. The District, the Comptroller General of the United States, State of California, and its authorized representatives shall have the right to audit the books, records and accounts of the Contractor under any of the following conditions:
 - (i) The Contract is terminated for any reason in accordance with the provisions of the Contract Documents in order to arrive at equitable termination costs;
 - (ii) In the event of a disagreement between the Contractor and the District over the amount due the Contractor under the terms of the Contract;
 - (iii) To check or substantiate any amounts invoiced or paid which are required to reflect the costs of the Contractor, or the Contractor's efficiency or effectiveness under this Contract or in connection with extras, changes, claims, additions, backcharges, or others, as may be provided for in this Contract; and/or
 - (iv) If it becomes necessary to determine the District's rights and the Contractor's obligations under the Contract or to ascertain facts relative to any claim against the Contractor which may result in a charge against the District;
 - (v) To determine any difference in cost occasioned by a permissible substitution;
 - (vi) To make audits, examinations, excerpts, and transcriptions pertinent to the loan financing on this project.
 - (vii) For any other reason in the District's sole judgment.
- c) If any of the conditions stated in paragraph B-33(a) are satisfied, Contractor shall provide the District (or its representatives), unlimited, reasonable access during working hours to the Contractor's books and records under the conditions stated above. The District's audit rights shall be liberally construed in the District's favor.
- d) The Contractor, from the effective date of final payment or termination hereunder, shall preserve and make available to the District for a period of three (3) years thereafter, at all reasonable times

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at the office of the Contractor (but without any charge to the District), all its books, records, documents, photographs, micro-photographs, and other evidence bearing on the costs and expenses of the Contractor under this Contract and relating to the Work hereunder.

- e) In accordance with 2 CFR Section 200.512, financial and programmatic records related to expenditure of funds on grant-supported projects shall be maintained at least 3 years following the date the grantee submits its final expenditure report on the project.
- f) The District will make all payments required of it under this Contract subject to audit, under circumstances stated above, which audit may be performed at the District's option, either during the Contract time period or during the record retention time period. Regardless of authorization, approval or acceptance, signatures or letters which are given by the District and are part of the District's control systems or are requested by the Contractor, the payments made under this Contract shall not constitute a waiver or agreement by the District that it accepts as correct the billings, invoices or other charges on which the payments are based. If the District's audit produces a claim against the Contractor, the District may pursue all its legal remedies even though it has made all or part of the payments required by this Contract.
- g) If any audit by the District or its representative discloses an underpayment by the District pursuant to the terms of the Contract Documents, the District shall have the duty to pay any amount found by the audit to be owed to the Contractor. If such audit discloses an overpayment, the Contractor shall have the obligation to reimburse the District for the amount of the overpayment. The District's right to claim reimbursement from the Contractor of any overpayment shall not be terminated or waived until three years after the completion of the District's audit or upon the termination of audit rights under subparagraph B-33(d), whichever date is later. The obligation of the Contractor to make reimbursements hereunder shall not terminate except as provided by law.

The District's right to audit and the preservation of records shall terminate at the end of three (3) years after the date final payment is made or termination of the Contract. The Contractor shall include this "Right to Audit and Preservation of Records" clause in all subcontracts issued by it shall require the same to be inserted by all lower tier Subcontractors in their subcontracts, for any portion of the Work. Should Contractor fail to include this clause in any such contract or lower tier contract, or otherwise fail to ensure the District's rights hereunder, Contractor shall be liable to the District for all costs, expenses and attorney's fees which the District may have to incur obtaining or attempting to obtain an audit or inspection of or the restoration of records which otherwise have been available to the District from said persons under this clause. Such audit may be conducted by the District or its authorized representative.

ARTICLE III. PROGRESS AND COMPLETION OF WORK

B-34 Progress Schedule

The Contractor shall submit to the District such schedules of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data, where applicable, as are required by the Contract Documents for the Work to be performed.

Prior to the first partial payment estimate, the Contractor shall submit construction progress schedules showing the order in which it proposes to carry on the Work, including dates at which it will start the various parts of the Work, estimated date of completion of each part and as applicable:

- a) The dates at which special detail drawings will be required; and
- b) Respective dates for submission of shop drawings, the beginning of manufacture, the testing and the installation of materials, supplies, and equipment.
- c) The Contractor shall also submit a schedule of payments that it anticipates it will earn during the course of the Work.

The progress schedules shall be submitted regularly and shall cover a time period satisfactory to the Engineer. The Contractor shall also forward to the Engineer, with the request for progress payment each month, a summary report of the progress of the various parts of the Work under the Contract in the shops and in the field, stating the existing status, rate of progress, estimated time of completion, and cause of delay, if any. If the Work is behind the submitted schedule, the Contractor shall submit in writing a plan acceptable to the District and Engineer for bringing the Work up to schedule.

B-35 Commencement and Progress of the Work and Time of Completion

Prior to the start of construction, the District will conduct a preconstruction conference. At the conference, the District will review the planned development with the Engineer, Contractor, and other interested parties. Items to be reviewed include materials, equipment, rights-of-way, schedules and all arrangements for prosecuting the Work.

The Contractor shall begin work within twenty-one (21) calendar days after receiving a Notice to Proceed and shall diligently prosecute the work to completion within three hundred thirty (330) calendar days thereafter. Engineer shall have the right to specify the locations where Contractor shall start and proceed with the Work.

B-36 Suspension of Work

- a) The Engineer may at any time, by notice in writing to the Contractor, suspend any part of the Work for such period of time as may be necessary to prevent improper execution of the Work on the project by the Contractor, its Subcontractors or agents, and the Contractor shall have no claim for damages or additional compensation on account of any such suspension.
- b) The District may at any time suspend any part or all of the Work upon ten (10) calendar days written notice to the Contractor, who shall thereupon discontinue all Work suspended except for all operations to prevent loss or damage to Work already executed as may be directed by the Engineer. In the event a part of the Work is suspended, the Contractor, if the suspension is not through its fault or the fault of its Subcontractors or agents, shall be paid on the same basis as Extra Work for costs of work performed in accordance with such orders of the Engineer during such suspension, provided that this shall not include any cost pertaining to Work not suspended by said notice. Work shall be resumed by the Contractor after such suspension on written notice from the District. In the event of suspension of the entire Work by the District, the Contractor, if the suspension is not through fault of the Contractor or the fault of its Subcontractors or agents, shall

be paid the sum of \$500.00 for each calendar day during which the entire Work shall have been suspended. Said sum is hereby mutually agreed upon as fixed and liquidated damages in full settlement of all costs and expenses, losses and damages resulting to the Contractor from such suspension. Work shall be resumed by the Contractor after such suspension on written notice from the District.

- c) In the event of any suspension of the Work in whole or in part under subsection (b) above, the Contractor shall be entitled to an extension of time wherein to complete the Work to the extent of the delay caused the Contractor thereby.
- d) In the event the entire Work shall be suspended by order of the District, as hereinabove provided, and shall remain so suspended for a period of sixty (60) consecutive calendar days, through no fault of the Contractor, and notice to resume the Work shall not have been served on the Contractor as hereinabove provided, Contractor may, at its option, by written notice to the District, terminate the Contract in the same manner as if the termination had been initiated by the District, and the District shall have no claim for damages because of such termination of the Contract.
- e) If, through no act or fault of the Contractor, the Work is suspended for a period of more than ninety (90) calendar days by the District or under an order of Court or other public authority, or the Engineer fails to act on any request for payment within thirty (30) calendar days after it is submitted, or the District fails to pay the Contractor substantially the sum approved by the Engineer or any final award by arbitration or litigation within sixty (60) calendar days of its approval and presentation, then the Contractor may, after ten (10) calendar days from delivery of a written notice to the District and the Engineer, terminate the Contract and recover from the District payment for all Work executed and all expenses sustained.

In addition and in lieu of terminating the Contract, if the Engineer has failed to act on a request for payment or if the District has failed to make any payment as aforesaid, the Contractor may upon ten (10) calendar days written notice to the District and the Engineer stop the Work until he has been paid all amounts then due, in which event and upon resumption of the Work, Change Orders shall be issued for adjusting the Contract Price or extending the Contract Time or both to compensate for the costs and delays attributable to the stoppage of the Work.

If the performance of all or any portion of the Work is suspended, delayed, or interrupted as a result of a failure of the District or Engineer to act within the time specified in the Contract Documents, or if no time is specified, within a reasonable time, an adjustment in the Contract Price or an extension of the Contract Time, or both, shall be made by Change Order to compensate the Contractor for the costs and delays necessarily caused by the failure of the District or Engineer.

If the Contractor intends to file a claim for additional compensation for a delay caused by the District or Engineer at a particular time, the Contractor shall file a Notice of Claim with the District within seven (7) calendar days of the beginning of the occurrence. The Notice of Claim shall be in duplicate, in writing, and shall state the circumstances and the reasons for the Claim, but need not state the amount. No Claim for additional compensation will be considered unless a Notice of Claim has been filed with the District within the time and in the manner stated above. Contractor's failure to file a claim shall constitute a waiver.

B-37 Termination For Default - Damages For Delay - Timely Extension

- a) The Contractor shall at all times employ such force, plant, materials, and tools as will be sufficient, in the opinion of the Engineer, to prosecute the Work at not less than the rates fixed under the terms of the Contract and to complete the Work or any part thereof within the time limits fixed therein. If the Contractor refuses or fails to prosecute the Work, or any separable part thereof, with such diligence as will ensure the completion within the time specified in the Contract, or any

extension thereof, or fails to complete said Work within such time, the District may, after giving ten (10) calendar days written notice to the Contractor, terminate its right to proceed with the Work or such part of the Work as to which there has been delay.

- b) The Contractor's right to proceed shall not be so terminated nor the Contractor charged with resulting damage if:
 - (i) The delay in the completion of the Work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to Acts of God, acts of the public enemy, acts of the District, acts of another contractor in the performance of a Contract with the District, fires, floods, excluding site flooding due to groundwater, epidemics, quarantine restrictions, unusually severe weather, as determined by the Engineer; and
 - (ii) The Contractor shall, within 48 hours of the start of the occurrence, give notice to the District of the cause of the potential delay and an estimate of the possible time extension involved. The Contractor, within seven (7) calendar days from the beginning of any such delay (unless the Engineer grants further period of time before the date of final payment under the Contract), notifies the Engineer in writing of the causes of delay and requests an extension of time.
 - (iii) The Engineer shall ascertain the facts and the extent of the delay and extend the time for completing the Work when, in its judgment, the findings of fact justify such an extension, and its findings of fact shall be final and conclusive on the parties.
- c) A request for an extension of time, or the granting of an extension of time, shall not constitute a basis for any claim against the District for additional compensation or damages unless caused by the District or another contractor employed by the District.
- d) If the Contractor should be adjudged bankrupt, or if it should make a general assignment for the benefit of its creditors, or if a receiver should be appointed for the Contractor on account of its insolvency and not be discharged within ten (10) calendar days after its appointment, or if the Contractor should fail to make prompt payments to Subcontractors or suppliers, or should it persistently disregard laws, ordinances, or the instructions of the Engineer, or otherwise commit a substantial violation of any provisions of the Contract, the District may, after giving ten (10) calendar days written notice to the Contractor, terminate the Contract and the Contractor's right to proceed with the Work.
- e) No extension of time will be considered for time lost due to weather conditions normal to the area. Unusual weather conditions, if determined by the Engineer to be of a severity that could not be predicted, may be considered as cause for an extension of Contract completion time.
- f) Delays in delivery of equipment or material purchased by the Contractor or his Subcontractors shall not be considered as a just cause for delay. The Contractor shall be fully responsible for the timely ordering, scheduling, expediting delivery, and installation of all equipment and materials.
- g) The rights and remedies of the District provided in this section are in addition to any of the rights and remedies provided by law or under this Contract.
- h) In addition to the District's rights under this section, if at any time before completion of the work under the Contract, it shall be determined by the District that reasons beyond the control of the parties hereto render it impossible or against the interests of the District to complete the Work, or if the Work shall be stopped by an injunction of a court of competent jurisdiction or by order of any competent authority, the District may, upon ten (10) calendar days written notice to the Contractor, discontinue the Work and terminate the Contract. Upon service of such notice of termination, the Contractor shall discontinue the Work in such manner, sequence, and at such times as the Engineer may direct. The Contractor shall have no claim for damages for such discontinuance or

termination, nor any claim for anticipated profits on the Work thus dispensed with, nor any other claim except for the Work actually performed up to the time of discontinuance, including any extra work ordered by the Engineer to be done, nor for any claim for liquidated damages in accordance with the provisions of Section B-39.

B-38 Rights of District Upon Termination

- a) In the event the right of the Contractor to proceed with the Work, or any portion thereof, has been terminated because of the fault of the Contractor and the Contractor has been given ten (10) calendar days' notice to cure such fault and has not done so, the District may take over the Work and prosecute the same to completion by contract or any other method the District deems expedient, and may take possession of and utilize in completing the Work such materials, appliances, equipment and plant as may be on the site of the Work and necessary therefor. Whether or not the Contractor's right to proceed with the Work is terminated, it and its sureties shall be liable for all damages including costs of managerial and administrative services, engineering, legal and other consultant fees, sustained or incurred by the District in enforcing the provisions of Section B-37 and in completing or causing to complete the Contract Work.
- b) Upon termination the Contractor shall not be entitled to receive any further payment until the Work is finished. If upon completion of the Work the total cost to the District, including engineering, legal and other consultant fees, costs of managerial and administrative services, construction costs, and liquidated damages shall be less than the amount which would have been paid if the Work had been completed by the Contractor in accordance with the terms of the Contract, then the difference shall be paid to the Contractor in the same manner as the final payment under the Contract. If the total cost incurred by the District on account of termination of the Contract and subsequent completion of the Work by the District by whatever method the District may deem expedient shall exceed said amount which the Contractor would otherwise have been paid, the Contractor and its sureties shall be liable to the District for the full amount of such excess expense.
- c) The rights and remedies of the District provided in this section are in addition to any of the rights and remedies provided by the law or under this Contract.

B-39 Failure to Complete the Work in the Time Agreed Upon - Liquidated Damages

- a) **Liquidated Damages** - It is agreed by the parties to the Contract that time is of the essence; and that in case all the Work is not completed before or upon the expiration of the time limit as set in the Bid, Contract and Progress Schedule, or within any time extensions that may have been granted, damage will be sustained by the District; and that it may be impracticable to determine the actual amount of damage by reason of such delay; and it is, therefore, agreed that the Contractor shall pay to the District as damages the amount of \$750.00 per day for each and every day's delay in finishing the Work in excess of the number of days specified. The parties expressly agree that this liquidated damage clause is reasonable under the circumstances existing at the time the Contract was made. The District shall have the right to deduct the amount of liquidated damages from any money due or to become due the Contractor.
- b) In addition, the District shall have the right to charge to the Contractor and to deduct from the final or progress payments for the Work the actual cost to the District of legal, engineering, inspection, superintendence, and other expenses, which are directly chargeable to the Contract and which accrue during the period of such delay, except that the cost of final inspection and preparation of the final estimate shall not be included in the charges.
- c) **Exclusions** - Notwithstanding the provisions of subsection (a), the Contractor shall not be liable for liquidated damages or delays caused by the removal or relocation of utilities when such removal or relocation is the responsibility of the District or the owner of the utility under Government Code Section 4215.

B-40 Clean-up

During the progress of the Work, the Contractor shall maintain the site and related structures and equipment in a clean, orderly condition and free from unsightly accumulation of rubbish. Upon completion of Work and before the final estimate is submitted, the Contractor shall at its own cost and expense remove from the vicinity of the Work all plants, buildings, rubbish, unused work materials, concrete forms, and other like materials, belonging to it or used under its direction during the construction, and in the event of its failure to do so, the same may be removed by the District after ten (10) calendar days' notice to the Contractor, such removal to be at the expense of the Contractor. Areas crossed during construction shall be restored by the Contractor to the complete satisfaction of the Engineer, at the Contractor's expense.

ARTICLE IV. LEGAL RELATIONS AND RESPONSIBILITY

B-41 Compliance with Laws - Permits, Regulations, Taxes

Contractor is an independent contractor and shall at its sole cost and expense comply with all laws, rules, ordinances and regulations of all governing bodies having jurisdiction over the Work, obtain all necessary permits and licenses therefor, pay all manufacturers' taxes, sales taxes, use taxes, processing taxes, and all Federal and State taxes, insurance and contributions for social security and unemployment which are measured by wages, salaries or any remuneration paid to Contractor's employees, whether levied under existing or subsequently enacted laws, rules, or regulations. Contractor shall also pay all property tax assessments on materials or equipment used until acceptance by the District. If any discrepancy or inconsistency is discovered in the Plans or Specifications, or in this Contract in relation to any such law, rule, ordinance, regulation, order or decree, the Contractor shall forthwith report the same to the Engineer in writing. It shall also protect and indemnify the District, the Engineer, and all of the District's officers, agents, and servants against any claim or liability arising from or based upon the violation of any such law, rule, ordinance, regulation, order or decree, whether by the Contractor itself or by its employees. Particular attention is called to the following:

- a) Without limitation, materials furnished and performance by Contractor hereunder shall comply with Safety Orders of the Division of Industrial Safety, State of California, Federal Safety regulations of the Bureau of Labor, Department of Labor; and any other applicable Federal regulations.

The Contractor, upon request, shall furnish evidence satisfactory to the District and Engineer that any or all of the foregoing obligations have been or are being fulfilled. The Contractor warrants to the District that it is licensed by all applicable governmental bodies to perform this Contract and will remain so licensed throughout the progress of the Work, and that it has, and will have, throughout the progress of the Work, the necessary experience, skill and financial resources to enable it to perform this Contract.

Government code section references shall be interpreted to be the most recent applicable version.

B-42 Prevailing Wage

- a) The Contractor shall forfeit as penalty to the District the sum of Two Hundred Dollars (\$200) for each calendar day or portion thereof for each worker (whether employed by the Contractor or Subcontractor) paid less than the stipulated prevailing rates for any Work done under the Contract in violation of the provisions of the Labor Code and in particular, Section 1775.
- b) The District will not recognize any claims for additional compensation because of the payment of the wages set forth in the Contract Documents. The possibility of wage increases is one of the elements to be considered by the Contractor in determining its proposal, and will not under any circumstances be considered as the basis of a claim against the District or the Engineer.
- c) The Contractor shall at all times keep posted at the jobsite current wage rates in effect for this Work.
- d) This is a Public Works Project funded with Federal (FEMA) and District funds. Therefore both CA State prevailing wage rates and Federal wage rates will be required on this project, whichever wages are higher. The District requires that all contractors and subcontractors working on this project keep certified payroll records in accordance with California Labor Code 1776 and submit copies to the District.
 - (i) In accordance with the provisions of section 1720 et seq. of the Labor Code, the Division of Labor Standards and Research has determined the general prevailing rates or wages and employer payments for health and welfare, pension, vacation, travel time, and subsistence pay as provided for in section 1773.8.

- (ii) It shall be mandatory upon the Contractor herein and upon any Subcontractor to pay not less than the said specified rates to all laborers, workers and mechanics employed by them in the execution of the Agreement pursuant to CA Labor Code 1774.
- (iii) Attention is directed to the provisions in section 1777.5 and sections 1777.6 of the Labor Code concerning the requirement to employ apprentices by the Contractor or any Subcontractor under it. The Contractor shall submit documentation to the District confirming compliance with these requirements.
- (iv) The Contractor shall comply with and shall cause his subcontractors to comply with all laws and regulations governing the contractor's and subcontractor's performance on this project including, but not limited to: anti-discrimination laws, workers' compensation laws, and prevailing wage laws as set forth in CA Labor Code, Sections 1720-1861 et seq. and licensing laws, as well as Federal Labor Standards set forth in the Davis-Bacon Act (40 USC 276(a-a5), the Copeland "Anti-Kickback" Act (40 USC 276(c); and the Contract Work Hours and Safety Standards Act (CWHSSA) (40 USC 327-333). The contractor is required to include the prevailing wage language in all subcontracts pursuant to CA Labor Code 1775(E)(b)(1). The Contractor shall post, at appropriate conspicuous points on the site of the Project, a schedule showing all the determined general prevailing wage rates.
- (v) The Contractor agrees to comply with Labor Code Section 1775 (Payment of the Prevailing Wage Rates) and Labor Code 1776 (keeping accurate records) and Labor Code 1777.5, placing responsibility for compliance with the statutory requirements for all apprenticeable occupations on the prime contractor. The Contractor shall comply with the requirements imposed by the California Labor Code Sections 1720 through 1861 regarding public works projects and prevailing wage laws and sections 16000-16800 of the CA Code of Regulations.
- (vi) Each worker needed to execute the work must be paid travel and subsistence payments as defined in the applicable collective bargaining agreements filed in accordance with Labor Code Section 1773.8.
- (vii) Holiday and overtime work when permitted by law shall be paid for at a rate of at least one and one-half times the above specified rate of per diem wages, unless otherwise specified.
- (viii) Contractors and any Subcontractors shall be assessed penalties for violating the following labor codes; CA Labor Code 1813 for overtime, 1775 for underpayment of the prevailing wage, and 1776 for inaccurate or incomplete payroll records.

B-43 Labor Compliance and Discrimination

Pursuant to Labor Code section 1771.4, the Contract for this Project is subject to compliance monitoring and enforcement by the California Department of Industrial Relations.

- a) On each job site that is subject to compliance monitoring and enforcement by the Department of Industrial Relations under this subchapter, the prime contractor shall post a Notice containing the following language:

"This public works project is subject to monitoring and investigative activities by the Division of Labor Standards Enforcement (DLSE), Department of Industrial Relations, State of California. This Notice is intended to provide information to all workers employed in the execution of the contract for public work and to all contractors and other persons having access to the job site to enable the DLSE to ensure compliance with and enforcement of prevailing wage laws on public works projects."

"The prevailing wage laws require that all workers be paid at least the minimum hourly wage as determined by the Director of Industrial Relations for the specific classification (or type of work) performed by workers on the project. These rates are listed on a separate job site posting of minimum prevailing rates required to be maintained by the public entity which awarded the public works contract. Complaints concerning nonpayment of the required minimum wage rates to workers on this project may be filed with the DLSE."

Humboldt Bay Municipal Water District
12 kV Switchgear Relocation Project

Local Office Contact Information:

Telephone Number: 844-522-6734
Address: BOFE – Public Works
Attn: Complaints Unit
2031 2031 Howe Ave, Suite 100
Sacramento, CA 95825

“Complaints should be filed in writing immediately upon discovery of any violations of the prevailing wage laws due to the short period of time following the completion of the project that the DLSE may take legal action against those responsible.”

“Complaints should contain details about the violations alleged (for example, wrong rate paid, not all hours paid, overtime rate not paid for hours worked in excess of 8 per day or 40 per week, etc) as well as the name of the employer, the public entity which awarded the public works contract, and the location and name of the project.”

“For general information concerning the prevailing wage laws and how to file a complaint concerning any violation of these prevailing wage laws, you may contact any DLSE office. Complaint forms are also available at the Department of Industrial Relations website found at www.dir.ca.gov/dlse/PublicWorks.html.”

Attention is directed to Section 1735 of the Labor Code, which reads as follows:

- a) No discrimination shall be made in the employment of persons upon public works because of the race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender expression, age, sexual orientation, or military and veteran status of such persons, except as provided in Section 12940 of the Government Code, and every Contractor for public works violating this section is subject to all the penalties imposed for a violation of this chapter.

Federal Equal Opportunity Clauses from 41 CFR 60 1.4(b) also apply. See Part 4 for detailed outline of Federal requirements. See Part 5 for required Non-discrimination Form.

B-44 Eight-Hour Day Limitation

- a) In accordance with the provisions of the Labor Code, and in particular, Sections 1810 to 1815 thereof, inclusive, eight hours labor shall constitute a day's work, and no worker, in the employ of said Contractor, or any Subcontractor, doing or contracting to do any part of the Work contemplated by this Contract, shall be required or permitted to work more than eight (8) hours in any one calendar day and forty (40) hours in any one calendar week in violation of those provisions; provided that subject to Labor Code Section 1815, a worker may perform work in excess of either eight (8) hours per day or forty (40) hours during any one week upon compensation for all hours worked in excess of eight (8) hours per day or forty (40) hours during any one week at not less than one and one-half times the basic rate of pay.
- b) The Contractor and each Subcontractor shall also keep an accurate record showing the names, addresses, social security numbers, work classifications, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by the Contractor and by the Subcontractor in connection with the work specified herein, which record shall be open at all reasonable hours to the inspection of the District, State and Federal officers and agents; and it is hereby further agreed that, except as provided in (a) above, the Contractor shall forfeit as a penalty to the District the sum of one hundred dollars (\$100) for each worker employed in the performance of this Contract by it or by any Subcontractor under it for each calendar day during which such worker is required or permitted

to labor more than eight (8) hours in any one calendar day and forty (40) hours in any one calendar week in violation of Sections 1810 through 1815.

B-45 Compliance with State Requirements for Employment of Apprentices

The Contractor's attention is directed to Section 1777.2 through 1777.5 of the Labor Code; provisions of those Sections pertaining to employment of registered apprentices are hereby incorporated by reference into these Specifications. As applicable, the Contractor or any Subcontractor employed by it in the performance of the Contract work shall take such actions as necessary to comply with the provisions of Section 1777.5. Contractor shall provide the District copies of applicable forms or equivalent: DAS 140 – Public Works Contract Award Information; CAC2 – Training Fund Contributions; and any other communications relating to apprentices on public works projects. Contractor shall be solely liable for any and all fines assessed by the DIR or other agency or entity for non-compliance with any prevailing wage requirements.

B-46 Underground Utilities

In accordance with Government Code Section 4215, the Contractor shall be compensated for the costs of locating, repairing damage not due to the failure of the Contractor to exercise reasonable care, and removing or relocating existing main or trunkline utility facilities not indicated in the Contract Plans and Specifications with reasonable accuracy, and for the equipment on the project necessarily idled during such work; provided that the Contractor shall first notify the Engineer before commencing work on locating, repairing damage to, removing or relocating such utilities.

B-47 Water Pollution

The Contractor shall exercise every reasonable precaution to protect streams, lakes, reservoirs, and other waters of the state and/or United States from pollution with fuels, oils, bitumens, calcium chloride, and other harmful materials and shall conduct and schedule its operations so as to avoid or minimize muddying and silting of said streams, lakes, reservoirs, and water bodies. Care shall be exercised to preserve vegetation beyond the limits of construction. The Contractor shall comply with Section 5650 of the California Fish and Wildlife Code, State of California Construction General Permit, and all other applicable statutes and regulations relating to the prevention and abatement of water pollution.

B-48 Payment of Taxes

The Contract prices paid for the Work shall include full compensation for all taxes which the Contractor is required to pay, whether imposed by Federal, State, or local governments.

B-49 Permits and Licenses

Except as otherwise provided in this Contract, the Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the lawful prosecution of the Work.

Procurement procedures shall be in conformance with 2 CFR Section 200.320.

B-50 Patents

The Contractor shall pay all applicable royalties and license fees and assume all costs arising from the use of patented materials, equipment and devices. The Contractor shall defend all suits or claims for infringement of any patent rights and save the District and Engineer and their duly authorized representatives harmless from loss on account thereof, except that the District shall be responsible for any such loss when a particular process, design, or the product of a particular manufacturer or manufacturers is specified; however if the Contractor has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Engineer.

Humboldt Bay Municipal Water District
12 kV Switchgear Relocation Project

This project is funded by a Federal Emergency Management Agency (FEMA) Grant. As such, in accordance with 2 CFR Section 200.315, FEMA reserves a royalty-free, nonexclusive, and irrevocable license to reproduce, publish or otherwise use, and to authorize others to use, for Federal Government purposes:

- a) The copyright in any work developed under a grant, subgrant, or contract under a grant or subgrant; and
- b) Any rights of copyright to which a grantee, subgrantee or a contractor purchases ownership with grant support.

B-51 Public Convenience

- a) This section defines the Contractor's responsibility with regard to convenience of the public and public traffic in connection with its operations.
- b) The Contractor shall so conduct its operations as to offer the least possible obstruction and inconvenience to the public and it shall have under construction no greater length or amount of work than it can prosecute properly with due regard to the rights of the public.
- c) Spillage resulting from hauling operations along or across any publicly traveled way shall be removed immediately by the Contractor at the Contractor's expense.
- d) Construction operations shall be conducted in such a manner as to cause as little inconvenience as possible to abutting property owners.
- e) Water shall be supplied if ordered by the Engineer for the alleviation or prevention of dust nuisance as provided in the Contract Documents.

B-52 Safety

- a) General - The Contractor shall be solely and completely responsible for the conditions of the job site, including safety of all persons and property during performance of the Work. This requirement shall apply continuously and not be limited to normal working hours. Safety provisions shall conform to all applicable Federal, State, and local laws, ordinances, and codes, and to the rules and regulations established by the California Division of Industrial Safety, and to other rules of law applicable to the Work.
- b) The services of the Engineer in conducting construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's work methods, equipment, bracing or scaffolding or safety measures, in, on, or near the construction site, and shall not be construed as supervision of the actual construction nor make the Engineer or the District responsible for providing a safe place for the performance of work by the Contractor, Subcontractors, or suppliers; or for access, visits, use work, travel or occupancy by any person.
- c) The Contractor shall carefully instruct all personnel working in potentially hazardous work areas as to the potential dangers and shall provide such necessary safety equipment and instruction as is necessary to prevent injury and damage to property. The Contractor shall appoint for the duration of this Contract, a qualified supervisor employee to develop and/or supervise the Contractor's job safety program that will effectively implement the safety provisions of the above agencies.
- d) The Contractor, as a part of its safety program, shall maintain at its office or other well-known place at the job site, safety equipment applicable to the Work as prescribed by the aforementioned authorities, all articles necessary for giving first aid to the injured, and shall establish the procedure for the immediate removal to a hospital or a doctor's care of persons (including employees) who may be injured on the job site.

- e) If death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the Engineer and the District. In addition, the Contractor must promptly report in writing to the Engineer all accidents whatsoever arising out of, or in connection with, the performance of the Work whether on, or adjacent to, the site, giving full details and statements of witnesses.
- f) If any claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Engineer, giving full details of the claim.
- g) All work and materials shall be in strict accordance with all applicable State, Federal, and local laws, rules, regulations, and codes.
- h) Nothing in this Contract is to be construed to permit work not conforming to governing law. When Contract Documents differ from governing law, the Contractor shall furnish and install the higher standards called for without extra charge. All equipment furnished shall be grounded and provided with guards and protection as required by safety codes. Where vapor-tight or explosion-proof electrical installation is required by law, this shall be provided.
- i) Trenching and Worker Protection - In accordance with Section 6705 of the State Labor Code, the Contractor shall submit to the District specific plans to show details of provisions for worker protection from caving ground. Not less than thirty (30) calendar days before beginning excavation for any trench or trenches five (5) feet or more in depth required under this Contract, the Contractor shall furnish to the Engineer working drawings of its trench safety plan. The trench safety plan working drawings shall be detailed plans showing the design of shoring, bracing, sloping or other provisions to be made for worker protection from the hazard of caving ground. If such plan varies from the shoring system standards established by the Construction Safety Orders of the California Department of Industrial Relations or the Federal Safety and Health Regulations for Construction of the Occupational Safety and Health Administration, Department of Labor, the plan shall be prepared by a registered civil or structural engineer. In no event shall the Contractor use a shoring, sloping, or protective system less effective than that required by said Construction Safety Orders, or less effective than that required by said Federal Safety and Health Regulations for Construction. Submission of this plan in no way relieves the Contractor from the requirement to maintain safety in all operations performed by it or its Subcontractors.
- j) Hazardous Wastes and Unforeseen Conditions - In accordance with Section 7104 of the State Public Contract Code, if the Work contemplated hereunder involves digging trenches or other earthwork activities, the Contractor shall promptly, and before the following conditions are disturbed, notify the District, in writing, of any: (i) material that the Contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law; (ii) Subsurface or latent physical conditions at the site differing from those indicated; or (iii) unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract. The District shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the Work shall issue a change order under the procedures described herein. In the event that a dispute arises between the District and the Contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the Work, the Contractor shall not be excused from any scheduled completion date provided for herein, but shall proceed with all Work to be performed hereunder. The Contractor shall retain any and all rights provided either by contract or by law which pertain to the resolution of disputes and protests between the District and Contractor.

Humboldt Bay Municipal Water District
12 kV Switchgear Relocation Project

- k) The Contractor shall perform all Work in a fire-safe manner. The Contractor shall supply and maintain onsite adequate firefighting equipment capable of extinguishing incipient fires. The Contractor shall comply with applicable Federal, State, and local fire prevention regulations and where the regulations do not cover, with applicable parts of the National Fire Prevention Standard for "Safeguarding Building Construction Operations," (NFPA No. 241).

B-53 Protection of Person and Property

- a) The Contractor shall take whatever precautions are necessary to prevent damage to all existing improvements, including above ground and underground utilities, trees, shrubbery that is not specifically shown to be removed, fences, signs, mailboxes, survey markers and monuments, buildings, structures, the District's property, adjacent property, and any other improvements or facilities within or adjacent to the Work. If such improvements or property are injured or damaged by reason of the Contractor's operations, they shall be replaced or restored, at the Contractor's expense, to a condition at least as good as the condition they were in prior to the start of the Contractor's operations.
- b) The Contractor shall adopt all practical means to minimize interference to traffic and public inconvenience, discomfort or damage. The Contractor shall protect against injury any pipes, conduits or other structures, crossing the trenching or encountered in the Work and shall be responsible for any injury done to such pipes or structures, or damage to property resulting therefrom. The Contractor shall support or replace any such structures without delay and without any additional compensation to the entire satisfaction of the Engineer. All obstructions to traffic shall be guarded by barriers illuminated at night. The Contractor shall be responsible for all damage to persons and property directly or indirectly caused by its operations and, under all circumstances, the Contractor must comply with the laws and regulations of the County and the State of California relative to safety of persons and property and the interruption of traffic and the convenience of the public within the respective jurisdictions.

B-54 Responsibility for Repair of Facilities

All public or private facilities, including but not limited to structures, telephone cables, roadways, parking lots, private drives, levees and embankments disturbed during construction of the Work shall be repaired and/or replaced by the Contractor to match facilities existing prior to construction. In addition, the Contractor shall be responsible for any settlement damage to such facilities or adjoining areas for a period of one year after acceptance of such required facilities.

B-55 Resolution of Construction Claims

- a) For any claim arising under this Contract, the following procedures will apply:
 - (i) The claim must be in writing and include the documents necessary to substantiate the claim. Claims must be filed on or before the day of final payment. Nothing in this subsection is intended to extend the time limit or supersede notice requirements for the filing of claims as set forth elsewhere in this Contract.
- b) The Contractor shall proceed with the Work in accordance with the Plans and Specifications and determinations and instructions of the Engineer during the resolution of any claims disputes.

B-56 District's Repair

In the event the Contractor refuses or neglects to make good any loss or damage for which the Contractor is responsible under this Contract, the District may itself, or by the employment of others, make good any such loss or damage, and the cost and expense of doing so, including any reasonable engineering, legal and other consultant fees, and any costs of administrative and managerial services, shall be charged to the Contractor. Such costs and expenses may be deducted by the District from claims for payment made

by the Contractor for Work completed or remaining to be completed.

B-57 Antitrust Claim Assignment

In entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to this Contract, the Contractor and all subcontractors shall offer and agree to assign to the District 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, services or materials pursuant to the public works contract or subcontract. This assignment shall be made and become effective at the time the District tenders final payment to the Contractor, without further acknowledgment by the parties.

B-58 Waiver of Right to Rescind For Material Breach

The Contractor agrees that it can be adequately compensated by money damages for any breach of this Contract which may be committed by the District and hereby agrees that no default, act, or omission of the District or the Engineer, except for failure to make progress payments as a required by Section B-67, shall constitute a material breach of the Contract entitling the Contractor to cancel or rescind the provisions of this Contract or (unless the District shall so consent or direct in writing) to suspend or abandon performance of all or any part of the Work. The Contractor hereby waives any and all rights and remedies to which it might otherwise be or become entitled, save only its right to money damages.

B-59 Contractor's License Notice

Contractors are required by law to be licensed and regulated by the Contractors' State License Board which has jurisdiction to investigate complaints against contractors of a complaint if filed within three (3) years of the date of the alleged violation. Any questions concerning a contractor may be referred to the Registrar, Contractors' State License Board, 9835 Goethe Road, Sacramento, California. Mailing address: P.O. Box 26000, Sacramento, California 95826.

ARTICLE V. INSURANCE AND LIABILITY

B-60 Insurance

- a) Neither the Contractor nor any Subcontractors shall commence any work until all required insurance has been obtained at their own expense. Such insurance must have the approval of the District as to limit, form, and amount, and shall be placed with insurers with a current A.M. Best's rating of no less than A-VII.
- b) Any insurance bearing on adequacy of performance shall be maintained after completion of the project for the full guarantee period.
- c) Prior to execution of the Contract, the Contractor shall furnish the District with original endorsements effecting coverage for all policies required by the Contract. The Contractor shall not permit any Subcontractor identified in the Designation of Subcontractors form to commence work on this project until such Subcontractor has furnished the District with original endorsements effecting coverage for all insurance policies required by the Contract. The endorsements shall be signed by a person authorized by the insurer to bind coverage on its behalf. The Contractor's insurer shall provide complete, certified copies of all required insurance policies, including endorsements affecting the coverage required by this paragraph. The Contractor agrees to furnish one copy of each policy to the District, and additional copies as requested in writing, certified by an authorized representative of the insurer.
- d) All of the Contractor's policies shall contain an endorsement providing that written notice shall be given to the District at least sixty (60) calendar days prior to termination, cancellation, or reduction of coverage in the policy.
- e) Any policy or policies of insurance that the Contractor elects to carry as insurance against loss or damage to its construction equipment and tools shall include a provision therein providing a waiver of the insurer's right to subrogation against the District and the Engineer.
- f) The requirements as to the types, limits, and the District's approval of insurance coverage to be maintained by the Contractor are not intended to and shall not in any manner limit or qualify the liabilities and obligations assumed by the Contractor under the Contract.
- g) In addition to any other remedy the District may have, if the Contractor or any of the Subcontractors fails to maintain the insurance coverage as required in this Section, the District may obtain such insurance coverage as is not being maintained, in form and amount substantially the same as required herein, and the District may deduct the cost of such insurance from any amounts due or which may become due the Contractor under this Contract.
- h) The Contractor and all Subcontractors shall, at their expense, maintain in effect at all times during the performance of work under the Contract not less than the following coverage and limits of insurance, which shall be maintained with insurers and under forms of policy satisfactory to the District. The maintenance by the Contractor and all Subcontractors of the following coverage and limits of insurance is a material element of this Contract. The failure of the Contractor or any Subcontractor to maintain or renew coverage or to provide evidence of renewal may be treated by the District as a material breach of this Contract.
 - (i) Worker's Compensation and Employer's Liability Insurance.
 - a. Worker's Compensation – The Contractor shall Provide, during the life of this Contract, workers' compensation insurance for all of the employees engaged in Work under this Contract, on or at the Project site, and, in case any of sublet Work, the Contractor shall require each subcontractor similarly to provide workers' compensation insurance for all the latter's employees as prescribed by State law. Any class of employee or employees not covered by a subcontractor's insurance shall be covered by the Contractor's insurance. In

case any class of employees engaged in work under this Contract, on or at the Project site, is not protected under the Workers' Compensation Statutes, the Contractor shall provide or shall cause a subcontractor to provide, adequate insurance coverage for the protection of such employees not otherwise protected. The Contractor is required to secure payment of compensation to his employees in accordance with the provisions of Section 3700 of the Labor Code. The Contractor shall file with the District certificates of its insurance protecting workers and shall provide certificates at any time upon request. Company or companies providing insurance coverage shall be acceptable to the District, if in the form and coverage as set forth in the Contract Documents.

- b. Contractor shall assume the immediate defense of and indemnify and save harmless the District and its officers and employees, agents, and consultants from all claims, loss, damage, injury, and liability of every kind, nature, and description brought by any person employed or used by Contractor, or any subcontractor, to perform the Work under this contract regardless of responsibility or negligence. Contractor hereby agrees to waive rights of subrogation which any insurer of Contractor may acquire from Contractor by virtue of the payment of any loss. Contractor agrees to obtain any endorsement that may be necessary to effect this waiver of subrogation. The Workers' Compensation Policy shall be endorsed with a waiver of subrogation in the favor of the District for all work performed by the Contractor, its employees, agents and subcontractors.
 - c. The Contractor and all Subcontractors shall maintain insurance to protect the Contractor or Subcontractor from all claims under Worker's Compensation and Employer's Liability Acts, including Longshoremens and Harbor Worker's Act. Such coverage shall be maintained, in type and amount, in strict compliance with all applicable State and Federal statutes and regulations. The Contractor shall execute a certificate in compliance with Labor Code Section 1861.
- (ii) Claims Against District - If an injury occurs to any employee of the Contractor or any of the Subcontractors for which the employee or its dependents, in the event of its death, may be entitled to compensation from the District under the provisions of the said Acts, or for which compensation is claimed from the District, there will be retained out of the sums due the Contractor under this Contract, an amount sufficient to cover such compensation as fixed by said Acts, until such compensation is paid or it is determined that no compensation is due. If the District is required to pay such compensation, the amount so paid will be deducted and retained from such sums due, or to become due the Contractor.
- (iii) Commercial General Liability and Automobile Liability Insurance - the Contractor shall provide and maintain the following commercial general liability and automobile liability insurance:
- a. Coverage – coverage for commercial general liability and automobile liability insurance shall be at least as broad as the following:
 - i. Insurance Services Office (ISO) Commercial General Liability Coverage (Occurrence Form CG 0001)
 - ii. Insurance Services Office (ISO) Business Auto Coverage (Form CA 0001), covering Symbol 1 (any auto)
 - b. Limits – the Contractor shall maintain limits no less than the following:
 - i. General Liability - Five million dollars (\$5,000,000) per occurrence or the full per occurrence limits of the policies available, whichever is greater for bodily injury, personal injury and property damage. If Commercial General Liability Insurance or other form with a general aggregate limit or products-completed operations aggregate limit is used, either the general aggregate limit shall apply separately to the project/location (with the ISO CG 2503, or ISO CG 2504, or insurer's equivalent endorsement provided to District) or the general aggregate limit and products-completed operations aggregate limit shall be twice the required occurrence limit.
 - ii. Automobile Liability - One million dollars (\$1,000,000) for bodily injury and property damage each accident limit.
 - c. Required Provisions - the general liability, auto liability and excess liability policies are to

contain, or be endorsed to contain, the following provisions:

- i. The District, its directors, officers, employees, and authorized volunteers are to be given insured status at least as broad as ISO endorsement CG 2010 11 85; or both CG 20 10 10 01 and CG 20 37 04 13 (or the CG 20 10 04 13 (or earlier edition date) specifically naming all of the District parties required in this agreement, or using language that states "as required by contract"). All Subcontractors hired by Contractor must also have the same forms or coverage at least as broad; as respects (via CG 20 38 04 13): liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the Contractor; premises owned, occupied or used by the Contractor; and automobiles owned, leased, hired or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to the District, its directors, officers, employees, or authorized volunteers.
 - ii. It is understood and agreed to by the parties hereto and the insurance company(s), that the Certificate(s) of Insurance and policies shall so covenant and shall be construed as primary, and the District insurance and/or deductibles and/or self-insured retentions or self-insured programs shall not be construed as contributory using the ISO endorsement CG 20 01 04 13 or coverage at least as broad.
 - iii. Any failure to comply with reporting or other provisions of the policies including breaches of warranties shall not affect coverage provided to the District, its directors, officers, employees, or authorized volunteers.
 - iv. The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.
 - v. Each insurance policy required above shall provide that coverage shall not be canceled, except with notice to the District.
- d. Such liability insurance shall indemnify the Contractor and his/her sub-contractors against loss from liability imposed by law upon, or assumed under contract by, the Contractor or his/her sub-contractors for damages on account of such bodily injury (including death), property damage, personal injury, completed operations, and products liability.
 - e. The general liability policy shall cover bodily injury and property damage liability, owned and non-owned equipment, blanket contractual liability, completed operations liability, explosion, collapse, underground excavation, and removal of lateral support.
 - f. The automobile liability policy shall cover all owned, non-owned, and hired automobiles.
 - g. All of the insurance shall be provided on policy forms and through companies satisfactory to the District.
 - h. The comprehensive general and automobile liability insurance coverage shall also include the following:
 - i. Provision or endorsement naming the District, the Engineer and its consultants, and each of their officers, employees, and agents, each as additional insureds in regards to liability arising out of the performance of any work under the Contract and providing that such insurance is primary insurance as respects the interest of the District and Engineer and that any other insurance maintained by the District and Engineer is excess and not contributing insurance with the insurance required hereunder.
 - ii. "Cross Liability" or "Severability of Interest" clause.
 - iii. Provision or endorsement stating that such insurance, subject to all of its other terms and conditions, applies to the liability assumed by the Contractor under the Contract, including, without limitation, that set forth in Section B-61, Indemnity and Litigation Costs.
 - iv. Provision or endorsement stating that any failure to comply with reporting or other provisions of the policies including breaches of warranties shall not affect

coverage provided to the District, its officers, officials, employees, or volunteers.

- i) Deductibles and Self-Insured Retentions - Insurance deductibles or self-insured retentions must be declared by the Contractor, and such deductibles and retentions shall have the prior written consent from the District. At the election of the District the Contractor shall either 1) reduce or eliminate such deductibles or self-insured retentions, or 2) procure a bond which guarantees payment of losses and related investigations, claims administration, and defense costs and expenses. Policies containing any self-insured retention (SIR) provision shall provide or be endorsed to provide that the SIR may be satisfied by either the named or additional insureds, co-insurers, and/or insureds other than the First Named Insured.
- j) Acceptability of Insurers - Any insurance carrier providing insurance coverage required by the Contract Documents shall be admitted to and authorized to do business in the State of California unless waived, in writing, by the District Risk Manager. Carrier(s) shall have an A.M. Best rating of not less than an A-: VII or better.
- k) Responsibility for Work - Until the completion and final acceptance by the District of all the work under and implied by this agreement, the work shall be under the Contractor's responsible care and charge. The Contractor shall rebuild, repair, restore and make good all injuries, damages, re-erections, and repairs occasioned or rendered necessary by causes of any nature whatsoever.
 - a. The Contractor shall provide and maintain builder's risk insurance (or installation floater) covering all risks of direct physical loss, damage or destruction to the work in the amount specified in the General Conditions, to insure against such losses until final acceptance of the work by the District. Such insurance shall insure at least against the perils of fire and extended coverage, theft, vandalism and malicious mischief, and collapse. The District, its directors, officers, employees, and authorized volunteers shall be named insureds on any such policy. The making of progress payments to the Contractor shall not be construed as creating an insurable interest by or for the District or be construed as relieving the Contractor or his/her subcontractors of responsibility for loss from any direct physical loss, damage or destruction occurring prior to final acceptance of the work by the District.
 - b. The Contractor shall waive all rights of subrogation against the District, its directors, officers, employees, or authorized volunteers.
- l) Evidences of Insurance - Prior to execution of the agreement, the Contractor shall file with the District a certificate of insurance (Acord Form 25 or equivalent) signed by the insurer's representative evidencing the coverage required by this agreement. Such evidence shall include an additional insured endorsement signed by the insurer's representative and evidence of waiver of rights of subrogation against the District (if builder's risk insurance is applicable). Such evidence shall also include (1) attached additional insured endorsements with primary & non-contributory wording, (2) Workers' Compensation waiver of subrogation, and (3) a copy of the CGL declarations or endorsement page listing all policy endorsements, and confirmation that coverage includes or has been modified to include Required Provisions 1-5 above. The District reserves the right to obtain complete, certified copies of all required insurance policies, at any time. Failure to continually satisfy the Insurance requirements is a material breach of contract.
- m) Continuation of Coverage - The Contractor shall, upon demand of the District deliver evidence of coverage showing continuation of coverage for at least (10) years after completion of the project. Contractor further waives all rights of subrogation under this agreement. When any of the required coverages expire during the term of this agreement, the Contractor shall deliver the renewal certificate(s) including the general liability additional insured endorsement and evidence of waiver of rights of subrogation against the District (if builder's risk insurance is applicable) to the District at least ten (10) days prior to the expiration date.

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- n) Subcontractors - In the event that the Contractor employs other contractors (Subcontractors) as part of the work covered by this agreement, it shall be the Contractor's responsibility to require and confirm that each sub-contractor meets the minimum insurance requirements specified above. The Contractor shall, upon demand of the District, deliver to the District copies such policy or policies of insurance and the receipts for payment of premiums thereon.
- o) The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.
- p) The District reserves the right to modify these insurance requirements, including limits, based on the nature of the risk, prior experience, insurer, coverage or other circumstances.

B-61 Indemnity and Litigation Cost

- a) Promptly upon execution of the Contract, the Contractor specifically obligates itself and hereby agrees to protect, hold free and harmless, defend and indemnify the District, the Engineer and its consultants, and each of their officers, officials, employees and agents, from and against any and all liability, penalties, costs, losses, damages, expenses, causes of action, claims or judgments, including without limitation attorneys' fees and other costs of litigation, which arise out of or are in any way connected with the Contractor's, or its Subcontractors' or suppliers', performance of Work under this Contract or failure to comply with any of the obligations contained in the Contract. This indemnity shall not extend, however, to attorney fees and costs incurred by the District in prosecuting or defending against the Contractor in any proceeding under Section B-8, and shall imply no reciprocal right of the Contractor in any action on the contract pursuant to California Civil Code section 1717 or section 1717.5. To the extent legally permissible, this indemnity and hold harmless agreement by the Contractor shall apply to any acts or omissions, whether active or passive, on the part of the Contractor or its agents, employees, representatives, or Subcontractor's agents, employees and representatives, resulting in liability, irrespective of whether or not any acts or omissions of the parties to be indemnified hereunder may also have been a contributing factor to the liability, except such loss or damage which was caused by the active negligence, sole negligence or willful misconduct of the District.
- b) In any and all claims against the District or the Engineer and its consultants, and each of their officers, employees and agents by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation under this Section shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under Worker's Compensation statutes, disability benefit statutes or other employee benefit statutes.
- c) Each party to this Contract has been represented by counsel in the negotiation and execution of this Contract.

B-62 Protection of Work

- a) The Contractor shall be responsible for the care of all work until completion and final acceptance; and the Contractor shall, at its own expense replace damaged or lost material and repair damaged parts of the Work or the same may be done at the Contractor's expense by the District and the Contractor and its sureties shall be liable therefore. The Contractor shall make its own provisions for properly storing and protecting all material and equipment against theft, injury, or damage from any and all causes. Damaged material and equipment shall not be used in the Work. The Contractor shall take all risks from floods and casualties except as provided by law, and shall make no charge for the restoration of such portions of the Work as may be destroyed or damaged by flood or other casualties or because of danger from flood or other casualties or for delays from such causes. The Contractor may, however, be allowed a reasonable extension of time on account

of such delays, subject to the conditions hereinbefore specified. The Contractor shall not be responsible for the cost, in excess of five percent (5%) of the contracted amount, of repairing or restoring damage to the Work, if the damage was proximately caused by an earthquake in excess of a magnitude of 3.5 on the Richter Scale or by tidal waves; provided that the Work damaged was built in accordance with accepted and applicable building standards, and the Plans and Specifications of the District.

- b) The Contractor shall effectively secure and protect adjacent property and structures. The Contractor shall be responsible that no loss or inconvenience shall accrue to the owner or tenant by virtue of its fences having been opened or the gate not having been either shut or attended at all times. In all cases where the Contractor removes fences to obtain work room, it shall provide and install temporary fencing as required, and on completion of construction shall restore the original fence to the satisfaction of the Engineer. All costs of providing, maintaining and restoring gates and fencing shall be borne by the Contractor. The Contractor shall provide and maintain all passageways, guard fences, lights and other facilities for protection required by public authority or local conditions.
- c) The Contractor shall use extreme care during construction to prevent damage from dust to crops and adjacent property. The Contractor, at its own expense, shall provide adequate dust control and take other preventive measures as directed by the Engineer.
- d) The Contractor shall be responsible for all damage to any property resulting from trespass by the Contractor or its employees in the course of their employment, whether such trespass was committed with or without the consent or knowledge of the Contractor.
- e) The Contractor shall see that the work site is kept drained and free of all ground water and any other water which may impede the progress or execution of the Contract work.
- f) The Contractor shall be responsible for any damage caused by drainage or water runoff from construction areas and from construction plant areas. In an emergency affecting the safety of life, or of the Work, or of adjoining property, the Contractor, without special instruction or authorization from the Engineer, is hereby permitted to act at the Contractor's discretion to prevent such threatened loss or injury, and it shall so act without appeal if so instructed or authorized. Any compensation claimed by the Contractor on account of emergency work shall be determined as specified under Section B-3. Should the Engineer deem an emergency condition to exist, the Contractor shall immediately do those things and take those steps ordered by the Engineer. The decision of the Engineer in this respect shall be final and conclusive. Any claims for compensation made by the Contractor on account of emergency work shall be determined as specified under Section B-3.
- g) Except as provided by Government Code Section 4215, the Contractor shall be responsible for the removal, relocation and protection of all public and private utilities, including irrigation facilities in the nature of utilities, located on the site of the construction project if and to the extent that the same are identified in the Contract Documents, and the Contractor shall not be entitled to any extension of time or claim for damages for extra compensation in connection therewith. If and to the extent that such utilities or facilities are not identified in the Contract Documents, as between the Contractor and the District, the District will be responsible for the cost of their removal, relocation or protection, as the case may be, but the Contractor shall perform any such work in conformance with applicable provisions of Sections B-3 and B-4, if so directed by the Engineer and in such situation the Contractor shall not be responsible for delay in completion of the project caused by the failure of the District or the owner of the utility to provide for such removal or relocation. If the Contractor, while performing the Contract, discovers utility or irrigation facilities not identified by the District in the Contract Documents, it shall immediately notify the Engineer in writing.

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B-63 No Personal Liability

Neither the District, the Engineer, nor any of their other officers, agents, or employees nor any other public office shall be personally responsible for any liability arising under the Contract, except such obligations as are specifically set forth herein.

ARTICLE VI. MEASUREMENT AND PAYMENT

B-64 Measurement of Quantities

- a) Where the Contract provides for payment on a lump sum price basis, the Contractor shall submit a price breakdown to the Engineer immediately after award of the Contract. The price breakdown as agreed upon between the Contractor and the Engineer shall be used for preparing future estimates for partial payments to the Contractor and shall list the major items of Work and a price for each item. Overhead and other general costs and profit shall be prorated to each item so that the total of all items equals the lump sum price. The price breakdown shall be subject to the approval of the Engineer and Contractor may be required to verify the prices for any or all items.

Where the Contract provides for payment on a unit price basis, the quantities of work performed will be computed by the Engineer on the basis of measurements taken by the Engineer.

- b) Whenever the estimated quantities of Work to be done and materials to be furnished under this Contract are shown in any of the documents including the Proposal, they are given for use in comparing bids and the right is especially reserved, except as herein or otherwise specifically limited, to increase or diminish them as may be deemed reasonably necessary or desirable by the District to complete the Work contemplated by this Contract and such increase or diminution shall in no way violate this Contract, nor shall any such increase or diminution give cause for claims, liability for damage or adjustment to the Contract time bid price.

B-65 Scope of Payment

- a) The Contractor shall accept the compensation provided in the Contract as full payment for furnishing all labor, materials, tools, equipment, and incidentals necessary to the completed Work and for performing all Work contemplated and embraced under the Contract; also for loss or damage arising from the nature of the Work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the Work until the acceptance by the District and for all risks of every description connected with the prosecution of the Work, also for all expenses incurred in consequence of the suspension or discontinuance of the Work as provided in the Contract; and for completing the Work according to the Specifications and Plans. Neither the payment of any estimate nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective work or material.
- b) No compensation will be made in any case for loss of anticipated profits. Increased or decreased work involving supplemental agreements will be paid for as provided in such agreements.

B-66 Progress Estimate

At the end of each month where work was performed, the Contractor will submit to the Engineer a partial payment estimate filled out and signed by the Contractor covering the Work performed during the period covered by the partial pay estimate and supported by such data as the Engineer may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at or near the site, the partial payment estimate shall also be accompanied by such supporting data, satisfactory to the District, as will establish the District's title to the material, and equipment and protect its interest therein, including, applicable insurance. The Engineer will within seven (7) calendar days after receipt of each partial payment estimate either recommend payment to the District or return the estimate to the Contractor indicating in writing its reasons for refusing to approve payment. In the latter case, the Contractor may make the necessary corrections and resubmit the partial pay estimate.

Payroll certification forms provided by the Contractor and fully executed shall be filed with the Engineer at the time of submission of each partial payment estimate and also when the claim for final payment is submitted. Wage Report forms shall be completed and submitted as set forth in Parts 4 and 5.

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B-67 Progress Payments

- a) The Contractor is made aware that the District will approve all partial payments.
- b) Upon receipt of an undisputed, properly submitted progress estimate from the Contractor, recommended by the Engineer, the District shall act in accordance with the following:
 - (i) Each payment request shall be reviewed by the District as soon as practicable after receipt for the purpose of determining that the progress estimate is a proper payment request.
 - (ii) Any payment request determined not to be a proper payment request suitable for payment shall be returned to the Contractor as soon as practicable but not later than seven (7) calendar days after receipt. A request returned pursuant to this paragraph shall be accompanied by a document setting forth in writing the reasons why the payment request is not proper.
- c) The number of days available to the District to make a payment without incurring interest pursuant to this section shall be reduced by the number of days by which the District exceeds the ten-day return requirement set forth herein.
- d) The District will pay the Contractor ninety-five percent (95%) of the amount of each progress estimate within sixty (60) calendar days after receipt of an undisputed, properly submitted progress estimate from the Contractor, recommended by the Engineer. If the District fails to pay an undisputed progress estimate within the allotted sixty (60) calendar days, the District shall pay interest to the Contractor equivalent to the legal rate set forth in subdivision (s) of Section 685.010 of the Code of Civil Procedures. Five percent (5%) of amount of each estimate shall be retained by the District until final completion and acceptance of all Work under Contract.
- e) When, in the judgment of the Engineer, the work is not proceeding in accordance with the provisions of the Contract, or when in the Engineer's judgment the total amount of the work done since the last estimate amounts to less than \$1,000, no pay estimate will be prepared and no progress payment will be made.
- f) No progress estimate or payment shall be considered to be an approval or acceptance of any work, materials, or equipment. Estimated amounts and values of work done and materials and equipment furnished will be confirmed with actual amounts and values as they become available in subsequent progress estimates, progress payments and the final estimate and payment. All estimates and payments will be subject to correction in subsequent progress estimates and payments and the final estimate and payment.
- g) The District requires that any payments due to Subcontractors for a portion of the Work satisfactory completed shall be made by Contractor to Subcontractors within thirty (30) calendar days of District's payment to Contractor. Failure to make such payments in a timely fashion may result in the District issuing future progress payments by joint check to the Contractor and Subcontractors.
- h) It is mutually agreed between the parties to the Contract that no payments made under the Contract, including progress payments and the final payment, shall be evidence of the performance of the Contract, either wholly or in part, and no payment shall be construed to be an acceptance of any defective or incomplete work or improper materials.

B-68 Liens and Stop Notices

The Contractor agrees to keep the Work, the site of the Work and all monies held by the District free and clear of all liens and stop notices related to labor and materials furnished in connection with the Work, if permitted by law. Furthermore, the Contractor waives any right it may have to file any type of lien or stop notice in connection with the Work. Notwithstanding anything to the contrary contained in the Contract documents, if any such lien or stop notice is filed or there is evidence to believe that lien or stop notice

may be filed at any time during the progress of the Work or within the duration of this Contract, the District may refuse to make any payment otherwise due the Contractor or may withhold any payment due the Contractor a sum sufficient in the opinion of the District to pay all obligations and expenses necessary to satisfy such lien or stop notice. The District may withhold such payment unless or until the Contractor, within ten (10) calendar days after demand therefor by the District, shall furnish satisfactory evidence that the indebtedness and any lien or stop notice in respect thereof has been satisfied, discharged and released of record, or that the Contractor has legally caused such lien or stop notice to be released of record pending the resolution of any dispute between the Contractor and any person or persons filing such lien or stop notice. If the Contractor shall fail to furnish such satisfactory evidence within ten days of the demand therefor, the District may discharge such indebtedness and deduct the amount thereof, together with any and all losses, costs, damages and attorney's fees suffered or incurred by the District from any sum payable to the Contractor under the Contract documents, including but not limited to final payment and retained percentage. This Section shall be specifically included in all Subcontracts and purchase orders entered into by the Contractor.

B-69 Final Acceptance and Date of Completion

Whenever the Contractor shall deem all Work under this Contract to have been completed in accordance therewith, it shall so notify the Engineer in writing, and the Engineer shall promptly ascertain whether the Work has been satisfactorily completed and, if not, shall advise the Contractor in detail and in writing of any additional work required. When all the provisions of the Contract have been fully complied with to the satisfaction of the Engineer, the Engineer shall proceed with all reasonable diligence to determine accurately the total value of all Work performed by the Contractor at the prices set forth in the Contract or fixed by Change Orders, and the total value of all extra work, all in accordance with the Contract. The Engineer will then certify to said final estimate and to the completion of the Work, and will file copies thereof with the District and the Contractor. The date of completion shall be the date upon which the District makes its formal written acceptance of the Work.

B-70 Final Payment

Within ten (10) calendar days after the date of completion, the District will file in the Office of the County Recorder, a Notice of Completion of the Work herein agreed to be done by the Contractor. On the expiration of thirty-five (35) calendar days after the recordation of such Notice of Completion the difference between said final estimate and all payments theretofore made to the Contractor shall be due and payable to the Contractor, subject to any requirements concerning the furnishings of a maintenance bond, and excepting only such sum or sums as may be withheld or deducted in accordance with the provisions of this Contract. All prior certifications upon which partial payments may have been made, being merely estimates, shall be subject to correction in the final certificate.

B-71 Final Release

Final payment to the Contractor in accordance with the final estimate is contingent upon the Contractor furnishing the District with a signed written release of all claims against the District arising by virtue of the Contract. Disputed Contract claims in stated amounts may be specifically excluded by the Contractor from the operation of the release. The release shall be in substantially the following form:

WAIVER AND RELEASE UPON FINAL PAYMENT

The undersigned has been paid in full by the Humboldt Bay Municipal Water District (District) for all labor, services, equipment and material furnished to the District for the 12 kV Switchgear Relocation Project located in Humboldt County, California, and does hereby waive and release the District, its officers, agents, and employees, from all claims and liability to the Contractor arising out of, or in any way connected with, the Contract, except for the disputed contract claims specified below:

Notice of Disputed Claim

Amount of Claim

\$ _____

Dated: _____

(Name of Contractor)

By: _____
(Title)

Any payment, however, final or otherwise shall not release the Contractor or its sureties from obligations under the Contract Documents or Performance and Payment Bonds.

B-72 Right to Withhold Payments

- a) In addition to all other rights and remedies of the District hereunder and by virtue of the law, the District may withhold or nullify the whole or any part of any partial or final payment to such extent as may reasonably be necessary to protect the District from loss on account of:
- (i) Defective work not remedied, irrespective of when any such work be found to be defective;
 - (ii) Claims or liens filed or reasonable evidence indicating probable filing of claims or liens including, but not limited to claims under Sections 1775, 1776, or 1777.7 of the Labor Code;
 - (iii) Failure of the Contractor to make payments properly for labor, materials, equipment, or other facilities, or to Subcontractors and/or suppliers;
 - (iv) A reasonable doubt that the Work can be completed for the balance then unearned;
 - (v) A reasonable doubt that the Contractor will complete the Work within the agreed time limits;
 - (vi) Costs to the District resulting from failure of the Contractor to complete the Work within the proper time; or
 - (vii) Damage to Work or property.
 - (viii) Damage to another Contractor.
 - (ix) Performance of Work in violation of the Terms of the Contract Documents.
 - (x) Where work on unit items is substantially complete, but lacks cleanup and/or other corrections ordered by the Engineer, amounts shall be deducted from the unit prices in partial payment estimates to amply cover such cleanup and correction.
 - (xi) Failure to file required Equal Opportunity and Affirmative Action forms.
- b) Whenever the District shall, in accordance herewith, withhold any monies otherwise due the Contractor, written notice of the amount withheld and the reasons therefore will be given the Contractor. After the Contractor has corrected the enumerated deficiencies, the District will promptly pay to the Contractor the amount so withheld. When monies are withheld to protect the District against claims or liens of mechanics, material men, Subcontractors, etc., the District may at its discretion permit the Contractor to deliver a surety bond in terms and amount satisfactory to the District, indemnifying the District against any loss or expense, and upon acceptance thereof by the District, the District shall release to the Contractor monies so withheld.

B-73 Waiver of Interest

The District shall have no obligation to pay and the Contractor hereby waives the right to recover interest with regard to monies which the District is required to withhold by reason of judgment, order, statute or judicial process.

B-74 Satisfaction of Claims and Liens

Neither the final payment nor any part of the retained percentage shall become due until the Contractor, if required, shall deliver to the District, a complete release of all liens and claims arising out of this Contract, or receipts in full in lieu thereof and, if required in either case, an affidavit that so far as it has knowledge or information the releases and receipts include all the labor and material for which a lien or claim could be filed; but the Contractor may, if any Subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the Engineer, to indemnify the District against any lien or claim. If any lien or claim remains unsatisfied after all payments are made, the Contractor shall refund to the District all monies that the latter may be compelled to pay in discharging such a lien, or claim, including all costs and reasonable attorney's fees.

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PART 4
SPECIFICATIONS

SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.01. WORK COVERED BY CONTRACT DOCUMENTS

A. General:

1. The Contract Documents describe the Work to be performed under this Contract which includes, but is not limited to, furnishing all plants, tools, equipment, materials, supplies, and manufactured articles for the Project. It shall also include the furnishing of all transportation and services, including fuel, power, water, and essential communications necessary for the performance of all labor, work, or other operations required for the performance of the Contract in accordance with the Contract Documents.
2. The Contractor shall carefully review all sections of the Specifications in order to completely understand the Work and all constraints including schedule, environmental, permit, and material requirements.
3. Contractor is encouraged to proceed in an orderly and expeditious manner based on the constraints shown on the Drawings and described in the Specifications. All Work is to be constructed in strict accordance with the Contract Drawings and Specifications and subject to the terms and conditions of the Contract.

B. The environmental compliance reports and notices developed for this project include a: Biological Resources Report, Cultural Resources Investigation Report, and Categorical Exemption. Requirements affecting the Contractor's work have been incorporated into these specifications.

C. The District has submitted an application for service relocation to PG&E. The Contractor shall comply with all PG&E interconnection requirements, coordinate with the utility for development and all required interconnection services, pay all fees associated with PG&E facility upgrades and service interconnection, and said requirements shall become part of the Contract Documents.

D. The District will obtain a Humboldt County Grading Permit for this project. This will be made available to the Contractor prior to beginning the work, and the Contractor shall comply with all requirements in the permit. It is assumed that the Plans already contain all of the requirements that will be included in the permit.

E. Contractor shall obtain all other necessary permits and comply with them and all other applicable Local, State, and Federal laws and regulations.

F. Reports completed for this project include the following:

1. "Geotechnical Investigation: 12 kV Switchgear Relocation. Humboldt Bay Municipal Water District, Humboldt County, California." August 2019. Prepared by GHD, Inc. The contractor shall comply with all requirements given in this document, and said requirements shall become part of the Contract Documents. This report has been included as Appendix A to these Specifications.

Humboldt Bay Municipal Water District
12 kV Switchgear Relocation Project

2. "A Cultural Resources Investigation Report for the Humboldt Bay Municipal Water District 12-kV Switchgear Relocation Project Near Essex, Humboldt County, California." June 2019. Prepared by Roscoe and Associates.
3. "Biological Resources Report: Prepared for Humboldt Bay Municipal Water District 12 kV Switchgear Replacement Project." July 2019. Prepared by GHD, Inc.

G. Location of the Work:

1. Humboldt County, California, near the Cities of Arcata and Blue Lake. Humboldt Bay Municipal Water District's Essex Pump Station Facility at 7270 West End Road, Arcata, CA. 95521. See the Cover Sheet on the Drawings for more information.

H. Contractor's duties:

1. Except as specifically noted, provide and pay for:
 - a. Labor, materials and equipment.
 - b. Tools, construction equipment and machinery.
 - c. Water, heat, and utilities required for construction.
 - d. All other facilities and services necessary for proper execution and completion of Work.
2. Pay legally required sales, consumer, and use taxes.
3. Conform to the requirements in all permits, easement agreements, and environmental regulations.
4. Secure and pay for, as necessary for proper execution and completion of the Work, all other applicable permits and licenses.
5. Give required notices.
6. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities that bear on performance of the Work.
7. Promptly submit written notice to Engineer of observed variance of Contract Documents from legal requirements.
8. If any Subcontractor or person employed by the Contractor shall appear to the Engineer to be incompetent or to act in a disorderly or improper manner, that person shall be discharged immediately on the requisition of the Engineer, and such person shall not again be employed on the Work.
9. Laydown and storage areas have been provided to the Contractor as shown on the Drawings. It is believed that these areas will be sufficient for the execution of the work. However, if required, the Contractor shall obtain all additional laydown and storage areas necessary for the execution of the Work. Contractor shall obtain all necessary permissions and approvals for use of laydown and storage areas and shall submit a signed statement from the property owner granting permission and holding the District harmless from any and all damages that may result from the Contractor's use of the site.

10. The Contractor shall obtain its own disposal site for replaced soils and other debris. Prior to the use of disposal sites the Contractor must submit a signed statement from the property owner granting permission to spoil materials and holding the District harmless from any and all damages that may result from the spoiling of materials. The Contractor shall contact Humboldt County Department of Environmental Health prior to disposal of any soils off-site.
11. The Contractor is responsible for providing construction staking and surveying as required for the job. The District will provide control point information as needed for the purpose of locating the project components. The Contractor shall mark the location of all equipment and appurtenances 48 hours in advance of construction for approval by the Engineer.

I. All equipment shall be maintained in proper working order, including proper muffling.

1.02. CONTRACT DESCRIPTION

A. Description:

1. The Contractor is advised to carefully review all sections of the Drawings and Specifications in order to completely understand the Work and all constraints including the schedule, permitting, and material requirements. The Work generally includes, but is not limited to the following: providing all labor, materials, equipment, and supervision required for relocation, replacement, and modernization of the District's 12 kV switchgear and associated infrastructure; intercepting and extending 12 kV underground feeders; construction staking; site access improvements; grading; sediment and erosion control; slab foundation; access ramp construction; potholing utilities; cutting asphalt, trenching; excavation; vacuum truck services; installing handholes; installing vaults; installing conduits; installing ductbanks; pulling wires; interconnections to existing infrastructure; procuring and installing a fully tested and commissioned integrated power assembly building with switchgear included; procuring and installing switchgear; interconnecting to PG&E; coordination of protective relays; completing systems commissioning, testing, and demonstration; demolition and removal of decommissioned equipment; and all other Work required to complete the modifications as shown on the Plans and described in the Specifications.
2. All Work is contained in this Contract. The limits of Work are shown in the Contract Drawings. It will be the Contractor's responsibility to coordinate their activities to resolve conflicts.
3. All risk of loss, damage or diminution to the Work shall rest with Contractor until final acceptance of the Work by the District.

1.03. WORK SEQUENCE AND CONSTRAINTS

A. General:

1. Work under this contract includes furnishing all labor, materials, equipment, and supervision required for installing a new 12 kV switchgear in a walk in integrated power assembly, intercepting and extending existing feeders and communications conduit and wiring, reconnection to new and relocated equipment, integrating with existing power generation, load, and communications equipment, and all required coordination with utility, cut-over, testing and commissioning.

2. New switchgear in a fully tested and commissioned integrated power assembly must be installed and interconnected to the utility with permission to operate prior to beginning cutover of 12 kV load feeders and communications wires. Power must remain on during trenching and use of a vacuum excavation truck is required, along with metal cover plates and site safety fencing. Install handholes, vaults, and conduits as specified in the plans to allow for ease of cutover. Complete all access road improvements, earthwork, slabs, form work and trench capping to the greatest extent possible, prior to delivery of IPA. Complete IPA field wiring, security lighting, and permanent fencing installation prior to feeder and communications wiring cutover. Cutover Bus #1 loads, intercept conduit/feeders and install new conduit to box, pull new cable to load, terminate, test as specified in contract documents. Cutover Bus #2 loads, intercept conduit, install conduit to box, pull new cable to loads, terminate at new switchgear, and test as specified in contract documents. Relocate and cutover data interface equipment, pull new cable, interface, program, and test. Fully test commission, train, and demonstrate complete system per plans and specifications.
 3. The Contractor shall note that only certain constraints are addressed in this section. All Work, whether or not addressed here, shall be governed by applicable parts of this section, and schedules and procedures further submitted for approval.
 4. Changes to existing utilities or any new connection thereto must be coordinated to provide the least possible interference with site and utility operation. Prior to any planned Work, all materials, fittings, supports, equipment, and tools shall be on the site and all necessary labor scheduled prior to starting any connection Work.
 5. The Contractor will be required to coordinate their schedule with District personnel to ensure minimal interruption to the operation of the water system.
 6. No connection shall be disconnected without prior written approval from the District and at the agreed upon time and date and for the agreed upon duration negotiated with the District. When it is necessary to disconnect a service connection, the Contractor shall give at least fourteen (14) calendar days' notice to the District for approval of the proposed schedule.
- B. Specific Sequence and Constraints:
1. The first order of business is submission of submittals. Complete submittals for all items to be incorporated into the Work shall be made no later than fifteen (15) calendar days following receipt of Notice to Proceed.
 2. The Contractor shall include all Work described in this section in the construction schedule. The sequence and constraints identified in this section shall be followed in the construction of the Work. However, alternatives to these sequences and constraints may be submitted by the Contractor for review by the District.
 3. Specific Sequencing constraints include:
 - a. The pre-construction conference described in this Section shall be coordinated to accommodate attendance by representatives of the District.
 - b. Contractor shall anticipate weekly construction progress meetings with District staff to review work progress and issues (see Section 01 30 00).
 - c. Stockpiling of excavated soils that are potentially contaminated is not allowed. Contractor to remove contaminated material from the site and dispose of it at an approved disposal site.

- d. All new utilities must be inspected and tested by the Contractor and accepted by the District before they can be put into service, before connections between new and existing facilities can be made, and before old facilities can be abandoned.
- e. Existing District electrical and communications system will remain in operation during the duration of the Work. The existing electrical service, switchgear, and feeders will be used until the new service, switchgear, and conductors have been installed, tested, commissioned, and permission to interconnect provided by PG&E. It is the responsibility of the Contractor to repair any damage to the existing infrastructure that may result from construction activities.
- f. Contractor shall maintain vehicular and pedestrian access at all times throughout the project duration at all points in the project.
- g. Contractor shall provide as much notice as possible, but a minimum of fourteen (14) calendar days' written notice prior to power and communications systems cutover connecting the new service to the existing loads. Contractor shall not make these connections until written approval is obtained from the District. It is anticipated that some of these connections may need to be made during non-regular work hours to minimize service interruptions.

1.04. CONTRACT METHOD

- A. The Work of this Contract is based on the Bid Schedule provided in Part 1 and Section 01 22 00 – Measurement and Payment.
- B. The Contractor shall include the requirements of the General Conditions of the Contract as a part of all of its subcontract agreements.

1.05. UNDERGROUND FACILITIES

- A. The Contractor shall exercise care in all excavations to avoid damage to existing underground facilities. This shall include potholing, hand digging, and vacuum truck services in those areas where underground facilities are known to exist until they have been sufficiently located to avoid damage to the facilities.
- B. Prior to fabrication of any materials, the Contractor shall verify the locations and elevations of existing underground facilities which the Contractor is connecting to.
- C. The Contractor shall exercise care in maintaining those conduits, wire, and equipment to be abandoned and/or removed which are required for the continuing operation of the existing facilities until such time as they can be abandoned. The Contractor shall exercise extreme caution in working in any area adjacent to existing underground infrastructure. It is essential that the existing utilities be maintained in service until the new Work is ready for full-time operation and is placed in service.
- D. No additional compensation shall be provided the Contractor for compliance with the provisions of this section for the damage and repair of such facilities due to the lack of care.

1.06. PROJECT MEETINGS

- A. See Section 01 30 00 - Administrative Requirements

1.07. CONTRACTOR USE OF PREMISES

- A. Construction is limited to those areas as shown on the Drawings.
 - 1. Laydown and storage areas have been provided to the Contractor as shown on the Drawings. Contractor is responsible for all security and safekeeping of material and equipment stored in these areas. It is believed that these areas will be sufficient for the execution of the work. However, if required, the Contractor shall obtain all additional laydown and storage areas necessary for the execution of the Work. Contractor shall obtain all necessary permissions and approvals for use of laydown and storage areas and shall submit a signed statement from the property owner granting permission and holding the District harmless from any and all damages that may result from the Contractor's use of the site.
 - 2. Prior to commencement of any development, a final plan detailing the locations and sizes of all construction staging areas, storage areas, stockpiling areas, concrete washout areas, Contractor employee parking areas, and other construction areas appurtenant to the authorized development shall be submitted to the Engineer. The plan shall demonstrate and include the following, at a minimum:
 - a. No construction staging, storage, stockpiling, concrete washout, parking, or other areas associated with construction of the authorized development shall be located within wetlands, riparian areas, or other environmentally sensitive habitat areas (ESHA).
 - b. Designated areas for construction vehicle or equipment cleaning, fueling, and/or maintenance shall be located at least 100 feet from drainage courses and shall be designed to fully contain any spills of fuel, oil, or other contaminants.
 - c. Concrete washout areas shall be located at least 100 feet from drainage courses and shall be implemented in a manner that controls runoff and prevents leaching to underlying soils.
 - d. The limits of such areas shall be depicted on plans and maps provided to the Engineer at least two weeks prior to commencement of construction.
 - e. If necessary, areas shall be flagged or otherwise delineated to ensure that construction activities are contained within designated areas.
 - f. No changes to the approved final plans shall occur without approval from the Engineer.
- B. Confine operations at site to areas permitted by the Contract Documents.
- C. Do not encumber site with materials or equipment beyond those required to complete the Work.
- D. Do not load structure or roadway with weight that will endanger or render unusable any structures or roadways.
- E. Assume full responsibility for protection and safekeeping of products stored on premises.
- F. Obtain and pay for use of additional storage or work area needed for operations.
- G. Return all surface areas to their original condition upon completion of the Work.

H. Repair all damaged utilities, roadways, sidewalks, property, and appurtenances damaged during the course of construction to pre-existing condition or better.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 11 00

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SECTION 01 22 00

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01. GENERAL

- A. Unless otherwise specified in other individual sections of these Specifications, quantities of Work shall be determined from measurements or dimensions in horizontal planes.
- B. Units of measurement shall be in accordance with U.S. Standard Measures.
- C. See Section B-67 of the General Conditions for special provisions related to progress payments and payment schedule to the Contractor.

1.02. MATERIALS

- A. The measurement and payment items are listed below:
 - 1. The payments to the Contractor are based on the following items. It is the intent that the scope of the description of the following items encompasses the entire scope of the Work as shown on the Plans and described in the Specifications. The bid amounts shall be for complete in place installations.

BASE BID SCHEDULE

Item 1 – Mobilization/Demobilization

Payment for this item shall be on a lump sum basis per the amount listed for this item in the Bid Schedule. Measurement shall correspond to percent complete as confirmed by the Engineer. This Work covers all Contractor costs and effort associated with mobilizing equipment, materials, and labor to the project site as well as demobilization of the same. Items covered by this include, but are not limited to, mobilization, demobilization, improving construction and staging areas, including any grading or material that may need to be imported, bonds, insurance, attendance of Contractor's staff at meetings, contracting and administrative costs, preparation and administrative costs for processing cost proposals, preparation of project schedules, updates to project schedules, costs associated with temporary facilities and utilities, punch list items, repairs of damaged property, site cleanup, and project maintenance and warranty.

When 10 percent of the total original Contract amount is earned from bid items, excluding amounts paid for materials on hand, 90 percent of the amount of the bid price for this item, or 10 percent of the total Contract amount, whichever is less, will be paid for this item. Upon completion of all Work on the project, payment of the balance of the bid amount for this item will be paid.

Item 2 – Sediment & Erosion Control

Payment for this item shall be on a lump sum basis per the amount listed for this item in the Bid Schedule. Measurement shall correspond to percent complete as confirmed by the Engineer. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary to install and maintain erosion and sediment control Best Management Practices. This Work covers all Contractor costs and effort associated with providing silt fences, fiber rolls, diversion dikes, and other Best Management Practices, complying with NPDES and general construction permits. This Bid Item also includes all necessary revegetation at areas that are disturbed during construction of this project.

Item 3 – Gravel Access Road

Payment for this item shall be on a lump sum basis per the amount listed for this item in the Bid Schedule. Measurement shall correspond to percent complete as confirmed by the Engineer. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary to improve the site access route to the new switchgear location on the old railroad grade, including any grubbing, grading, material that will need to be imported, and placing and compacting subgrade and placed material. The access road will be four inches thick, 12 feet wide, and approximately 560 feet long. This equates to approximately 83 cubic yards of placed, compacted material.

Item 4 – Site Trenching, Backfill, Compaction, Conduit, Wire, Cable Terminations and Capping

Payment for this item shall be on a lump sum basis per the amount listed for this item in the Bid Schedule. Measurement shall correspond to percent complete as confirmed by the Engineer. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary to cut concrete, trench, excavate, backfill, compact, and cap areas shown on the plans, procurement and installation of conduit, medium voltage cables, low voltage electrical power conductors and cables, communications cables, cable terminations, and additional infrastructure per project requirements. This includes all labor, equipment, materials necessary to protect existing facilities against damage and allow for continued use of the areas and electrical service and feeds during construction.

Item 5 – Precast Handholes/Vaults

Payment for this item shall be on a lump sum basis per the amount listed for this item in the Bid Schedule. Measurement shall correspond to percent complete as confirmed by the Engineer. Payment shall include full compensation for all labor, equipment, materials and supervision necessary to install handholes and vaults as shown on the plans and described in the specifications complete and in place, including but not limited to the cover, conduit, fasteners, sealant, resurfacing, and cleanup.

Item 6 – Concrete Pad for Integrated Power Assembly and Concrete Infill at Northwest End of Ramp

Payment for this item shall be on a lump sum basis per the amount listed for this item in the Bid Schedule. Measurement shall correspond to percent complete as confirmed by the Engineer. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary to furnish and install all concrete for the project except for the concrete associated with the ramp and retaining wall. This includes any prep work required for concrete placement, installing form boards, reinforcing bars, placement of concrete, concrete finishing, and other miscellaneous tasks associated with installing finished concrete slabs. This item includes concrete at the integrated power assembly location and a concrete infill at the northwest end of the ramp, as shown on the Drawings.

Item 7 – Drainage Improvements

Payment for this item shall be on a lump sum basis per the amount listed for this item in the Bid Schedule. Measurement shall correspond to percent complete as confirmed by the Engineer. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary to furnish and install all trench drains, drain pipe, and associated connections for the project. This includes excavation, backfill, compaction, connecting drain pipes to trench drains, connecting drain pipes to the existing storm drain manhole (and any coring or grouting required for these connections), and any other miscellaneous work items required for installing these drainage improvements as shown on the Drawings.

Item 8 – Concrete Ramp and Retaining Wall

Payment for this item shall be on a lump sum basis per the amount listed for this item in the Bid Schedule. Measurement shall correspond to percent complete as confirmed by the Engineer. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary to furnish and install the concrete ramp and retaining wall. This includes any prep work required for concrete placement, installing form boards, reinforcing bars, placement of concrete, concrete finishing, and other miscellaneous tasks associated with installing the concrete ramp and retaining wall.

Item 9 – Site Grading and Fill Material

Measurement and payment for this item shall be on a per cubic yard basis. Measurement shall correspond to cubic yardage placed as measured by the Contractor and confirmed by a post-construction survey to be performed by the Owner. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary excavate, grade, fill, and compact areas of the site to achieve the final grades as shown on the Drawings, with the exception of the access road. It is estimated that there will be approximately 25 cubic yards of cut material for installation of the concrete ramp. The gross fill volume for the project is estimated to be 220 cubic yards. If all of the cut material is suitable for reuse as fill as determined by evaluation by the Engineer, there will be an estimated 195 cubic yards of net imported fill at the site. The Contractor's cubic yardage cost given in the Bid Schedule shall be given assuming that the cut material will be re-used as fill. This item does not include work for installing the gravel access road to the site, which is described under Item 3.

Item 10 – Security Fence and Gates

Measurement and payment for this item shall be on a per linear foot basis for fencing and gates installed. Measurement shall correspond to quantity complete as confirmed by the Engineer. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary to furnish and install new fencing and gates around the project site, including all necessary footings and appurtenances, as shown on the Drawings. This item shall also include the removal of a portion of the existing fence as shown on the Drawings.

Item 11 – Integrated Power Assembly

Payment for this item shall be on a per square foot basis per the area listed for this item in the Bid Schedule. Measurement shall correspond to square feet of integrated power assembly (IPA) installed and accepted by the Engineer. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary to furnish and install a fully functional, tested, PG&E approved integrated power assembly that satisfies all building and occupational safety code requirements, and complies with the Drawings and Specifications. The configuration of the IPA must allow for adequate working clearances in compliance with PG&E's Greenbook. This item includes but is not limited to shop drawings, component sizing, structural calculations, electrical layout, energy calculations, lighting, HVAC, and all additional effort and components required to satisfy the intent of the drawings and specifications.

Item 12 – PG&E Interconnection

Payment for this item shall be on a lump sum basis per the amount listed for this item in the Bid Schedule. Measurement shall correspond to percent complete as confirmed by the Engineer. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary to interconnect PG&E new service drop to the new switchgear utility cabinet, coordination of all protective relays and breaker functionality to standards required by PG&E, direct coordination with PG&E permitting authorities and inspectors, and shop drawings required by PG&E to approve equipment and functional testing prior to manufacturing.

Item 13 – 1200 A Utility Metering Compartment

Payment for this item shall be on a lump sum basis per the amount listed for this item in the Bid Schedule. Measurement shall correspond to percent complete as confirmed by the Engineer. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary to furnish and install the new 1200 A Utility Metering Compartment with all associated functionality and components as shown on the plans and described in the specifications. Items covered by this include, but are not limited to, PG&E required current transformers, potential transformers, metering, protective functional relay, fuses, terminations, covers and bushings, complete panel assembly, busing, access paneling, front and rear doors and all additional items required to satisfy the intent of the plans and specifications to provide utility power and metering coordinated with the existing 2 MW generator and switchgear Bus #1 and Bus #2 in a “make before break” configuration.

Item 14 – 1200 A Main Breakers, PTs, CPTs, Metering, Relays, and Compartment

Measurement and payment for this item shall be on a unit basis per the amount listed for each main utility breaker compartment and associated components installed in the switchgear lineup. Measurement shall correspond to percent complete as confirmed by the Engineer. Payment shall include full compensation for all labor, equipment, materials and supervision necessary to furnish and install the new 1200 A Main Breaker Compartments with all associated functionality and components as shown on the plans and described in the specifications. Items covered by this include, but are not limited to, main breaker compartments, main breakers, potential transformers, control power transformers, protective relays, metering, coordination of all equipment, interconnection to switchgear and IPA components, including AC panel, fuses, mechanical interlocking, current transformers, bus assemblies, lock out relay, doors, indicator lamp assembly, and all other components required to satisfy the requirements of PG&E and the plans and specifications, to provide full functionality and coordination between components.

Item 15 – 1200 A Feeder Section/Compartment, with (2) 1200 A Breakers and Relays

Measurement and payment for this item shall be on a unit basis per the amount listed for each double breaker stacked feeder breaker compartment and associated components installed in the switchgear lineup. Measurement shall correspond to percent complete as confirmed by the Engineer. Payment shall include full compensation for all labor, equipment, materials and supervision necessary to furnish and install the new 1200 A Feeder Breaker Compartments with all associated functionality and components as shown on the plans and described in the specifications. Items covered by this include, but are not limited to, feeder breaker compartments, two feeder breakers, protective relays, instrument compartment, busing, fuse holders, padlock provisions, lug boot and support assemblies, indicating lamp assemblies, doors, independent feeder metering, and associated components required by the project specifications and utility.

Item 16 – 1200 A Bus Tie Breakers, Relays, and Compartment

Measurement and payment for this item shall be on a unit basis per the amount listed for each Bus Tie Breaker compartment and associated components installed in the switchgear lineup. Measurement shall correspond to percent complete as confirmed by the Engineer. Payment shall include full compensation for all labor, equipment, materials and supervision necessary to furnish and install the new 1200 A Bus Tie Breaker Compartments with all associated functionality and components as shown on the plans and described in the specifications. This includes, but is not limited to, breakers, protective multi-functional relays, coordination, potential transformers and assembly, current transformers, doors, fuses, lamp assemblies, metering and source power as necessary.

Item 17 – Switchgear Battery System

Payment for this item shall be on a lump sum basis per the amount listed for this item in the Bid Schedule. Measurement shall correspond to percent complete as confirmed by the Engineer. Payment for the battery system shall include full compensation for all materials, labor, equipment, and supervision necessary to complete the installation of the battery system, racking, charger system, backup systems, alarms, sizing, and integration and interconnection with the new switchgear as shown on the Drawings and as required by the Specifications.

Item 18 – Relocate Generator Controller, Converter, and Add Remote Interface Panel

Payment for this item shall be on a lump sum basis per the amount listed for this item in the Bid Schedule. Measurement shall correspond to percent complete as confirmed by the Engineer. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary to relocate the generator controller “onan command center” synchronizing panel and HBMWD data interface panel from the maintenance building to the new integrated power assembly, and all associated wiring, programming, and any additional requirements to render the units fully operational as required by the specifications. This item also includes the addition of a remote interface panel to the switchgear lineup for displaying and controlling facility processes, including wiring and associated programming.

Item 19 – Testing, Commissioning, Demonstration, and Training

Payment for this item shall be on a lump sum basis per the amount listed for this item in the Bid Schedule. Measurement shall correspond to percent complete as confirmed by the Engineer. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary to test, coordinate, commission, verify, and demonstrate functionality of all new and existing interconnected systems required by the specifications for this project, and train District staff on the operation and maintenance of these systems. This item includes but is not limited to factory testing, field testing, third party testing, testing and commissioning reports, training, coordination of all components, and documentation to confirm that all systems have been fully tested and commissioned as described on the plans and in the specifications to the satisfaction of the District. All manufacturer’s instructions for testing must be performed by contractor and testing standards followed. Demonstration must include, but not necessary be limited to full system operation and maintenance of products, start-up, control adjustment, troubleshooting, servicing, and shutdown of each item of equipment. Training to District maintenance personnel must be provided by a factory authorized service representative.

Item 20 – Decommissioning of Existing Switchgear and Associated Components

Payment for this item shall be on a lump sum basis per the amount listed for this item in the Bid Schedule. Measurement shall correspond to percent complete as confirmed by the Engineer. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary to decommission and dispose of electrical equipment, conduit, breakers, disconnect and remove wiring, safe off all connections in panels that will remain in place, remove, and dispose of all conductors including: 12 kV, low voltage, and communications wires, dismantle switchgear components, including; 12 kV transfer switch, main switchgear Bus #1 and Bus #2 sections, 12 kV disconnect panel, and removal from site with proper disposal, cutting and capping conduit, disposal of batteries and existing charger and rectifier equipment and racking, and finish work to cover and cap vaults and openings in the ground surface to match area surface material. The lean to switchgear cover structure is to remain in place. This item shall also cover coordination of the decommissioning and removal of PG&E existing overhead lines, power poles, and metering shed. PG&E is responsible for removal of poles and lines, but will need access to these locations to be provided by contractor. Contractor is responsible for removal and disposal of PG&E meter building “shed”. This item also includes conduit removal and demolition associated with relocation of the generator controller synchronizing panel and data interface converter panel to the new Integrated Power Assembly and demolition of conduit connected to the equipment.

ADDITIVE BID SCHEDULE

Item A-1 – Higher Security Fence and Gates

If this item is awarded by the Owner, it will be in place of Item 10 – Security Fence and Gates as given in the Base Bid Schedule. Measurement and payment for this item shall be on a per linear foot basis similar to Item 9. The additive design measures for a higher security fence and gate are described in Note 4 on the Security Fence and Gate Detail on Sheet C-501

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 22 00

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Coordination and project conditions
- B. Field engineering
- C. Pre-bid meeting
- D. Preconstruction meeting
- E. Progress meetings
- F. Pre-Connection meetings

1.02. MEASUREMENT AND PAYMENT

- A. Measurement and payment for the items addressed in this Section shall be included in the Mobilization/Demobilization Bid Item. No additional measurement or payment will be included for the requirements of this section.

1.03. COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various sections of Project to ensure efficient and orderly sequence of installation of construction elements.

1.04. FIELD ENGINEERING

- A. Protect survey control points prior to starting site Work; preserve permanent reference points during construction.
- B. Promptly report to Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.
- C. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer. The surveyor shall comply with the California Professional Land Surveyors' Act in replacement of all permanent survey monuments.

1.05. PRE-BID MEETING

- A. Prior to awarding the Contract, a non-mandatory pre-bid meeting will occur as established in the Advertisement for Bids. The pre-bid meeting shall be attended by District representatives and the Engineer. While non-mandatory, it is highly recommended that the Contractor's construction superintendent and/or project manager attend the meeting.

1.06. PRECONSTRUCTION MEETING

- A. Contractor will schedule meeting after Notice of Award.

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- B. Prior to the commencement of Work at the site, a preconstruction meeting will be held at a mutually agreed upon time and place. The preconstruction meeting shall be attended by District representatives, Engineer, construction foreman, contractor's construction superintendent, key subcontractors, and any other parties requested by the Contractor or the Engineer.
- C. Unless previously submitted to the Engineer, the Contractor shall bring to the conference three (3) copies of each of the following:
 - 1. Draft Construction Schedule.
 - 2. Procurement schedule of major equipment and materials and items requiring long lead time.
 - 3. Shop Drawing/Sample/submittal schedule.
 - 4. Substitution requests.
 - 5. Contact sheet designating contact information for the construction foreman, construction Superintendent, and Project Manager for the Contractor including cell phone numbers or contact information to allow for emergency contact after business hours.
- D. At the preconstruction meeting the District will provide the Contractor with three (3) sets of the Contract Documents. It shall be the Contractor's responsibility to arrange to pay all costs of additional reproduction required by the Contractor.
- E. The purpose of the meeting is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established.
- F. The Engineer will preside at the preconstruction conference and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.
- G. Agenda:
 - 1. Notice to Proceed date.
 - 2. Distribution of Contract Documents.
 - 3. Contractor's tentative schedules.
 - 4. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.
 - 5. Critical work sequencing.
 - 6. Designation of personnel representing parties in Contract, and Engineer.
 - 7. Procedures and processing of field decisions, submittals, substitutions, requests for information, applications for payments, proposal request, change orders, and contract closeout procedures.
 - 8. Scheduling.

9. Major equipment deliveries and priorities.
10. Use of premises by Owner and Contractor.
11. Owner's requirements and occupancy.
12. Site Safety: Contractor's assignments for safety and first aid.
13. Construction facilities and controls provided by Owner.
14. Temporary utilities provided by Owner.
15. Conduit and feeder interception and extension procedures.
16. Integrated Power Assembly mounting procedures.
17. Contingency Plan for unexpected loss of power or communications.
18. Application for payment procedures.
19. Procedures for testing.
20. Procedures for maintaining record documents.
21. Requirements for system shut down, cutover, and interconnection coordination with District and PG&E.

1.07. PROGRESS MEETINGS

- A. The Engineer shall schedule, arrange and conduct progress meetings. These meetings shall be conducted once per week, or as mutually agreed by Contractor and Owner, and shall be attended by the Contractor's superintendent and representatives of key Subcontractors, utilities, and others, who are active in the execution of the Work. The purpose of these meetings shall be to review the Contractor's schedule provided in accordance with this Section, resolve conflicts, and in general, coordinate and expedite the execution of the Work.
- B. Engineer will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings and record the meeting minutes.
- C. Attendance Required: construction superintendent, key subcontractors, Owner and Engineer, as appropriate to agenda topics for each meeting.
- D. Agenda:
 1. Review and acceptance of minutes of previous meeting.
 2. Review of Work progress.
 3. Field observations, problems, and decisions.
 4. Site Safety.
 5. Identification of problems impeding planned progress.
 6. Review of submittals schedule and status of submittals.

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7. Review of delivery schedules.
 8. Maintenance of progress schedule.
 9. Corrective measures to regain projected schedules.
 10. Planned progress during succeeding work period.
 11. Coordination of projected progress.
 12. Maintenance of quality and work standards.
 13. Effect of proposed changes on progress schedule and coordination.
 - a. Progress Payment.
 - b. Change Orders.
 - c. Claims.
 - d. Field Work Directives
 - e. Requests for Information
 14. Other business relating to Work.
- E. The Engineer shall record minutes and distribute copies within two days after meeting to participants and those affected by decisions made.

1.08. PRE-CONNECTION MEETINGS

- A. Coordination meetings may also be required prior to system shut downs for cutover of power and communications systems, and interconnection to PG&E. These meetings may also be incorporated into weekly progress meetings.
- B. Require attendance of parties directly affecting, or affected by, Work of specific interconnections.
- C. Notify Engineer a minimum of fourteen (14) calendar days in advance of planned cutover dates.
- D. Engineer shall prepare agenda and preside at meeting:
 1. Review conditions of connections, preparation, connection, and cutover procedures.
 2. Review schedule.
 3. Discussion of contingency plan if work does not proceed according to schedule.
- E. Engineer shall record minutes and distribute copies within two days after meeting to participants and those affected by decisions made.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 30 00

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SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Product data & shop drawings.
- D. Test reports.
- E. Certificates.

1.02. MEASUREMENT AND PAYMENT

- A. Measurement and payment for the items addressed in this Section shall be included in the Bid Item to which they relate. No additional measurement or payment will be included for the requirements of this section.

1.03. SUBMITTAL PROCEDURES

- A. Submit on Submittal Form (attached at the end of this section). Contractor shall submit one electronic version in Word format.
- B. Sequentially number transmittal forms. The first iteration of a particular submittal shall be Revision Number 0.
- C. Identify Project, Contractor, Subcontractor and supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.
- D. Apply Contractor's stamp and/or signature certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite Project and coordinate submission of related items.
- F. Allow fourteen (14) calendar days for review of each submittal.
- G. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work.
- H. When revised for resubmission, clearly identify changes made since previous submission.
- I. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.

1.04. CONSTRUCTION PROGRESS SCHEDULES

- A. Submit an initial schedule electronically within ten (10) calendar days after date of Notice to Proceed. After review, resubmit required revised data within ten (10) calendar days.
- B. Submit revised Progress Schedules with each Application for Payment.
- C. Distribute copies of reviewed schedules to Project site file, Subcontractors, suppliers, and other concerned parties.
- D. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.
- E. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities.
- F. Indicate estimated percentage of completion for each item of Work at each submission.
- G. Revisions to Schedules:
 - 1. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
 - 2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.

1.05. PRODUCT DATA AND SHOP DRAWINGS

- A. Product Data and Shop Drawings: Submit to Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Submit a single reproducible copy or email an electronic version of the submittal to the Engineer.
- C. Mark submittal to clearly identify applicable products, models, options, and other data to be used on this project. Supplement manufacturers' standard data to provide information specific to this Project.

1.06. TEST REPORTS

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

1.07. CERTIFICATES

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

1.08. REQUESTS FOR SUBMITTALS

Contractor is directed to each Specification section for required submittals

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 33 00

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**Humboldt Bay Municipal Water District
SHOP DRAWING & SUBMITTAL REVIEW FORM**

Date:	Contract Title: 12 kV Switchgear Relocation Project GHD Job #: 11186675
To: GHD, Inc. 718 Third Street Eureka, CA 95501 Attention: Patrick Kaspari, PE Email: Pat.Kaspari@ghd.com Phone: (707) 443-8326 Fax: (707) 444-8330	From: Contractor Name Contractor Address Line 1 Contractor Address Line 2 Submitted By: Signature: Phone:

Spec Section or Dwg	Submittal No.	Rev. No.	Qty.	Subject of Shop Drawing or Submittal	Review Action

Engineer's Review Comments:

Signature: _____ **Date:** _____

Review Action Explanation:

1. No Exceptions Taken	4. Rejected – Resubmit
2. Make Corrections Noted – No Resubmittal Required	5. Answer provided
3. Amend and Resubmit	6. Not Reviewed – Filed Only

Shaded areas  for Engineer use only.

This review is only for general conformance with the design concept and the information given in the Construction Documents. Notations made on the submittals during this review do not relieve the Contractor from compliance with the requirements of the construction documents, including without limitation, the plans and specifications, and all applicable laws and codes. Review of that specific item shall not include review of an assembly of which the item is a component. The Contractor is responsible for: dimensions to be confirmed and correlated at the jobsite; information that pertains solely to the fabrication processes or to the means, methods techniques, sequences and procedures of construction; and coordination of the Work with all other trades and performing all Work in a safe and satisfactory manner. This review is not for constructability or Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto. This review is subject to all provisions of the Contract Documents.

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SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01. SECTION INCLUDES

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

1.02. MEASUREMENT AND PAYMENT

- A. Measurement and payment for the items addressed in this Section shall be included in the Bid Item to which they relate. No additional measurement or payment shall be made for the requirements of this section.

1.03. QUALITY CONTROL AND CONTROL OF INSTALLATION

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

1.04. TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.05. REFERENCES

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

1.06. LABELING

- A. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label:
 - 1. Model number.
 - 2. Serial number.
 - 3. Performance characteristics.
- B. Manufacturer's Nameplates, Trademarks, Logos, and Other Identifying Marks on Products: Not allowed on surfaces exposed to view in public areas, interior or exterior without the Owner's prior approval.

1.07. TESTING AND INSPECTION SERVICES

- A. Employ and pay for services of an independent testing agency or laboratory acceptable to Owner to perform specified testing.
 - 1. Before starting Work, submit testing laboratory name, address, and telephone number, and names of full-time appropriately licensed or certified Professional Engineer and responsible officer.

2. Submit copy of report of laboratory facilities' inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of deficiencies reported by inspection.
- B. Independent firm will perform tests, inspections, and other services specified in individual Specification Sections and as required by the Engineer.
1. Laboratory: Authorized to operate in State of California.
 2. Laboratory Staff: Maintain full-time appropriately licensed or certified Professional Engineer on staff to review services.
 3. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to National Bureau of Standards or accepted values of natural physical constants.
- C. Testing, inspections, and source quality control may occur on or off Project Site. Perform off-Site testing as required by the Engineer or Owner.
- D. Reports shall be submitted by independent firm to the Engineer, Contractor, and authorities having jurisdiction, in duplicate, indicating observations and results of tests and compliance or noncompliance with Contract Documents.
1. Submit final report indicating correction of Work previously reported as noncompliant.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
1. Notify Engineer and independent firm forty-eight (48) hours before expected time for operations requiring services.
 2. Make arrangements with independent firm and pay for additional Samples and tests required for Contractor's use.
- F. Employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work according to requirements of Contract Documents.
- G. Retesting or re-inspection required because of nonconformance with specified or indicated requirements shall be performed by same independent firm on instructions from Engineer. Payment for retesting or re-inspection will be charged to Contractor.
- H. Testing Agency Responsibilities:
1. Test Samples of mixes submitted by Contractor.
 2. Provide qualified personnel at Site. Cooperate with Engineer and Contractor in performance of services.
 3. Perform indicated sampling and testing of products according to specified standards.
 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 5. Promptly notify Engineer and Contractor of observed irregularities or nonconformance of Work or products.

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12 kV Switchgear Relocation Project

6. Perform additional tests required by Engineer.
7. Attend preconstruction meetings and progress meetings, as requested.
- I. Agency Reports: After each test, promptly submit two (2) copies of report to Engineer, Contractor, and authorities having jurisdiction. When requested by Engineer, provide interpretation of test results. Include the following:
 1. Date issued.
 2. Project title and number.
 3. Name of inspector.
 4. Date and time of sampling or inspection.
 5. Identification of product and Specification Section.
 6. Location in Project.
 7. Type of inspection or test.
 8. Date of test.
 9. Results of tests.
 10. Conformance with Contract Documents.
- J. Limits on Testing Authority:
 1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency or laboratory may not approve or accept any portion of the Work.
 3. Agency or laboratory may not assume duties of Contractor.
 4. Agency or laboratory has no authority to stop the Work.

1.08. MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Engineer thirty (30) calendar days in advance of required observations. Observer subject to approval of Engineer.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means Contractor acceptance of existing conditions.
- B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify utility services are available, of correct characteristics, and in correct locations.

PART 4 PREPARATION

4.01. PREPARATION

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

END OF SECTION 01 40 00

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SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Public Utilities
 - 1. Agencies Affected
 - 2. Notification Requirements
 - 3. Contractor Responsibility
- B. Temporary Utilities
 - 1. Temporary water
 - 2. Temporary electricity
 - 3. Temporary ventilation
 - 4. Temporary sanitary facilities
- C. Existing Utilities and Improvements
 - 1. General
 - 2. District Right of Access
 - 3. Underground Utilities Indicated
 - 4. Underground Utilities not Indicated
 - 5. Approval of Repairs
 - 6. Maintain in Service
- D. Temporary Field Office and Storage Facility
- E. Vehicular Access
- F. Parking
- G. Progress Cleaning and Waste Removal
- H. Barriers
- I. Security
- J. Water Control

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- K. Dust Control
- L. Erosion and Sediment Control
- M. Pollution Control
- N. Removal of utilities, facilities, and controls
- O. Related Sections
 - 1. Section 01 33 00 – Submittal Procedures
 - 2. Section 01 57 13 – Erosion Control
 - 3. Section 01 57 19 – Environmental Requirements

1.02. MEASUREMENT AND PAYMENT

- A. Measurement and payment for this item shall be included in the Mobilization/Demobilization Bid Item, or other appropriate Bid Item. No additional measurement or payment will be included for the requirements of this section.

1.03. SUBMITTAL REQUIREMENTS

- A. Section 01 33 00 - Submittal Procedures.

1.04. PUBLIC UTILITIES

- A. Agencies Affected
 - 1. Electrical: Pacific Gas & Electric. Where a structure that is known to receive service does not have overhead service, underground service shall be assumed to exist.
 - 2. Gas: Pacific Gas & Electric Company has jurisdiction over gas lines.
 - 3. Telephone Service: AT&T. Where a structure that is known to receive service does not have overhead service, underground service shall be assumed to exist.
 - 4. Water Service: HBMWD has jurisdiction over water usage.
 - 5. Drainage: Humboldt County Department of Public Works has jurisdiction over drainage in the area.
 - 6. Streets/Pavement: Humboldt County Department of Public Works has jurisdiction over streets and pavement in the area.
 - 7. Sewer Service: Individual owner provided sewer service.
- B. Notification Requirements
 - 1. Prior to any excavation in the vicinity of any existing underground facilities, including all water, sewer, storm drain, gas, or other pipelines; all buried electric power, communications, or television cables; all traffic signal and street lighting facilities; and all roadways; the Contractor shall notify the respective authorities representing the

owners or agencies responsible for such facilities not less than two (2) work days nor more than seven (7) work days prior to excavation.

2. Notify USA North at 811 or online at USANorth811.org at least two (2) work days, but no more than fourteen (14) work days, prior to such excavation.

C. Contractor Responsibility

1. The Contractor shall anticipate water, sewer, electrical, gas, communication, fiber optic, drainage and telephone services. It may be expected that there will be variation in location from that as shown on the Plans to the actual location. Contractor responsible for verifying actual location in the field after pre-marking by the various utilities affected.
2. No extra payment will be allowed for the removal, replacement, repair, or possible increased cost caused by inadvertent or planned interception and breaking of underground obstructions which may exist.
3. It should be understood that the various utilities are indicated on the Plans to show only the approximate location and must be verified in the field by the Contractor. The various utility agencies will cooperate with the Contractor to endeavor to familiarize the Contractor with all known underground utilities obstructions, but this will not relieve the Contractor from full responsibility in anticipating and locating their actual location.
4. The Contractor, in conjunction with the affected utility company(s), shall pothole and establish the horizontal and vertical locations of all pertinent utilities shown on the Plans and marked in the field. This may be done on an area-by-area basis, but shall be accomplished at least five working days in advance of the date of construction within such area. Any discrepancies (horizontal and/or vertical) between the locations of utilities found by the potholing operation than that shown on the Plans shall be brought to the Engineer's attention immediately. Potholing shall be required at the connection to existing facilities prior to the shop drawing submittals.

1.05. TEMPORARY UTILITIES

A. Temporary Water

1. Owner supplied temporary water is available at the site.

B. Temporary Electricity

1. Owner supplied temporary electricity is generally available onsite through coordination with the Owner.
2. Contractor will pay cost of energy used and is responsible for all necessary permits, permissions, code and regulatory compliance associated with such use.

C. Temporary Ventilation

1. Ventilate enclosed areas, such as air relief enclosures and valve vaults to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
2. Contractor shall comply with all applicable OSHA requirements for working in confined spaces.

D. Temporary Sanitary Facilities

1. Provide and maintain required facilities and enclosures sufficient to accommodate Contractor and Subcontractor personnel at locations easily accessible from work. Existing facility use is not permitted. Provide facilities at time of project mobilization.
2. Contractor is responsible for cleaning, maintenance, security, placement and removal of facilities.

1.06. EXISTING UTILITIES AND IMPROVEMENTS

A. General

1. The Contractor shall protect all underground utilities and other improvements that may be impaired during construction operations. It shall be the Contractor's responsibility to ascertain the actual location of all existing utilities and other improvements that will be encountered in its construction operations, and to see that such utilities or other improvements are adequately protected from damage due to such operations. The Contractor shall take all possible precautions for the protection of unforeseen utility lines to provide for uninterrupted service and to provide such special protection as may be necessary.
2. In case it shall be necessary to move the property of any public utility or franchise holder, such utility company or franchise holder will be notified by the Contractor to move such property. Time of relocation of the utility by the utility company is not a responsibility of the District. When utility lines that are to be removed are encountered within the area of operations, the Contractor shall notify the Engineer a sufficient time in advance for the necessary measures to be taken to prevent interruption of service.
3. Where the proper completion of the Work requires the temporary or permanent removal and/or relocation of an existing utility or other improvement that is indicated, the Contractor shall remove and, without unnecessary delay, temporarily replace or relocate such utility or improvement in a manner satisfactory to the Engineer and the District. In all cases of such temporary removal or relocation, restoration to former location shall be accomplished by the Contractor in a manner that will restore or replace the utility or improvement as nearly as possible to its former location and to equal or better condition as found prior to removal.

B. District Right of Access

1. The right is reserved by the District and the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property when necessary during the performance of the Work of this Contract.

C. Underground Utilities Indicated

1. Existing utility lines that are indicated or the locations of which are made known to the Contractor prior to excavation and that are to be retained, and all utility lines that are constructed during excavation operations shall be protected from damage during excavation and backfilling, and if damaged, shall be immediately repaired or replaced by the Contractor.

D. Underground Utilities not indicated

1. In the event that the Contractor damages any existing utility lines that are not indicated or the locations of which are not made known to the Contractor prior to excavation, a written report thereof shall be made by the Contractor to the District.
2. All costs of locating, repairing damage not due to failure of the Contractor to exercise reasonable care, and removing or relocating such utility facilities not shown in the Contract documents with reasonable accuracy, and for equipment on the project which was actually working on that portion of the Work which was interrupted or idled during such Work will be paid for as extra Work.

E. Approval of Repairs

1. All repairs to a damaged utility or improvement are subject to inspection and approval by an authorized representative of the utility or improvement Owner before being concealed by backfill or other Work. Contractor to schedule with Owner for the inspection and shall notify the Engineer of the schedule and place of the inspection a minimum of three (3) calendar days prior to inspection.

F. Maintain In Service

1. All power and telephone or the communication cable ducts, gas and water mains, sewer lines, storm drain lines, poles, and overhead power and communication wires and cables encountered along the line of Work shall remain continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the Engineer are made with the owner of said utilities. The Contractor shall be responsible for and shall repair all damage due to its operations, and the provisions of this section shall not be abated even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling.

1.07. TEMPORARY FIELD OFFICE AND STORAGE FACILITY

A. Contractor and Subcontractors:

1. The Contractor and their Subcontractors shall make arrangements for and maintain temporary field offices and storage facilities as may be necessary for the proper execution of the Work. These shall be located so as to cause no interference with any Work to be performed on the site. Coordination and location of offices or storage facilities shall be the responsibility of the Contractor.

1.08. VEHICULAR ACCESS

- A. Provide unimpeded access for Owner's vehicles.
- B. Provide means of removing mud from vehicle wheels before entering streets.
- C. Use existing on-site roads and railroad alignment for construction traffic.

1.09. PARKING

- A. Arrange for temporary surface parking areas to accommodate construction personnel.
- B. When site space is not adequate, provide additional off-site parking.
- C. Use of designated existing on-site streets and driveways used for construction traffic is permitted.

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- D. Tracked vehicles not allowed on paved areas.
- E. Maintenance
 - 1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, and mud.
 - 2. Maintain existing areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain surface course and drainage in original, or specified, condition.
- F. Removal, Repair
 - 1. Remove temporary materials and construction at Substantial Completion.
 - 2. Repair existing facilities damaged by use to original condition.
- G. Mud From Site Vehicles
 - 1. Provide means of removing mud from vehicle wheels before entering streets.

1.10. PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, vaults and other closed or remote spaces, prior to enclosing spaces.
- C. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.

1.11. BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Protect vehicular traffic, stored materials, site, and structures from damage.

1.12. SECURITY

- A. Security Program
 - 1. Protect Work, existing premises and Owner's operations from theft, vandalism, and unauthorized entry.
 - 2. Initiate security program in coordination with Owner's existing security system at project mobilization.
 - 3. Maintain program throughout construction period until Owner acceptance precludes need for Contractor security.
- B. Entry Control
 - 1. Restrict entrance of persons and vehicles into Work site.

2. Owner will control entrance of persons and vehicles related to Owner's operations.

1.13. WATER CONTROL

A. Grade Site to Drain

1. Maintain excavations free of water.
2. Provide, operate, and maintain pumping equipment.

1.14. DUST CONTROL

- A. See Section 01 57 19 Environmental Requirements of these Specifications.

1.15. EROSION AND SEDIMENT CONTROL

- A. See Section 01 57 13 – Erosion Control
- B. See Section 01 57 19 – Environmental Requirements

1.16. POLLUTION CONTROL

- A. See Section 01 57 19 – Environmental Requirements

1.17. REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 50 00

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SECTION 01 57 13

EROSION CONTROL

PART 1 GENERAL

1.01. GENERAL

- A. Minimize the extent of all ground-disturbing activities and avoid Work in any drainage channels if at all feasible.
- B. Heavy equipment shall be placed outside of drainage channels except when absolutely necessary to perform the Work.
- C. Upon completion of construction activities, natural drainage shall be restored and re-contoured as nearly as practicable to pre-project conditions and shall match adjacent natural channel contours.
- D. In addition to ongoing erosion control measures, all disturbed areas resulting in bare earth shall be treated with seed upon completion of the project. Seed shall be per Caltrans standards for roadside seeding in the project region. Seed shall be applied at a minimum rate of 100 pounds per acre.

1.02. RELATED SECTIONS

Related work specified in other sections:

- A. Section 01 57 19 – Environmental Requirements
- B. Section 31 00 00 – Earthwork

1.03. MEASUREMENT AND PAYMENT

- A. Measurement and payment for erosion control shall be included in the Sediment and Erosion Control Bid Item. No additional measurement or payment will be included for the requirements of this section.

1.04. SUBMITTALS

- A. Mill Certificate or Affidavit. A mill certificate or affidavit shall be provided attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified below.
- B. Erosion Control Plan.
- C. Proposed Seed Mix

1.05. REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. American Society for Testing and Materials (ASTM)

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1. ASTM D4439 - Standard Terminology for Geosynthetics.
 2. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 3. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 4. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 5. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 6. ASTM D4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
- C. California State Water Resources Control Board:
1. National Pollutant Discharge Elimination System (NPDES) General Permit Discharge from Construction Activities.
 2. HBMWD Statewide NPDES General Permit for Drinking Water System Discharges (see Appendix A of these Specifications).

1.06. EROSION AND SEDIMENT CONTROLS

- A. The controls and measures required of the Contractor are described but not limited to the below.
1. Structural Practices: Structural practices shall be implemented to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Structural practices shall be implemented in a timely manner during the construction process to minimize erosion and sediment runoff. Structural practices shall include the following devices.
 - a. Silt Fences. The Contractor shall provide silt fences as a temporary structural practice to minimize erosion and sediment runoff. Silt fences shall be properly placed and installed to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (e.g. clearing and grubbing, trench excavation, backfilling, and grading). Silt fences shall be installed in the locations as directed by the Engineer. Final removal of silt fence barriers by the Contractor shall be upon approval of the Engineer.
 - b. Fiber Rolls (sediment logs or wattles): Contractor shall provide fiber rolls as temporary structural practice to minimize erosion and sediment runoff. Fiber rolls shall be properly placed and installed to effectively retain sediment immediately after completing each phase of work (e.g., clearing and grubbing, trench excavation, backfill, and grading) in each independent runoff area (e.g., after clearing and grubbing in an area between a ridge and drain, fiber rolls shall be placed as work progresses; fiber rolls shall be removed/replaced/relocated as needed for work to progress in the drainage area). Final removal of fiber roll barriers by the Contractor shall be upon approval by the Engineer. Fiber Rolls shall be provided as follows, or as required to conform to the intent of this section:

- 1) Along the downhill perimeter edge of all areas disturbed.
 - 2) Along the top of the slope or top bank of drainage ditches, channels, swales, etc. that traverse disturbed areas.
 - 3) Along the toe of all cut slopes and fill slopes of the construction areas.
 - 4) Perpendicular to the flow in the bottom of existing drainage ditches, channels, swales, etc. that traverse disturbed areas or carry runoff from disturbed areas. Rows shall be spaced a maximum of 100 feet apart.
 - 5) Perpendicular to the flow in the bottom of new drainage ditches, channels, and swales. Rows shall be spaced a maximum of 100 feet apart.
 - 6) At the entrance to culverts that receive runoff from disturbed areas.
- c. To minimize wildlife entanglement and plastic debris pollution, the use of plastic netting (such as polypropylene, nylon, polyethylene, polyester, or other synthetic fibers used in fiber rolls, erosion control blankets, and mulch control netting) in temporary rolled erosion and sediment control products is prohibited. Any erosion control associated netting shall be made of natural fibers and constructed in a loose-weave design with movable joints between the horizontal and vertical twines.

PART 2 PRODUCTS

2.01. SILT FENCES

- A. Ultraviolet stabilized woven polypropylene face. The filter fabric shall meet the following requirements:

Physical Property	Test Procedure	Required Value
Grab Tensile	ASTM D 4632	160 lbs. min.
Elongation (%)	ASTM D 1682	25 % max.
Mullen Burst Strength, psi, min.	ASTM D 3876	350
Equivalent Opening Size, max.	US Standard Sieve	30-70
Ultraviolet Radiation Resistance, % Strength Retention	ASTM D 4355	70
Weight oz./sq. yd.	ASTM D 3776	4

- B. Mill Certificate or Affidavit. A mill certificate or affidavit shall be provided attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above.
- C. The Contractor may use either wooden stakes or steel posts for silt fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 inches by 2 inches when oak is used and 4 inches by 4 inches when pine is used. Steel posts

(standard "U" or "T" section) utilized for silt fence construction, shall have a minimum weight of 1.33 pounds per linear foot.

2.02. FIBER ROLLS (SEDIMENT LOGS OR WATTLES)

- A. Composed of certified weed free rice straw or coconut fiber in 8.5 to 9-inch diameter rolls with and approximate weight of 2lbs/lineal foot, contained in a core, jute, or burlap netting.
- B. Manufacturers:
 - 1. Earth Savers 9"-Coir Log
 - 2. Erosion Control Blanket, 9-inch Stenlog
 - 3. Substitutions: Section 01 60 00 - Product Requirements.
- C. The Contractor shall use wooden stakes for fiber roll installation. Wooden stakes used for fiber roll installation shall have a minimum cross section of 1 inch by 2 inches, or as suggested by the fiber roll manufacturer.

PART 3 EXECUTION

3.01. INSTALLATION OF SILT FENCES

- A. Silt fences shall extend a minimum of 16 inches above the ground surface and shall not exceed 34 inches above the ground surface. Filter fabric shall be from a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter fabric shall be spliced together at a support post, with a minimum 6 inch overlap, and securely sealed. A trench shall be excavated approximately 4 inches wide and 4 inches deep on the upslope side of the location of the silt fence. The 4-inch by 4-inch trench shall be backfilled and the soil compacted over the filter fabric. Silt fences shall be removed upon approval by the Engineer.
- B. Maximum spacing for post supports shall be 6 feet on center. Posts shall be buried 12 inches minimum and shall not exceed 36 inches above the ground surface.

3.02. INSTALLATION OF FIBER ROLLS (SEDIMENT LOGS OR WATTLES)

- A. Fine grade the subgrade by hand, dressing where necessary to remove local deviations and to remove larger stones or debris that will inhibit intimate contact of the fiber roll with the subgrade. Prior to roll installation, contour a concave key trench 2 to 4 inches deep along the proposed installation route. Soil excavated in trenching should be placed on the uphill or flow side of the roll to prevent water from undercutting the roll.
- B. Place fiber rolls into the key trench and stake on both sides of the roll within 6 feet of each end. Spacing for stakes shall be 3 to 5 feet. Stakes are typically driven in on alternating sides of the roll. Stakes shall be buried 12 inches minimum.
- C. When more than one fiber roll is placed in a row, the rows shall be abutted securely to one another to provide a tight joint, not overlapped. Fiber rolls shall be placed in a single row, lengthwise on the contour, with ends of adjacent rolls tightly abutting one another.

3.03. MAINTENANCE

- A. The Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures. The following procedures shall be followed to maintain the protective measures.
1. Silt Fence Maintenance. Silt fences shall be inspected in accordance with PART 4. Any required repairs shall be made promptly. Close attention shall be given to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, the fabric shall be replaced promptly. Sediment deposits shall be removed when deposits reach one-third of the height of the barrier. When a silt fence is no longer required, it shall be removed. The immediate area occupied by the fence and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be re-vegetated.
 2. Fiber Roll Maintenance. Fiber roll barriers shall be inspected in accordance with PART 4. Close attention shall be given to the repair of damaged rolls, end runs and undercutting beneath rolls. Necessary repairs to barriers or replacement of rolls shall be accomplished promptly. Sediment deposits shall be removed when deposits reach one-half of the height of the barrier. Roll rows used to retain sediment shall be turned uphill at each end of each row. When a fiber roll barrier is no longer required, it shall be removed. The immediate area occupied by the roll and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be re-vegetated.

PART 4 INSPECTION

4.01. INSPECTIONS BY REGULATORY AGENCIES

- A. Allow Regional Water Quality Control Board, or any authorized representative of this or other applicable agencies, to conduct the following activities at reasonable times:
1. Enter onto areas of the site, including any construction support activity areas, and onto locations where records are kept.
 2. Access and copy any records that must be kept under the conditions of this Specification section;
 3. Inspect the construction site, including any construction support activity areas covered by this Contract and any stormwater controls installed and maintained at the site; and
 4. Sample or monitor for the purpose of ensuring compliance.

PART 5 CORRECTIVE ACTION

5.01. "CORRECTIVE ACTION" DEFINED

- A. Corrective actions are actions taken in compliance with this Specification section, which include:
1. Repair, modify, or replace any stormwater control used at the site;

2. Clean up and properly dispose of spills, releases, or other deposits; or
3. Remedy a permit violation

5.02. REQUIREMENTS FOR TAKING CORRECTIVE ACTION

- A. Contractor must complete the following corrective action in accordance with the deadlines specified in this Part. In all circumstances, Contractor must immediately take all reasonable steps to minimize or prevent the discharge of pollutants until a permanent solution is installed and made operational, including cleaning up any contaminated surfaces so that the material will not discharge in subsequent storm events.
- B. For any of the following conditions on the site, Contractor must install a new or modified erosion control measure and make it operational, or complete the repair, but no later than seven (7) calendar days from the time of discovery. If it is infeasible to complete the installation or repair within seven (7) calendar days, Contractor must document in their records why it is infeasible to complete the installation or repair within seven (7) calendar days and document the schedule for installing the stormwater control(s) and making it operational as soon as practicable after the seven (7) day timeframe.
 1. A required storm water control was never installed, was installed incorrectly, or not in accordance with the requirements of Section 01 57 13.
 2. If the Contractor determines that erosion control measures installed are not effective enough for the discharge to meet applicable water quality standards.
 3. Any of the prohibited discharges listed below are occurring or has occurred:
 - a. Wastewater from washout of concrete or slurry, unless managed by an appropriate control.
 - b. Wastewater from washout and cleanout of any other construction materials, unless managed by an appropriate control.
 - c. Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance.
 - d. Soaps, solvents, or detergents used in vehicle and equipment washing.
 - e. Drilling muds, or toxic or hazardous substances from a spill or other release.

5.03. CORRECTIVE ACTION REQUIRED BY REGULATORY AGENCY

- A. Contractor must comply with any corrective actions required by the State as a result of an inspection carried out under Part 4.02.

END OF SECTION 01 57 13

SECTION 01 57 19

ENVIRONMENTAL REQUIREMENTS

PART 1 GENERAL

1.01. SUMMARY

A. Section includes mitigation and project measures to reduce or avoid adverse effects, resulting from construction of the project.

B. Related Sections

1. Section 01 50 00 Temporary Facilities and Controls

2. Section 01 57 13 Erosion Control

3. Section 01 74 00 Site and Area Cleanup

4. Section 31 23 19 Dewatering

1.02. MEASUREMENT AND PAYMENT

A. Measurement and payment for the items addressed in this Section shall be included in the Bid Item to which they relate. No additional measurement or payment will be included for the requirements of this section.

1.03. DEFINITIONS

A. Project Measures: Measures and practices are included as part of the Project to reduce or avoid adverse effects that could result from construction or operation of the 12 kV switchgear.

B. Mitigation Measures: Measures and practices are included as part of the Project to reduce or avoid adverse effects that could result from construction or operation of the switchgear and require monitoring and checking for compliance prior, during, and following construction.

1.04. SUBMITTALS

A. Erosion Control Plan – Submit under Specification 01 57 13 – Erosion Control

B. General Construction Permit Application

C. Dewatering Plan

D. Fire Safety Plan

PART 2 PRODUCTS

2.01. PRODUCTS

A. The use of rodenticides containing any anticoagulant compounds including, but not limited to Warfarin, Bromadiolone, Brodifacoum, or Diphacinone is prohibited.

- B. The use of herbicides is prohibited.

PART 3 EXECUTION

3.01. PROJECT-WIDE MEASURES:

- A. **Implement Air Quality Emission Control Measures during Construction.** The principal concern about the effect of construction projects on air quality relates to the potential for earthwork and other activities to generate dust, including inhalable particulate matter (PM₁₀) that poses a human health hazard. To address the potential for dust generation, the Contractor will be required to implement the following BMPs. These measures will also apply to ground disturbing maintenance activities and equipment exhaust:
1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered twice per day, and additionally as necessary during dusty conditions or as directed by the Engineer.
 2. Erosion control measures must be employed to prevent water runoff containing silt and debris from entering drainage ways and the Mad River;
 3. All haul trucks transporting soil, sand, or other loose material on- or off-site shall be covered;
 4. Sweep paved access roads and parking areas daily. The use of dry power sweeping shall be prohibited;
 5. All visible mud or dirt tracked out onto adjacent public roads shall be removed using wet power vacuum street sweepers as needed. The use of dry power sweeping shall be prohibited;
 6. All vehicle speeds on unpaved areas shall be limited to 15 miles per hour;
 7. All paving shall be completed as soon as possible after other work is finished;
 8. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to five minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations);
 9. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
 10. Refer to Section 01 50 00, "Temporary Facilities and Controls," for additional BMPs and requirements.
- B. **Erosion Control.** The following erosion control measures shall be implemented by the construction Contractor to prevent soil erosion and sedimentation during construction. Erosion and sediment control measures will be in effect and maintained by the Contractor on a continuous basis until all disturbed areas are stabilized.
1. Stockpiled material will be covered or watered to eliminate excessive dust, as necessary.

2. Fiber rolls, silt fences, or similar products will be utilized in appropriate locations to reduce sediment runoff from disturbed soils, as necessary.
 3. A stabilized construction entrance will be maintained to minimize tracking of mud and dirt from construction vehicles onto public roads.
 4. Storm drain inlets receiving storm water runoff will be equipped with inlet protection, as necessary.
 5. A concrete washout area will be designated to clean concrete trucks and tools, if necessary. The washout area shall be located at least 100 feet from all waters, drainage courses, and storm drain inlets and shall be implemented in a manner that controls runoff and prevents leaching to underlying soils.
 6. Refer to Section 01 57 13 – Erosion Control for additional BMPs and requirements.
- C. **Construction Schedule.** Daytime work hours shall be limited to the hours of 7:00 a.m. to 7:00 p.m., Monday through Saturday. Construction outside of these hours, on Sunday, or legal or County holidays shall not be allowed without prior approval from the Engineer.
- D. **Site Restoration and Demobilization.** Following construction, the contractor shall demobilize and remove all equipment, supplies, and construction wastes. Disturbed areas shall be revegetated, and final erosion and sediment controls shall be installed. All disturbed areas of the project site shall be restored to original pre-construction conditions.
- E. **Groundwater Dewatering:** If required, temporary groundwater dewatering shall be conducted to provide a dry work area. Groundwater shall be pumped to a percolation area consisting of a hay bale perimeter to allow it to infiltrate back into the soil (or other method proposed by the Contractor). The Contractor shall submit a dewatering plan for review and approval by the Engineer. The Contractor may also:
1. Reuse the water on-site for dust control, compaction, or irrigation, as appropriate.
 2. Retain the water on-site in a grassy or porous area to allow infiltration/evaporation.
- Refer to Section 31 23 19 – Dewatering for additional BMPs and requirements.

3.02. SITE SPECIFIC MITIGATION MEASURES:

A. Biological Resources

1. **Avoidance or Replacement of Sensitive Wildlife Species and Habitats.**
 - a. If any trees with loose bark or cavities, snags, or rock crevices will be disturbed during the May 1 through August 15 bat maternity period, a qualified biologist working on behalf of the Owner shall survey the area for any presence of special status bats such as the Long-eared Myotis (*Myotis evotis*). The Engineer shall be given a minimum two weeks' notice prior to any such trees being disturbed.
2. **Bird Surveys for Nesting Birds**
 - a. Pre-construction bird surveys shall be conducted by a qualified biologist working on behalf of the Owner within seven days prior to the start of any construction within the nesting season (March 15 – August 15). The Engineer

shall be given a minimum two weeks' notice prior to any construction activities beginning.

- b. If active nests are detected within 500 feet of construction activities, the Owner shall flag locations that are supporting breeding, and no ground-disturbing work or vegetation removal shall commence within the buffers until the nests have fledged. Construction activities shall avoid nest sites until the biologist determines that the young have fledged or nesting activity has ceased. If nests are documented outside of the construction (disturbance) footprint, but within 500 feet of the construction area, buffers will be implemented if deemed appropriate in coordination with CDFW. The buffer size for sensitive species (CESA and ESA) would be 300 feet and the buffer size for raptors would be 500 feet, if deemed appropriate in coordination with CDFW.
- c. Buffer sizes will take into account factors such as (1) noise and human disturbance levels at the construction site at the time of the survey and the noise and disturbance expected during the construction activity; (2) distance and amount of vegetation or other screening between the construction site and the nest; and (3) sensitivity of individual nesting species and behaviors of the nesting birds.

B. Cultural Resources

1. **Identify and Avoid or Minimize Impacts to Unknown Historic and/or Archaeological Resources.** The Contractor shall ensure that if concentrations of prehistoric or historic-period materials are encountered as a result of ground-disturbing activity attributable to the Project, all work in the immediate vicinity shall halt until a qualified archaeologist can evaluate the finds and make recommendations. The recommendations of the archaeologist shall be implemented.

Prehistoric materials could include:

- obsidian and chert flakes or lithic materials
- grinding implements (e.g., pestles, handstones, mortars, slabs)
- bedrock outcrops and boulders with mortar cups
- locally darkened midden
- deposits of shell, dietary bone, and human burials

Historic materials could include:

- ceramics/pottery
- glass, metal, can and bottle dumps
- cut bone
- barbed wire fences
- building pads
- structures
- trails/roads
- railroad rails and ties, trestles, etc.

If such materials are encountered during construction, the Contractor shall immediately halt all Work in the vicinity and notify the Engineer. The District shall retain a qualified archaeologist who shall be present during subsequent surface and subsurface activities in the vicinity of the sensitive materials as determined necessary by the archaeologist. With respect to these areas of sensitive materials:

- Ground disturbance shall be monitored by a qualified archaeologist with the authority to temporarily halt work and redirect equipment if cultural materials are discovered.
- If cultural resources, such as chipped or ground stone, historic-era debris, building foundations, or bone are discovered during ground-disturbances, the Contractor shall stop Work within 20 meters (66 feet) of the discovery, per the requirements of CEQA (Title 14 CCR §15064.5[f]) and Section 106 (36 CFR 800).
- If cultural materials are discovered, the archaeologist shall assess the discovery to determine if it constitutes either a unique archaeological resource or a historical resource for purposes of the CEQA (Title 14 CCR §15064.5[a]).
- If the archaeologist determines that the materials do not constitute either a unique archaeological resource or a historical resource, their presence shall be noted but need not be considered further (Title 14 CCR §15064.5[c] [3]).
- If the archaeologist determines: (a) that the materials do constitute a unique archaeological resource or historical resource; and, (b) they are subject to substantial adverse change as defined in CCR Title 14 §15064.5[b], the archaeologist shall provide recommendations to the District for appropriate treatment which, among other options, may include preservation in place or archaeological data recovery. Preservation in place is preferred, if it is feasible.

Any additional Work requirements due to changes in alignment, re-excavation, and standby time will be paid for under a negotiated change order.

- 2. Evaluation and Treatment of Paleontological Resources.** If paleontological resources (e.g. vertebrate bones, teeth, or abundant and well-preserved invertebrates or plants), are encountered during construction, the Contractor shall ensure work in the immediate vicinity shall be diverted away from the find until a professional paleontologist assesses and salvages the find, as appropriate.

If such materials are encountered during construction, the Contractor shall immediately halt all Work within 50 feet of the find and notify the Engineer. The District shall retain a qualified paleontologist to assess and salvage the find. Based on the scientific value or uniqueness of the find, the paleontologist may record the find and allow work to continue, or recommend salvage and recovery of the material, if it is determined that the find cannot be avoided. The paleontologist shall make recommendations for any necessary treatment that is consistent with currently accepted scientific practices. Any fossils collected from the area shall then be deposited in an accredited and permanent scientific institution where they will be properly curated and preserved.

Work shall not proceed until the Contractor receives written clearance to proceed from the District. The Contractor shall continue Work in other areas of the Project during the Stop Work Order, and it is not anticipated that additional payment shall be required; however, if Work in other areas is impossible, standby time shall be paid for under a negotiated change order and per the General Conditions.

3. **Procedures regarding Encountering Human Remains.** Human remains may be encountered, given the reported presence of prehistoric sites in the vicinity. If human remains, associated grave goods, or items of cultural patrimony are encountered during construction, the following procedures shall be followed as required by Public Resources Code § 5097.9 and Health and Safety Code § 7050.5:
 - a. The Contractor shall halt the Work at the discovery location, within 20 meters (66 feet), and any nearby area reasonably suspected to overlie adjacent to human remains (Health and Safety Code, Section 7050.5).
 - b. The Humboldt County Coroner must be immediately contacted at the Coroner's office, Ernie Stewart, 3012 I Street, Eureka, CA 95501; Phone 707 445-7242.
 - c. The Engineer will be notified.
 - d. If the coroner determines that the remains are of Native American origin, the Coroner will notify the Native American Heritage Commission (NAHC) within 24 hours of identification. The NAHC will contact the most likely descendant (MLD).
 - e. The MLD has 48 hours after contact to inspect the site of the discovery of the human remains and make recommendations for their treatment and disposition, with appropriate dignity, of the human remains and any associated grave goods, as provided in PRC 5097.98.
 - f. If the NAHC is unable to identify a descendant, the descendant fails to make a recommendation, or the landowner refuses the descendant's recommendation, the landowner is required to reinter the remains and burial items with appropriate dignity on the property in a location not subject to further disturbance (PRC 5097.98 [b]).
 - g. A qualified archaeologist, the Contractor, Owner, and the MLD shall make all reasonable efforts to develop an agreement for the treatment, with appropriate dignity, of any human remains and associated or unassociated funerary objects. The agreement would take into consideration the appropriate excavation, removal, recordation, analysis, custodianship, and final disposition of the human remains and associated or unassociated funerary objects.
4. **Protect Tribal Cultural Resources during Construction Activities.** In the event that any tribal cultural resources are discovered during construction-related earth-moving activities:
 - a. The Contractor shall halt all ground-disturbing activity in the vicinity of the resources
 - b. An appropriate tribal representative(s)/archaeologist shall be notified
 - c. If the find is determined to constitute a tribal cultural resource per Public Resources Code Section 21074, the appropriate tribal representative(s)/archaeologist shall develop appropriate mitigation to protect the integrity of the resource and ensure that no additional resources are affected.

- d. Mitigation could include but would not necessarily be limited to avoidance, preservation in place, archival research, subsurface testing, or excavation and data recovery.

C. Hazards and Hazardous Materials

1. **Contaminated Materials Handling and Disposal.** The HBMWD shall retain a qualified consultant to recommend actions in accordance with the Comprehensive Environmental Response, Compensation and Liability Act to reduce the risk of handling contaminated soil or groundwater during construction. If potentially contaminated soils or groundwater are encountered during construction (based on visual discoloration or odors observed) then recommended actions may include, but are not limited to:
 - a. Soil excavated shall be stockpiled and characterized to determine suitability for re-use at the site or to determine appropriate methods of disposal off-site;
 - b. Groundwater generated from dewatering of excavations shall be containerized for chemical analysis, and depending on analytical results, shall be discharged to an approved offsite facility for treatment.
2. **Fire Safety Plan.** The Contractor shall develop and implement a Fire Safety Plan for use during Project construction. The Fire Safety Plan shall be submitted to the District and the Arcata Fire District for review and approval prior to commencement of construction. The Fire Safety Plan shall contain the following requirements:
 - a. Fires shall be immediately reported to 911, Arcata Fire Protection District, the Fieldbrook Volunteer Fire Department, Blue Lake Volunteer Fire Department, the Engineer and the Owner.
 - b. The construction Contractor shall maintain fire toolbox pursuant to California Code – Section 4428.
 - c. Fire safety measures shall be posted for the duration of construction on the project bulletin board at the Contractor’s field office of other central location and areas visible to employees.
 - d. All internal combustion engines used at the project site shall be equipped with spark arresters in working order, as applicable.
 - e. Mufflers on motor vehicles shall be maintained in good working order and motor vehicles shall only be used off-road if the area has been cleared of vegetation.
 - f. Equipment parking areas and small stationary engine sites shall be cleared of all flammable materials.
 - g. Personnel shall be trained in the practices of the Fire Safety Plan relevant to their duties.
 - h. Smoking shall be limited to approved areas cleared of all combustible vegetation.

D. Hydrology and Water Quality

1. BMPs to be Implemented During Construction.
 - a. At all times during construction activities, the Contractor shall minimize the area disturbed by excavation, grading, or earth moving to prevent the release of excessive fugitive dust. During periods of high winds (i.e. wind speed sufficient that fugitive dust leaves the site) the Contractor shall cover or treat areas of exposed soil and active portions of the construction site to prevent fugitive dust.
 - b. No construction materials, equipment, debris, or waste shall be placed or stored where it may be subject to wind or rain erosion and dispersion. Material handling on and offsite shall be required to comply with California Vehicle Code Sec. 23114 with regard to covering loads to prevent materials spills onto public roads.
 - c. All construction equipment shall be equipped and maintained to meet applicable EPA and CARB emission requirements for the duration of the construction activities.
 - d. Throughout construction, the Contractor shall maintain adjacent paved areas free of visible soil, sand or other debris.
 - e. If stockpiled on or offsite, soil and aggregate materials shall be covered with secured plastic sheeting and runoff shall be diverted around them. Stockpiled materials shall be stored a minimum of 100 feet from waterways, concentrated stormwater flows or drainage courses, and storm drain inlets.
 - f. Drainage courses, creeks, or catch basins shall be protected with straw bales, silt fences, and/or straw wattles.
 - g. Storm drain inlets shall be protected from sediment-laden runoff with sandbag barriers, filter fabric fences, straw wattles, block and gravel filters, and excavated drop inlet sediment traps.
 - h. Vehicle and equipment parking and vehicle maintenance shall be conducted in designated areas that are located at least 100 feet from waterways, drainage courses, creeks, and storm drain inlets.
 - i. Construction vehicle and equipment fueling areas shall be designed to fully contain any spills of fuel, oil, or other contaminants. Equipment that cannot be feasibly relocated to a designated fueling area may be fueled and maintained in other areas of the site provided that procedures are implemented to fully contain any potential spills.
 - j. Major maintenance, repair, and washing of vehicles and other equipment shall be conducted off-site or in a designated and controlled area.
 - k. Construction debris, plant and organic material, trash and hazardous materials shall be collected and properly disposed.

END OF SECTION 01 57 19

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01. SECTION INCLUDES

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

1.02. PRODUCTS

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

1.03. MEASUREMENT AND PAYMENT

- A. Measurement and payment for this item shall be included in the Bid Item to which it relates. No additional measurement or payment will be included for the requirements of this section.

1.04. PRODUCT DELIVERY REQUIREMENTS

- A. Schedule delivery of products or equipment as required to allow timely installation and to avoid prolonged storage.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Deliver products or equipment in manufacturer's original unbroken cartons or other containers designed and constructed to protect the contents from physical or environmental damage.
- D. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- F. Clearly and fully mark and identify as to manufacturer, item, and installation location.

1.05. PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products in accordance with manufacturer's instructions. Provide manufacturer's instructions for storage and handling.

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

1.06. STORAGE FACILITIES

- A. Laydown and storage areas have been provided to the Contractor as shown on the Drawings. It is believed that these areas will be sufficient for the execution of the work. However, if required, the Contractor shall obtain all additional laydown and storage areas necessary for the execution of the Work. Contractor shall obtain all necessary permissions and approvals for use of laydown and storage areas and shall submit a signed statement from the property owner granting permission and holding the District harmless from any and all damages that may result from the Contractor's use of the site. Contractor is responsible for all security and safekeeping of materials in laydown and storage areas and additional payment shall not be made for materials stolen or damaged while stored in these areas.

1.07. PRODUCT OPTIONS

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

1.08. PRODUCT SUBSTITUTION PROCEDURES

- A. General Conditions, Section B-14 – Conformity with Contract Documents and Allowable Deviations.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 60 00

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SECTION 01 70 00
EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01. SECTION INCLUDES:

- A. Start-up submittals.
- B. Closeout procedures.
- C. Final cleaning.
- D. Starting of systems.
- E. Demonstration and instructions.
- F. Protecting installed construction.
- G. Project record documents.
- H. Operation and maintenance data.
- I. Manual for equipment and systems.
- J. Spare parts and maintenance products.

1.02. MEASUREMENT AND PAYMENT

- A. Measurement and payment for the items addressed in this Section shall be included in the Bid Item to which they relate. No additional measurement or payment will be included for the requirements of this section.

1.03. START-UP SUBMITTALS

- A. Submit in the chronological order listed below prior to the completion of the Pre-Commissioning Period.
 - 1. Master operation and maintenance training schedule:
 - a. Schedule to include:
 - 1) Target date and time for Owner witnessing of each system initial start-up.
 - 2) Target date for initiation of Acceptance Testing Period.
 - 2. Submit for review and approval by the Engineer.
 - 3. Include holidays observed by the District.
 - 4. Schedule to be resubmitted until approved.

5. Completion Submittal:
 - a. File Contractor's Notice of Completion and Request for Final Inspection.
 - b. Approved Operation and Maintenance manuals received by Engineer minimum two (2) weeks prior to scheduled training.
 - c. Written request for District to witness each system commissioning start-up. Request to be received by Owner minimum two (2) weeks before scheduled training of Owner's personnel on that system.
 - d. Equipment installation and commissioning start-up certifications.
 - e. Letter verifying completion of all commissioning start-up activities including receipt of all specified items from manufacturers or suppliers as final item prior to initiation of Acceptance Testing Period.

1.04. CLOSEOUT PROCEDURES

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

1.05. FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.
- C. Clean site; sweep paved areas, rake clean landscaped surfaces.
- D. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.06. STARTING OF SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Engineer seven (7) calendar days prior to start-up of each item.
- C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable manufacturer's representative in accordance with manufacturers' instructions.

- G. Require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report in accordance with Section 01 33 00, "Submittal Procedures" that equipment or system has been properly installed and is functioning correctly.

1.07. DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel prior to date of Substantial Completion.
- B. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.
- D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

1.08. PROTECTING INSTALLED CONSTRUCTION

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

1.09. PROJECT RECORD DOCUMENTS

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

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- D. Record information concurrent with construction progress, not less than weekly.
 - E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
 - F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 3. Field changes of dimension and detail.
 - 4. Details not on original Contract drawings.
 - G. Submit Record Documents to Engineer with claim for final Application for Payment.
- 1.10. OPERATION AND MAINTENANCE DATA
- A. Submit data bound and organized in 8-1/2 x 11 inch (A4) text pages, three D side ring binders with durable cloth covers.
 - B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, date of submittal.
 - C. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
 - D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
 - E. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
 - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.
 - 2. Part 2: Operation and maintenance instructions, arranged by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.

- d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for [special] finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
3. Part 3: Project documents and certificates, including the following:
- a. Shop drawings and product data.
 - b. Certificates.
 - c. Photocopies of warranties and bonds.

1.11. MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit two sets of revised final volumes in final form within 10 days after final inspection.
- E. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
- F. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; by label machine.
- G. Include color coded wiring diagrams as installed.
- H. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and special operating instructions.
- I. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- J. Include servicing and lubrication schedule, and list of lubricants required.
- K. Include manufacturer's printed operation and maintenance instructions.
- L. Include sequence of operation by controls manufacturer.

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- M. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- N. Include control diagrams by controls manufacturer as installed.
- O. Include Contractor's coordination drawings, with color coded piping diagrams as installed.
- P. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- Q. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- R. Additional Requirements: As specified in individual product specification sections.
- S. Include listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

1.12. SPARE PARTS AND MAINTENANCE PRODUCTS

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 70 00

SECTION 01 74 00

SITE AND AREA CLEANUP

PART 1 GENERAL

1.01. DESCRIPTION

- A. Maintain work areas free from accumulations of waste, debris, dust and mud caused by Contractor's operations.
- B. At completion of Work, remove all waste materials, tools, equipment, machinery, surplus materials; leave property clean; leave all right-of-ways in a condition equal to pre-project conditions.
- C. Related Sections
 - 1. Section 01 50 00 – Temporary Facilities and Controls
 - 2. Section 01 57 19 – Environmental Requirements

1.02. MEASUREMENT AND PAYMENT

- A. Measurement and payment for this item shall be included in the Mobilization/Demobilization Bid Item. No additional measurement or payment will be included for the requirements of this section.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01. PROTECTION

- A. The Contractor shall contact Northern California Underground Service Alert (USA) 811 in accordance with the requirements of Section 01 50 00 – Temporary Facilities and Controls.
- B. The Contractor shall be solely responsible for the protection of adjacent properties, structures, streets, and utilities. Any damaged items shall be repaired to original condition or better, as determined by the Engineer, at the Contractor's expense.
- C. The Contractor shall protect benchmarks, survey control points, and existing structures not identified for removal from damage or displacement.

3.02. CLEARED MATERIAL

- A. Clearing and grubbing shall consist of removal of all objectionable material within the limits of work shown on the Plans and as directed by the Engineer. Objectionable materials shall include but are not limited to all abandoned or removed pipes or other appurtenances, conduits, waste concrete, waste drilling mud, trash, unused construction materials, unused sand or aggregate, extra asphalt paving, packing materials, silt fences and other erosion control materials as approved by Engineer and any other objectionable material identified by

the Engineer. All objectionable cleared material shall become the property of the Contractor and shall be removed from the project site and disposed of or recycled properly.

3.03. REMOVAL

- A. Remove objectionable materials, trash, debris, rock, and extracted plant life from site.
- B. Remove paving as indicated on Drawings. Neatly saw cut edges at right angle to surface. Dispose of at approved disposal or recycling facility.
- C. Do not burn or bury materials on site. Leave site in clean condition.

3.04. TOP SOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded without mixing with foreign materials for use in finish grading.
- B. Stockpile and protect from erosion. Stockpile material on impervious material and cover over with same material until reuse.
- C. Remove excess topsoil not intended for reuse from site.

3.05. DURING CONSTRUCTION

- A. Execute cleaning to ensure that any private property, grounds and especially access roads and public properties are maintained free from accumulation of waste materials, dust, mud and debris.
- B. The Contractor shall keep all access roads clean and free of dust, mud and debris resulting from Contractor's operations.
- C. All waste materials, debris and rubbish shall be disposed of at sites to be chosen by Contractor. Prior to dumping soils on any private property, a letter allowing such dumping shall be obtained from the property Owner and presented to the Engineer and the Humboldt County Department of Environmental Health for approval.

Senior REHS, Solid Waste Program
DHHS, Department of Environmental Health
100 H Street, Suite 100
Eureka, CA 95501

- D. If, in the opinion of the Engineer, the Contractor has not sufficiently cleaned the project area, the Engineer shall issue a written notice to the Contractor stating that the Contractor shall clean the project area to the satisfaction of the Engineer within forty-eight (48) hours. If the Contractor does not properly clean up (in the opinion of the Engineer or the Owner), then either the Engineer or the Owner shall have the option of using outside equipment to perform the Work and such cost will be withheld from the Contract.

3.06. AFTER CONSTRUCTION

- A. If, in the opinion of the Engineer, the Contractor has not sufficiently cleaned the project area, the Engineer shall issue a written notice to the Contractor stating that the Contractor shall clean the project area to the satisfaction of the Engineer within forty-eight (48) hours. If the Contractor does not properly clean up (in the opinion of the Engineer or the Owner), then either the Engineer or the Owner shall have the option of using outside equipment to perform

the Work and such cost will be withheld from the Contract. Site shall be left in a condition equal to or better than existed prior to construction.

END OF SECTION 01 74 00

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SECTION 02 00 10

SITE CONDITIONS

PART 1 GENERAL

1.01. INFORMATION ON SITE CONDITIONS

- A. All information obtained by the Owner regarding site conditions, surface topography, subsurface information, groundwater elevations, existing construction of site facilities, existing underground utilities, and similar data will be available to prospective Bidders upon request and at the office of the Engineer prior to bid opening.
- B. Investigations conducted by a Geotechnical Engineer of subsurface conditions were made for the purpose of study and design, and neither the Engineer nor the Owner assume any responsibility in respect to the sufficiency or accuracy of the test pits, or of other investigations that have been made, or of the interpretations made thereof, and there is no warranty or guarantee, either expressed or implied, that the conditions indicated by such investigations are representative of those existing throughout such area, or any part thereof, or that unforeseen for developments may not occur. The Geotechnical Report has been included as Appendix A to these Specifications.
- C. Any logs of test borings, pits, geotechnical reports, or topographic maps showing a record of the data obtained by the investigations of surface and subsurface conditions that are made available, shown on the Drawings, or bound herewith shall not be considered a part of the Contract Documents, said logs representing only the opinion of the Geotechnical Engineer as to the character of the materials encountered in their investigations and are provided only for the convenience of the Bidders.
- D. Information derived from inspection of logs of test borings, pits, topographic maps, geotechnical reports, or from Drawings showing locations of utilities and structures will not in any way relieve the Contractor from any risk, or from properly examining the site and making such additional investigations as the Contractor may elect, or from properly fulfilling all the terms of the Contract Documents.

1.02. CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor shall satisfy themselves as to the nature and location of the Work and the general and local conditions, particularly those bearing upon trenching, excavation, and grading methods, availability of transportation, disposal, limited access to site, handling and storage of materials, availability of labor, water, electric power, roads, and uncertainties of weather, river stages, or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment facilities needed prior to and during the prosecution of the Work, and all other matters which can in any way affect the Work or the cost thereof under this Contract.
- B. The Contractor shall further satisfy themselves as to the character, quality, and quantity of surface and subsurface materials to be encountered during the course of execution of the work by inspecting the site, as well as any exploratory work performed by the Engineer, and information presented in the Drawings and Specifications made a part of this Contract. Any failure by the Contractor to become acquainted with all available information will not relieve the Contractor from responsibility for properly estimating the difficulty or cost of successfully performing the Work. Refer to the reports included in the Appendices of the Contract Documents.
- C. The Contractor shall anticipate underground obstructions such as utility lines, concrete, water table, soil conditions, and debris. No extra payment will be allowed for the removal,

replacement, repair or possible increased cost caused by underground obstructions. Any such lines or obstructions indicated on the map show only the approximate location and must be verified in the field by the Contractor. The Engineer will endeavor to familiarize the Contractor with all known underground obstructions, but this will not relieve the Contractor from full responsibility in anticipating and locating all underground obstructions.

- D. The Contractor shall note that some of the roadways experience minimal traffic flow, and heavy truck and equipment operations may cause roadway damage in excess of normal usage. Damage caused to roadways by the Contractor's operations shall be repaired to a condition equal or better than the original condition at the Contractor's expense.
- E. Contractor shall submit a Site Security Plan, which shall include staging areas, fencing, and description of how to secure the project materials from damages and unauthorized access.

1.03. ADDITIONAL INFORMATION

- A. Prior to bidding, Bidders may make their own subsurface investigations subject to time schedules and arrangements approved in advance by the Owner. Before any subsurface test holes are excavated, Bidder must submit insurance documents and receive written approval from the Owner.

1.04. SURFACE FACILITIES

- A. The Contractor is advised that the Plans were prepared based on available information; therefore, all existing surface facilities may not be shown on the Drawings. It is the Contractor's responsibility to become acquainted with existing site conditions per this Section and anticipate those surface facilities which are typically encountered (fences, signs, mailboxes, sidewalks, driveways, ditches, AC pavement, AC dikes, curbing, power poles, overhead lines, landscaping, irrigation, etc.) and will affect the work. The Contractor shall provide adequate security to protect the public and Work. No extra payment will be made to the Contractor for the repair, removal and replacement of such facilities. Full payment for this work shall be as included in the various bid items.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 02 00 10

SECTION 03 33 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01. SUMMARY

- A. Section Includes:
 - 1. Formwork
 - 2. Reinforcement
 - 3. Accessories
 - 4. Cast-in place concrete
 - 5. Finishing and curing

1.02. MEASUREMENT AND PAYMENT

- A. Measurement and payment for all concrete work shall be included under the Bid Item to which it relates.

1.03. SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal requirements.
- B. Shop Drawings:
 - 1. Indicate pertinent dimensioning, location of construction joints, and pouring sequence.
 - 2. Indicate reinforcement sizes, spacing, locations, and quantities, bending and cutting schedules.
- C. Product Data: Indicate admixtures, anchors, grout, and epoxy grout.
- D. Design Data: Submit mix designs.
- E. Testing: submit results of testing including compressive strength and slump.
- F. Transit mix delivery slips
 - 1. Keep a record at the job site showing the time and place of each pour of concrete, together with transit mix delivery slip certifying contents of the pour, time of batching, etc.

1.04. QUALITY ASSURANCE

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

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- C. Perform cast-in-place concrete work in accordance with ACI 318 .
- D. Qualifications of workmen:
 - 1. Provide at least one (1) person who shall be present at all times during execution of this portion of the Work and who shall be thoroughly trained and experienced in placing the types of concrete specified and who shall direct all Work performed under this Section.
 - 2. For finishing of exposed surfaces of the concrete, use only thoroughly trained and experienced journeyman concrete finishers.

PART 2 PRODUCTS

2.01. FORM MATERIALS AND ACCESSORIES

- A. Form Materials: At discretion of Contractor.
- B. Form Release Agent: Colorless mineral oil not capable of staining concrete or impairing natural bonding characteristics of coating intended for use on concrete.

2.02. REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade, deformed billet bars, uncoated finish.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for support of reinforcing; plastic tipped or non-corroding for supports in slabs forming finished ceilings or where supports are exposed to weather.
- C. Fabricate concrete reinforcement in accordance with ACI 318.

2.03. CONCRETE MATERIALS

- A. Cement: ASTM C150, Normal-Type I Portland type.
- B. Fine and Coarse Aggregates: ASTM C33. Maximum aggregate size.
- C. Water: Clean and not detrimental to concrete.
- D. Air Entrainment Admixture: ASTM C260.
- E. Non-shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
- F. Epoxy Grout: ASTM C881, two-component high-solids epoxy based system supplied in manufacturer's standard cartridge and dispensed through a static-mixing nozzle supplied by the manufacturer. Anchors and dowels shall be installed per manufacturer's instructions.
- G. Pozzolan: If used for cement replacement, shall conform to ASTM C618 Class N or Class F (fly ash) with the following exceptions:
 - 1. Pozzolanic activity index with lime, at 7 days, shall be 1000 psi minimum (Table 2, ASTM C618).

- H. All other materials not specifically described but required for a complete and proper installation or cast-in-place concrete, shall be as selected by the Contractor subject to the approval of the Engineer.

2.04. COMPOUNDS, HARDENERS AND SEALERS

- A. Curing Compound: ASTM C309, Type 1, Class A.
- B. Membrane Curing Compound: ASTM C1315 Type I, Class C.
- C. Absorptive Mats Type C: ASTM C171.

2.05. CONCRETE MIX

- A. Mix and deliver concrete in accordance with ASTM C94/C94M, Option A.
- B. Furnish concrete of the following strength:
 - 1. Compressive strength 4000 psi (28 day).
 - 2. Slump four (4) to six (6) inches.
- C. Select admixture proportions for normal weight concrete in accordance with ACI 318.

PART 3 EXECUTION

3.01. FORMWORK ERECTION

- A. Erect formwork, shoring and bracing to achieve design requirements.
- B. Provide bracing to ensure stability of formwork.
- C. Form external corners of all concrete with 1/2 inch chamfer.
- D. Apply form release agent to formwork prior to placing form accessories and reinforcement.
- E. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings affected by agent.
- F. Clean forms as erection proceeds, to remove foreign matter.

3.02. INSERTS, EMBEDDED COMPONENTS, AND OPENINGS

- A. Provide formed openings where required for work to be embedded in and passing through concrete members.
- B. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
- C. Install concrete accessories straight, level, and plumb.

3.03. REINFORCEMENT PLACEMENT

- A. Place reinforcement, supported and secured against displacement.

- B. Ensure reinforcing is clean, free of loose scale, dirt, or other foreign coatings.
- C. Space reinforcement bars with minimum clear spacing in accordance with ACI 318.
- D. Maintain concrete cover around reinforcement in accordance with ACI 318.

3.04. PLACING CONCRETE

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.
- B. Remove all wood scraps, debris, and standing water from the areas in which concrete will be placed. Use cleanout openings in wall forms and otherwise where access for removal of debris is not practicable.
- C. Place concrete continuously between predetermined expansion, control and construction joints. Do not break or interrupt successive pours creating cold joints unless approved by the Engineer during the submittal process.
- D. Concrete shall be placed and consolidated by methods that will not cause segregation of the aggregates and will result in dense, homogeneous concrete which is free of voids and rock pockets. All concrete shall be placed while fresh and before it has taken an initial set.
- E. Forms and subgrade shall be thoroughly moistened with water immediately before placing concrete.
- F. Concrete shall be consolidated by means of high frequency internal vibrations within 15 minutes after it is deposited in the forms. The vibrators shall not be attached to or held against the forms or reinforcing steel. The vibration shall be done with care and in such a manner that displacement of reinforcement is avoided.
- G. Where new concrete is doweled to existing work, drill holes in existing concrete and secure dowels with epoxy grout per manufacturer's instructions.
- H. Screed slabs-on-grade level, unless it is sloped to a drain.

3.05. FORM REMOVAL

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

3.06. CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
 - 1. Protect concrete footings from freezing for minimum 5 days.
- B. Place absorptive matting, moisten, and keep damp.
- C. Immediately after placement, protect concrete from premature drying.
- D. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete for not less than 7 days.

- E. At formed surfaced wet forms at least twice daily or sufficient to minimize moisture loss until forms are removed or until 7 days have elapsed from time of pour. If forms are removed before 7 days, cure concrete for remaining days similar to exposed surfaces.

3.07. FORMED SURFACES

- A. Provide all formed surfaces with smooth rubbed finish.

3.08. ERECTION TOLERANCES

- A. Install reinforcement within tolerances required by ACI 318.

3.09. FIELD QUALITY CONTROL

- A. Contractor to hire an independent materials tester to perform field inspection and testing in accordance with ACI 318.
- B. Reinforcement Inspection:
 - 1. Inspect for correct materials, fabrication, sizes, locations, spacing, concrete cover, and splicing.
- C. Strength Test Samples:
 - 1. Sample concrete and make one set of five 4" x 8" cylinders for every 150 cu yds or less of each class of concrete placed each day and for every 5,000 sf of surface area for slabs and walls.
- D. Field Testing:
 - 1. Measure slump and temperature for each compressive strength concrete sample.
 - 2. Measure air content in air entrained concrete for each compressive strength concrete sample.
- E. Cylinder Compressive Strength Testing:
 - 1. Test Method: ASTM C39/C39M.
 - 2. Test Acceptance: In accordance with ACI 318.
 - 3. Test one cylinder at 7 days.
 - 4. Test three cylinders at 28 days.
 - 5. Retain one cylinder for 56 days for testing when requested by the Engineer.
 - 6. Dispose remaining cylinders when testing is not required.
- F. Contractor to submit all test results to Engineer for final approval.
- G. Notification: Notify the Engineer at least 60 hours prior to placing concrete.

3.10. DEFECTIVE CONCRETE

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- A. Modify or replace concrete not conforming to required lines, details and elevations, as directed by the Engineer.

END OF SECTION 03 30 00

SECTION 03 60 00

GROUT

PART 1 GENERAL

1.01. SUMMARY OF SECTION

- A. The principal items specified herein are:
 - 1. Non-Shrink Grout: Non-Shrink grout is to be used unless another type is specifically referenced or shown on the Drawings.
- B. The Contractor shall provide all materials, equipment, and labor necessary to furnish and place grout and shall form, mix, place, cure, repair, finish, and do all other work as necessary to produce finished grout as shown on the Drawings and as specified herein.

1.02. MEASUREMENT AND PAYMENT

- A. Measurement and payment for the placement of grout shall be included in the Bid Item to which it relates. No additional measurement or payment shall be made for the requirements of this section.

1.03. REFERENCED CODES AND SPECIFICATIONS

The following standards apply:

- A. Commercial Standards:
 - 1. ASTM C109 Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-In. or 50-mm Cube Specimens).
 - 2. ASTM C531 Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing.
 - 3. ASTM C579 Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing.
 - 4. ASTM C827 Test Method for Change in Height of Early Ages of Cylindrical Specimens from Cementitious Mixtures.
 - 5. ASTM D696 Test Method for Coefficient of Linear Thermal Expansion of Plastics.
 - 6. CRD-C-621 Corps of Engineers Specification for Non-shrink Grout.

1.04. SUBMITTALS

Submit the following in accordance with Section 01 33 00 – Submittal Procedures:

- A. Certificates of Compliance: Certificates of Compliance shall be provided for all products and materials proposed to be used under this Section.

PART 2 PRODUCTS

2.01. PREPACKAGED GROUTS

A. Non-Shrink Grout:

1. Non-shrink grout shall be a prepackaged, inorganic, non-gas-liberating, non-metallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout specified herein shall be that recommended by the manufacturer for the particular application.
2. Non-shrink grouts shall have a minimum 28-day compressive strength of 7000 psi; shall have no shrinkage (zero percent) and a maximum 4.0 percent expansion in the plastic state when tested in accordance with ASTM C 827; and shall have no shrinkage (zero percent) and a maximum of 0.2-percent expansion in the hardened state when tested in accordance with CRD C 621.
3. Application: Non-shrink grout shall be used for the repair of all holes and defects in concrete members, grouting under all equipment base plates, and at all locations where non-shrink grout is specified.

2.02. CONSISTENCY

- A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is such that the grout is plastic and moldable but will not flow. Where "dry pack" is specified, it shall mean a grout of that consistency; the type of grout to be used shall be as specified herein for the particular application.

2.03. MEASUREMENT OF INGREDIENTS

- A. Measurements for cement grout shall be made accurately by volume using appropriate containers. Shovel measurement will not be allowed.
- B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

PART 3 EXECUTION

3.01. GENERAL

- A. All mixing, surface preparation, handling, placing, consolidation and other means of execution for prepackaged grouts shall be done according to the printed instructions and recommendations of the manufacturer.

3.02. CONSOLIDATION

- A. Grout shall be placed in such a manner, for the consistency necessary for each application, so as to assure that the space to be grouted is completely filled.

END OF SECTION 03 60 00

SECTION 13 34 23

PREFABRICATED INTEGRATED POWER ASSEMBLY

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes prefabricated integrated power assembly containing electrical equipment. Electrical equipment installed in integrated power assembly performed prior to shipment to site.

1.02 RELATED SECTIONS

- A. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
- B. Section 26 05 33 – Raceway and Boxes for Electrical Systems
- C. Section 26 05 53 – Identification for Electrical Systems
- D. Section 26 09 23 – Lighting Control Devices
- E. Section 26 13 26 – Medium Voltage Metal-Clad Switchgear
- F. Section 26 24 16 – Panelboards
- G. Section 26 27 26 – Wiring Devices
- H. Section 26 33 00 – 125 VDC System
- I. Section 26 51 00 - Lighting

1.03 REFERENCES

The equipment and components in this specification shall be designed and manufactured according to latest revision of the following standards (unless otherwise noted).

- A. Uniform Building Code (UBC) - (Default Structural loading criteria shall be per the UBC)
- B. American National Standards Institute/American Society of Civil Engineers (ANSI/ASCE)
- C. American Institute of Steel Construction (AISC)
- D. American Iron and Steel Institute (AISI-Specification for the Design of Cold Formed Steel Structural Members)
- E. Metal Building Manufacturers Association (MBMA)

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- F. American Society for Testing and Material (ASTM)
- G. American Society of Heating, Refrigeration, and Air conditioning Engineers (ASHRAE)
- H. National Electric Manufacturers Association (NEMA)
- I. National Electric Code (NEC)
- J. California Building Code (CBC)

1.04 DEFINITIONS

- A. PEC – Power Equipment Center

1.05 SYSTEM DESCRIPTION

- A. NEMA 3R structure with exterior walls and roof fabricated from interlocking panels to house and protect the internal equipment from the elements.
- B. Structural grid base and floor system designed for applicable floor loading allowing the PEC to be lifted and transported with the interior equipment installed.
- C. The PEC shall be designed and constructed to withstand external loading conditions as prescribed by the Uniform Building Code.

1.06 SUBMITTALS – FOR REVIEW/APPROVAL

- A. The supplier shall provide the following submittals:
 - 1. Product Data on specified products.
 - 2. Installation, operation, and maintenance data.
 - 3. Structural drawings including:
 - a. Structural notes.
 - b. Building plan view.
 - c. Building base skid detail.
 - d. Building elevations.
 - e. Certified structural calculations, bearing the seal of a currently licensed professional civil or structural engineer in the State of California.

4. Mechanical drawings including:
 - a. Mechanical notes
 - b. Building mechanical plan, showing HVAC units, ventilation fans, and thermostats.
5. Electrical drawings including:
 - a. Electrical notes.
 - b. Building electrical plan, showing conduit, subfloor wireway, and any other means of wiring transit. Drawings shall also include conduit fill.
 - c. Building services wiring diagrams.
 - d. Grounding system plan.
 - e. Interconnection wiring diagrams.

1.07 SUBMITTALS – FOR CONSTRUCTION

- A. The following information shall be submitted for record purposes:
 1. Final as-built drawings and information, incorporating all changes made during the manufacturing process.
 2. Wiring diagrams
 3. Structural calculations
 4. Mechanical calculations, for HVAC and fan sizing.
 5. Installation information including equipment anchorage provisions
 6. Seismic certification for site and location conditions

1.08 QUALITY ASSURANCE (QUALIFICATIONS)

- A. Manufacturer shall have specialized in the manufacture and assembly of power equipment centers for ten (10) years.
- B. PEC shall be designed for installation in UBC /CBC seismic zone 4.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Contractor shall store, protect, and handle products in accordance with recommended practices listed in manufacturer's Installation and Maintenance Manuals.

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- B. Contractor shall inspect and report concealed damage to carrier within 48 hours.
- C. Contractor shall store in a clean, dry space. Cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. Heat enclosures to prevent condensation.
- D. Contractor shall handle in accordance with manufacturer's recommendations to avoid damaging equipment, installed devices, and finish.
- E. Equipment PEC should be supported at all times during handling, transportation and setting at all removable lift lug locations, as a minimum.

1.10 WARRANTY

- A. Manufacturer warrants equipment to be free from defects in materials and workmanship for 1 year from date of installation or 18 months from date of purchase, whichever occurs first.

1.11 FIELD MEASUREMENTS

- A. Contractor shall make all necessary field measurements to verify that equipment shall fit in allocated space in full compliance with minimum required clearances specified in National Electrical Code.

PART 2 PRODUCTS

2.01 DESIGN CRITERIA

- A. Structural components of the PEC shall be designed to withstand external loading as prescribed by the applicable codes above (as a minimum), with co-lateral considerations as follows:
- B. Base and floor system shall be designed to withstand all dead and live loads as applicable, or, a minimum of 250 lbs/ft² over the entire floor area, while supported at lift points only.
- C. Maximum deflection of all base members shall not exceed L/240 at time of lift, and following final installation, with all applicable dead and live loads applied, or, a minimum of 250 lbs/ft² over the entire floor area.
- D. Roof loading- Per Uniform Building Code (20 lbs/ft² minimum)
- E. Wind loading- Per Uniform Building Code - Exposure C minimum

2.02 GENERAL

Refer to Contract Drawings for actual layout and location of equipment and components; current ratings of devices, bus bars, and components; voltage ratings of devices, components and assemblies; interrupting and withstand ratings of devices, buses, and components; and other required details.

- A. Each shipping piece shall be designed for lifting by lugs located along the base perimeter members at 15'-0" approximate intervals
- B. All lifting lugs shall be removable.
- C. The ceiling shall be capable of withstanding a single continuous load of 100 lbs. per linear foot located at mid span of the ceiling panels, and running the entire length of the PEC. The ceiling panels shall act alone, structurally, and not depend on the roof or the interior equipment for support.
- D. All shipping splits and other penetrations shall have adequate structural reinforcement via rigid frames or other means to minimize distortion during handling and transportation.
- E. Area classification - General purpose / Non-hazardous.

2.03 BASIC MATERIALS AND CONSTRUCTION

- A. Base members shall be ASTM A36 wide flange, channel, angle and tube shapes forming a self supporting grid. All members shall be continuously welded to adjoining members.
- B. Floor shall be 1/4" (minimum) thickness flat steel plate, welded to all longitudinal and transverse base members.
- C. Floor plate seams shall be continuously welded at all joints, and ground smooth to minimize visibility of seams. Welding of floor plate shall be staged to produce a flat and ripple free surface.
- D. All welding shall be performed by AWS qualified personnel.
- E. Exterior walls shall be 18ga (minimum) G90 pre galvanized sheet steel interlocking panels formed by computer numerical controlled equipment to create a tightly interlocking panel design. Interlocking panel ribs shall repeat at a maximum of 16".
- F. Following assembly (and coating) of all interlocking wall and roof panels each exterior seam shall be neatly caulked using a high modulus silicone base product. The use of copolymer tape and / or neoprene gasketing is unacceptable between any exterior seams of the PEC.
- G. Roof material shall be 18ga (minimum) G90 pre-galvanized sheet steel interlocking panels formed by computer numerical controlled equipment to create a tightly interlocking panel design with vertical standing ribs.
- H. Interior walls shall be 18 ga (minimum) G90 pre-galvanized sheet steel firmly attached to interlocking ribs of exterior wall panels utilizing ASTM shear and pull out rated self tapping screws on 24" maximum centers. Each interior wall panel shall be formed to receive adjacent panels at overlaps.

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- I. Ceiling panels shall be 18ga (minimum) G90 pre-galvanized sheet steel interlocking panels formed by computer numerical controlled equipment to create a tightly interlocking panel design with vertical standing ribs.
- J. Wall insulation shall be secured to exterior wall panels by glue pins, straps or other means prior to assembly of interior wall liner panels. Ceiling insulation shall be laid between interlocking ceiling panels.
- K. Floor insulation shall be R7.2 Celotex or equal urethane board, secured tightly below the floor with welded metal straps (glue pins are not acceptable), or sprayed urethane foam.
- L. Insulation levels:
 - 1. Ceiling 3" fiberglass batt (R11)
 - 2. Walls 3" fiberglass batt (R11)
 - 3. Floor- 1" urethane board or urethane spray (R7.2)
 - 4. Equipment access doors- 1" urethane board (R7.2)
 - 5. Personnel doors- (R2.4)
- M. The entire roof perimeter shall be trimmed with a fascia that aesthetically hides the standing rib roof edges, prevents high velocity rain water run-off, and prevents built-up ice from sliding off the roof in large sheets.
- N. At shipping splits (when required due to transportation restrictions), each open area shall be sealed with 2" thick wooden framing and a complete plywood cover for temporary protection during transportation and setting. Seams in plywood shall be liberally caulked at the exterior.
- O. All permanent components shall consist of materials that do not freely support combustion. Use of wood or any other materials that freely support combustion shall not be allowed as permanent components.

2.04 COATINGS – (HIGH PERFORMANCE / LOW MAINTENANCE)

- A. All exterior and interior surfaces shall be thoroughly cleaned prior to coating application per the coating manufacturer's recommended practice.
- B. Exterior surfaces- Walls, Roof & Facia Substrate: G90 Galvanized Material
 - 1. Primer - high solids epoxy primer, 1.5 Mils DFT
 - 2. Finish - high solids polyurethane enamel, 1.5 Mils DFT
 - 3. Color - ANSI #61 Light Gray
 - 4. Touch-up paint - (1) quart

- C. Interior-Substrate: G90 Galvanized Material
 - 1. Primer - high solids epoxy primer, 1.5 Mils DFT
 - 2. Finish - high solids polyurethane enamel, 1.5 Mils DFT
 - 3. Color - white
 - 4. Touch-up paint - (1) quart

- D. Floor- (Top Area)
 - 1. Primer - high solids epoxy primer, 3.0 Mils DFT
 - 2. Finish - high solids polyurethane enamel, 1.5 Mils DFT with non skid additive
 - 3. Color - ANSI #61 Light Gray, anti-skid
 - 4. Touch-up paint - (1) quart

- E. Base & Floor Underside-
 - 1. Primer - high solid epoxy mastic, 2.0 Mils DFT
 - 2. Undercoat - high solid Coal Tar Epoxy, 4.0 Mils DFT

2.05 PERSONNEL AND EQUIPMENT ACCESS DOORS

- A. #4080 Single leaf, double wall, honeycomb reinforced personnel door, pre-galvanized, #20ga, 1 3/4" thick- (1) required equipped as follows:
 - 1. Panic hardware- thumbblatch w/ keyed cylinder lock
 - 2. Closer w/ stopping arm (Yale series #50)
 - 3. Wind safety chain
 - 4. Drip shield
 - 5. Threshold- Aluminum
 - 6. Factory frame
 - 7. Caps in top
 - 8. Weather stripping
 - 9. Stainless steel hinges

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10. R2.4 thermal resistance rating
 11. Fire resistant insulation
 12. Removable transom to allow 108" overall clearance through doorway
- B. #3070 Single leaf, double wall, honeycomb reinforced personnel door, pre-galvanized, #20ga, 1 3/4" thick- (1) required equipped as follows:
1. Panic hardware- thumbblatch w/ keyed cylinder lock
 2. Closer w/ stopping arm (Yale series #50)
 3. Wind safety chain
 4. Drip shield
 5. Threshold- Aluminum
 6. Factory frame
 7. Caps in top
 8. Weather stripping
 9. Stainless steel hinges
 10. R2.4 thermal resistance rating
 11. Fire resistant insulation (1.5 hour minimum rating)
- C. Equipment rear access doors 12ga G90 pre-galvanized steel (#) required, equipped as follows:
1. Posts (mullions) shall be easily removable (allowing total door and post removal without compromising the structural integrity of the PEC) providing full open access for potential equipment replacement or the addition of future equipment.
 2. NEMA 3R rating
 3. Stainless steel continuous piano type hinge
 4. Stainless steel padlockable vault handle
 5. (3) point latching system
 6. Full gasketing & drip shield

7. "DANGER HIGH VOLTAGE KEEP OUT" sign
 8. Hold open device
 9. 1" urethane board (R7.2)
 10. Metal inner skin over insulation welded to door
- D. Utility Section Access Roll-up Door
1. Manual, chain-operated
 2. Lockable from interior
 3. Full gasketing and drip shield to resist entry of rain, wind, rodents, and insects.
 4. Insulated panels

2.06 ELECTRICAL UTILITIES

- A. All utilities shall be UL listed and recognized devices.
- B. All utilities shall be functionally tested prior to completion.
- C. Interior lights: 48" enclosed strip LED - (quantity as required for 30 foot-candles interior illumination at floor level).
- D. Emergency light(s): Wall-mount, dual head LED with NiCad battery pack.
- E. Exterior light(s): LED wall pack with internal photocell.
- F. Light switch, 3-way, specification grade 20A, 125V ivory, two (2) required.
- G. Duplex receptacles, specification grade, 20A 125V ivory GFCI duplex receptacle, two (2) required.
- H. Wire type- THHN/THWN, #12 AWG minimum or as indicated on drawings.
- I. HVAC Control wiring: #18 AWG thermostat cable.
- J. AC distribution panel for building utility circuits shall be 120/240V, 1 phase, 3 wire, 42 circuit, plug in breakers, surface mount, 10,000V AIC with 100A main breaker.
- K. EPC utility circuits shall be distributed using the following panels:
 1. AC distribution panel to interior lighting
 2. AC distribution panel to exterior lighting

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3. AC distribution panel to emergency lighting
 4. AC distribution panel to receptacles
 5. AC distribution panel to HVAC units and exhaust fans
- L. Conduit: Exposed 3/4" EMT minimum.
- M. Ground lugs welded to base- Burndy #QA28-2N1-4/0, two (2) required.

2.07 INSTALLATION OF ELECTRICAL EQUIPMENT

- A. Electrical equipment indicated on the drawings shall be installed in the PEC on the vendor's premises.
- B. All equipment installed inside the PEC shall meet manufacturer's installation requirements.

2.08 HVAC SYSTEM

- A. Exterior design temperatures-
 1. Summer (Per ASHRAE 2% design temperature)
 2. Winter (Per ASHRAE 0.6% design temperature)
- B. Interior design temperatures-
 1. Summer 80 °F
 2. Winter 60 °F
- C. HVAC system shall maintain the maximum interior temperature above with consideration to ambient conditions and the specified internal equipment total heat loss calculated at 100% of the full load rating of each piece of electrical equipment installed in the PEC.
- D. Unit Heater: An assembly including casing, coil, fan, and motor in and horizontal discharge configuration with adjustable discharge louvers.
 1. Comply with UL 2021.
 2. Heating capacity: as required.

3. Cabinet: Removable panels for maintenance access to controls.
 4. Cabinet Finish: Manufacturer's standard baked enamel applied to factory-assembled and -tested propeller unit heater before shipping.
 5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
 6. Discharge Louver: Adjustable fin diffuser for horizontal units.
 7. Electric-Resistance Heating Elements: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in steel or corrosion-resistant metallic sheath with fins no closer than 0.16 inch. Element ends shall be enclosed in terminal box. Fin surface temperature shall not exceed 550 deg F at any point during normal operation.
 - a. Circuit Protection: One-time fuses in terminal box for overcurrent protection and limit controls for high-temperature protection of heaters.
 - b. Wiring Terminations: Stainless-steel or corrosion-resistant material.
 - c. Fan: Propeller type with aluminum wheel directly mounted on motor shaft in the fan venturi.
 8. Fan: Forward curved, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.
 9. Basic Unit Controls:
 - a. Wall-mounted adjustable line voltage thermostat.
- E. Propeller Fans
1. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.
 2. Steel Fan Wheels: Formed-steel blades riveted to heavy-gage steel spider bolted to cast-iron hub.
 3. Fan Drive: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
 4. Accessories:
 - a. Gravity Shutters: Aluminum blades in aluminum frame; interlocked blades with nylon bearings.

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- b. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
- c. Wall Sleeve: Galvanized steel to match fan and accessory size.
- d. Weathershield Hood: Galvanized steel to match fan and accessory size.
- e. Disconnect Switch: Non-fusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
- f. Wall-mounted adjustable line voltage thermostat.

2.09 ACCESSORIES

- A. Removable lift lugs required along base length at approximate 15'-0" centers (per shipping piece).
- B. Floor cutouts under equipment for cable entry and exit from below floor with gasketed 12ga galvanized top cover plates attached to the floor by screws

2.10 TESTING AND INSPECTION:

- A. Continuity checks of all wiring installed.
- B. Operational check of all supplier furnished and installed electrical equipment.
- C. Switchgear, switchboard, and MCC shipping sections' bus shall be respliced, torqued and meggered.
- D. A certified test report shall be provided.

PART 3 EXECUTION

3.01 EXAMINATION

- A. The following procedures shall be performed by the Contractor.
 - 1. Examine installation area to ensure there is enough clearance to install switchboard.
 - 2. Check concrete pads for uniformity and level surface.
 - 3. Verify that equipment is ready to install.
 - 4. Verify field measurements are as shown on Drawings.

5. Verify that required utilities are available, in proper location and ready for use.
6. Beginning of installation means installer accepts conditions.

3.02 INSTALLATION

- A. Installation shall be performed by the Contractor.
 1. Spreader bars, cables, shackles, and other lifting / rigging equipment shall be provided by Contractor.
 2. Install per manufacturer's instructions.
 3. Install required safety labels.

3.03 ADJUSTING

- A. Adjust all circuit breakers, switches, access doors, and operating handles for free mechanical and / or electrical operation as described in manufacturer's instructions.

3.04 CLEANING

- A. Clean interiors of switchgear, panels, and separate enclosures to remove construction debris, dirt, shipping materials.
- B. Repaint scratched or marred exterior surfaces to match original finish.

END OF SECTION

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SECTION 26 01 26

MAINTENANCE TESTING OF ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01. SUMMARY

- A. The extent of new and existing electrical systems and equipment requiring testing is shown on the drawings and is specified herein and in other individual sections of work. The general scope includes the following items:

1. New 15 kV Service Entrance Switchgear with electronic multi-function relays.
2. New 15 kV feeder circuit conductors.
3. Existing 15kV feeder conductors with new spliced cable section.

1.02. RELATED SECTIONS

- A. Section 26 05 13 - Medium Voltage Cables
- B. Section 26 13 26 – Medium Voltage Metal Clad Switchgear

1.03. REFERENCES - CODES AND STANDARDS

- A. All inspections and field tests shall be in accordance with the latest edition of the following codes, standards, and specifications except as provided otherwise herein.
1. American National Standards Institute – ANSI
 2. American Society for Testing and Materials – ASTM
 3. Institute of Electrical and Electronic Engineers – IEEE
 4. Insulated Cable Engineers Association – ICEA
 5. InterNational Electrical Testing Association – NETA
 6. NFPA 70 National Electrical Code (NEC). Latest approved edition.
 7. NFPA 70E Standard for Electrical Safety in the Workplace, 2009 Edition.
 8. National Electrical Manufacturer's Association - NEMA
 9. Occupational Safety and Health Administration – OSHA
 10. State and local codes and ordinances
 11. Underwriters Laboratories, Inc. – UL

1.04. SUBMITTALS AND TEST REPORTS

- A. Provide written test reports, signed and dated, for all tests prior to acceptance of the tested equipment by the Owner. Test reports on megger, dielectric absorption and high potential tests shall include the ambient temperature and relative humidity existing at the time of the tests.

1.05. QUALITY ASSURANCE

- A. All testing of new equipment and cables and PM related testing shall be conducted by a qualified Electrical Testing Firm.
1. The Electrical Testing Firm shall provide the necessary material, equipment, labor, and technical supervision to perform the inspections and tests described herein.
 2. The Electrical Testing Firm shall be an independent, third party, testing organization which can function as an unbiased testing authority, professionally independent of the manufacturers, suppliers, and installers of equipment or systems evaluated by the testing organization.
 3. The Electrical Testing Firm shall be regularly engaged in the testing of electrical equipment devices, installations, and systems, shall have a minimum of 3 years field experience in Online Partial Discharge testing of MV cables, and shall have completed at least 100 - Online Partial Discharge MV cable testing projects.
 4. The Electrical Testing Firm shall utilize engineers and technicians that are experienced and regularly perform electrical power system testing and have received training and certification in accordance with InterNational Electrical Testing Association (NETA).
 5. Accepted certifications:
 - a. Certified Technician/Level III
 - b. Certified Senior Technician/Level IV
 6. Personnel performing partial discharge testing and inspections shall be trained and certified to perform online partial discharge testing on cable systems. These individuals shall be capable of conducting the tests in a safe manner and with complete knowledge of the hazards involved. They must evaluate the test data and make an informed judgment regarding the cable circuits tested.
- B. Qualified Firms:
1. Industrial Tests, Inc.
 - a. 4021 Alvis Court, Suite 1
 - b. Rocklin, CA 95677
 - c. Phone 916-632-8378
 2. Electrical Reliability Services, Inc. / Div. of Emerson Process Solutions

- a. 6900 Koll Center Parkway, Suite 415
- b. Pleasanton, CA 94566
- c. Phone 530-758-2410
- 3. Power Systems Testing Co.
 - a. 2267 Claremont Court
 - b. Hayward, CA 94545
 - c. Phone: 510-783-5096
- C. Furnish products listed and classified by Underwriters' Laboratories, Inc. (UL), Electrical Testing Laboratories, Inc. (ETL), or other recognized, approved testing and listing agencies as suitable for the purpose specified and shown.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01. VISUAL INSPECTIONS

- A. Prior to any testing, perform visual inspections to verify the following:
 - 1. The equipment is completely and properly installed.
 - 2. The equipment is free from damage and defects.
 - 3. Shipping blocks and restraints have been removed.
 - 4. Electrical terminations have been properly tightened.
 - 5. The equipment has been properly aligned.
 - 6. The equipment has been properly lubricated.
 - 7. The ventilation louvers are open and unobstructed.
 - 8. The equipment is ready to be tested.

3.02. MANUAL OPERATION

- A. Prior to any testing, mechanical devices shall be exercised or rotated manually to verify that they operate properly and freely.

3.03. PRIMARY CABLE TESTS

- A. Field inspection and test shall be performed under provisions of NETA ATS – 2017 as follows.
- B. Visual and Mechanical Inspection.

1. Compare cable data with drawings and specifications
 2. Inspect exposed sections of cables for physical damage.
 3. Inspect all bolted electrical connections for high resistance using one of the following methods:
 1. Use of low-resistance ohmmeter in accordance with Section 7.3.3.2 (Electrical Tests).
 2. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or Table 10.12.
 3. Perform thermographic survey in accordance with Section 9.
 4. Inspect compression-applied connectors for correct cable match and indentation.
 5. Inspect for shield grounding, cable support, and termination.
 6. Verify that visible cable bends meet or exceed ICEA and/or manufacturer's minimum allowable bending radius.
 7. Inspect fireproofing in common cable areas, if specified.
 8. If cables are terminated through window-type current transformers, make an inspection to verify that neutral and ground conductors are correctly placed and that shields are correctly terminated for operation of protective devices.
 9. Inspect for correct identification and arrangements.
 10. Visually inspect jacket and insulation condition.
- C. Electrical Tests.
1. Perform resistance measurements through bolted connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.3.3.1.
 2. Perform an insulation-resistance test individually on each conductor with all other conductors and shields grounded. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1.
 3. Perform a shield-continuity test on each power cable.
 4. In accordance with ICEA, IEC, IEEE and other power cable consensus standards, testing can be performed by means of direct current, power frequency alternating current, or very low frequency alternating current. These sources may be used to perform insulation-withstand tests, and baseline diagnostic tests such as partial discharge analysis, and power factor or dissipation factor. The selection shall be made after an evaluation of the available test methods and a review of the installed cable system. Some of the available test methods are listed below.
 - 4.1 **Dielectric Withstand**

1. Direct current (dc) dielectric withstand voltage
2. Very low frequency (VLF) dielectric withstand voltage
3. Power frequency (50/60 Hz) dielectric withstand voltage

4.2 **Baseline Diagnostic Tests**

1. Power factor/ dissipation factor (tan delta)
 - a. Power frequency (50/60 Hz)
 - b. Very low frequency (VLF)
2. DC insulation resistance
3. Off-line partial discharge
 - a. Power frequency (50/60 Hz)
 - b. Very low frequency (VLF)

D. Test Values Visual and Mechanical

1. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value. (7.3.3.1.3.1)
2. Bolt-torque levels should be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.12. (7.3.3.1.3.2)
3. Results of the thermographic survey shall be in accordance with Section 9. (7.3.3.1.3.3)
4. The minimum bend radius to which insulated cables may be bent for permanent training shall

be in accordance with Table 100.22. (7.3.3.1.6)

E. Test Values Electrical

1. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
2. Insulation-resistance values shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1. Values of insulation resistance less than this table or manufacturer's recommendations should be investigated.
3. Shielding shall exhibit continuity. Investigate resistance values in excess of ten ohms per 1000feet of cable.

4. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.
 5. Based on the test methodology chosen, refer to applicable standards or manufacturer's literature for acceptable values.
- F. When new primary cable (15KV) is provided under this contract and spliced to existing primary cable on this project, the complete new primary cable and existing primary cable shall be given a complete Partial Discharge Test after all splices are completed and tested as indicated below.
- G. After splices are complete a DC Hi Pot test shall be performed prior to the Partial Discharge Test.
- H. This Hi Pot test shall be a 5KV test in 1KV increments holding for two minutes up to the 5KV max. At 5KV the cable shall be soaked for 10 minutes with no appreciable loss of leakage current. Test result shall be approved by the Engineer before proceeding with the Partial Discharge Testing.

3.04. ONLINE PARTIAL DISCHARGE TESTING SPECIFICATION

- A. Objective:
1. The purpose for this project is to develop data that will assist in assessing the condition of the medium voltage cable systems. Data collected during this project shall be of a nature that will enable data trending to assess degradation over time.
 2. Since it is impractical to remove the medium voltage cable circuits from service for the purpose of performing condition assessment testing, this project and all associated work shall be done while the cables, accessories and all parts of the electrical system remain in service and energized.
- B. The scope of Partial Discharge (PD) Testing to be performed by the qualified Electrical Testing Firm includes:
1. Perform partial discharge testing on each of the combined new and existing cable circuits as indicated on the Primary Single Line Diagram.
 2. Perform the work while the medium voltage circuits and equipment remain in service and energized. The cable circuits shall not be disconnected or de-energized and the testing shall not expose the cables to voltages that exceed normal operating voltage.
 3. Use a time or frequency domain detection process incorporating radio frequency current transformer (RF CT) sensors. The detection system shall have a PD detection range that at least covers the frequency range of 10khz to 300Mhz. The testing shall be performed in a manner that complies with the requirements of:
 - a. IEEE Standard 400, IEEE Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems.

- b. IEEE Draft Standard 400.3 IEEE Guide for Partial Discharge Testing of Shielded Power Cable Systems in a Field Environment.
- c. Provide a comprehensive report that identifies numerically and graphically the magnitude of partial discharge detected for each circuit and each cable section tested. The report shall provide commentary regarding the significance of the PD detected and shall also provide conclusions and recommendations for corrective action as appropriate. In addition, the test report shall include the following:
 - 1) Summary of project
 - 2) Description of circuits and cable sections tested
 - 3) Identification of the testing organization
 - 4) Identification of the test equipment used
 - 5) Date work was performed
 - 6) Identification of the person that performed the tests

3.05. MEDIUM VOLTAGE OIL SWITCHES

- A. Inspect physical and mechanical condition.
- B. Inspect anchorage, alignment, grounding, and required clearances.
- C. Clean the unit.
- D. Perform mechanical operator tests.
- E. Inspect bolted electrical connections for high resistance using one of the following methods:
 - 1. Use of a low-resistance ohmmeter.
 - 2. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method.
- F. Verify that insulating oil level is correct.
- G. Inspect and/or replace gaskets.
- H. Use lubrication on moving current-carrying parts and on moving and sliding surfaces.
- I. Perform a contact/pole-resistance test.
- J. Remove a sample of insulating liquid in accordance with ASTM D 923. Sample shall be tested in accordance with the referenced standard.
 - 1. Dielectric breakdown voltage: ASTM D 877 and/or D 1816
 - 2. Color: ANSI/ASTM D 1500

3. Visual condition: ASTM D 1524

3.06. MEDIUM VOLTAGE LIQUID FILLED TRANSFORMERS

- A. Inspect physical and mechanical condition.
- B. Inspect anchorage, alignment, and grounding.
- C. Verify the presence of PCB labeling, if applicable.
- D. Clean bushings and control cabinets.
- E. Verify correct liquid level in tanks and bushings.
- F. Verify that positive pressure is maintained on gas-blanketed transformers.
- G. Remove a sample of insulating liquid in accordance with ASTM D 923. The sample shall be tested for the following:
 1. Dielectric breakdown voltage: ASTM D 877 and/or ASTM D 1816
 2. Acid neutralization number: ANSI/ASTM D 974
 3. Interfacial tension: ANSI/ASTM D 971 or ANSI/ASTM D 2285
 4. Color: ANSI/ASTM D 1500
 5. Visual Condition: ASTM D 1524
 6. Water in insulating liquids: ASTM D 1533
 7. Measure power factor or dissipation factor in accordance with ASTM D 924
- H. Remove a sample of insulating liquid in accordance with ASTM D 3613 and perform dissolved-gas analysis (DGA) in accordance with ANSI/IEEE C57.104 or ASTM D3612.

3.07. MEDIUM VOLTAGE VACUUM BREAKERS

- A. Inspect physical and mechanical condition.
- B. Inspect anchorage, alignment, and grounding.
- C. Verify that all maintenance devices are available for servicing and operating the breaker.
- D. Clean the unit.
- E. Inspect vacuum bottle assemblies.
- F. Measure critical distances such as contact gap as recommended by the manufacturer.
- G. Perform all mechanical operation tests on the operating mechanism.

- H. Inspect bolted electrical connections for high resistance using one of the following methods:
 - 1. Use of a low-resistance ohmmeter.
 - 2. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method.
 - 3. Verify cell fit and element alignment.
 - 4. Verify racking mechanism operation.
 - 5. Use appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- I. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed and across each pole with the breaker open.
- J. Perform a contact/pole-resistance test.
- K. With breaker in a test position, perform the following tests:
 - 1. Trip and close breaker with the control switch.
 - 2. Trip breaker by operating each of its protective relays.
 - 3. Verify mechanism charge, trip-free, and antipump functions.
 - 4. Perform a vacuum bottle integrity test across each vacuum bottle with the breaker in the open position. Provide adequate barriers and protection against x-radiation during this test.
- L. Verify operation of heaters.
- M. Test instrument transformers.

3.08. PROTECTIVE RELAYS

- A. Inspect relays and cases for physical damage.
- B. Clean the unit.
- C. Relay Case:
 - 1. Tighten case connections.
 - 2. Inspect cover for correct gasket seal.
 - 3. Clean cover glass. Inspect shorting hardware, connection paddles, and/or knife switches.
 - 4. Remove any foreign material from the case.
 - 5. Verify target reset

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- D. Relay
 - 1. Inspect relay for foreign material.
 - 2. Verify relay calibration.
- E. Verify that all settings are in accordance with coordination study or setting sheet supplied by owner.
- F. 50 Instantaneous Overcurrent Relay
 - 1. Determine pickup.
 - 2. Determine dropout.
 - 3. Determine time delay.
- G. 51 Time Overcurrent Relay
 - 1. Determine minimum pickup.
 - 2. Determine time delay at two points on the time current curve.
- H. Verify that each of the relay contacts performs its intended function in the control scheme including breaker trip tests, close inhibit tests, 86 lockout tests, and alarm functions.

3.09. SWITCHGEAR AND SWITCHBOARD INSPECTION

- A. Inspect physical, electrical, and mechanical condition including evidence of moisture or corona.
- B. Inspect anchorage, alignment, grounding, and required area clearances.
- C. Clean the unit.
- D. Verify that fuse and/or circuit breaker sizes and types correspond to drawings and coordination study as well as to the circuit breaker address for microprocessor-communication packages.
- E. Verify that current and voltage transformer ratios correspond to drawings.
- F. Inspect bolted electrical connections for high resistance using one of the following methods:
 - 1. Use of a low-resistance ohmmeter.
 - 2. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench.
- G. Use appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- H. Verify correct barrier and shutter installation and operation.
- I. Exercise all active components.

- J. Inspect mechanical indicating devices for correct operation.
- K. Verify that filters are in place and/or vents are clear.
- L. Perform visual and mechanical inspection of instrument transformers.
- M. Inspect control power transformers:
 - 1. Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
 - 2. Verify that primary and secondary fuse ratings or circuit breakers match drawings.
 - 3. Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.
- N. Verify correct function of control transfer relays located in switchgear with multiple power sources.
- O. Verify operation of switchgear/switchboard heaters and their controller, if applicable.
- P. Verify proper operation of all space heaters.

3.10. SAFETY AND PROCEDURAL REQUIREMENTS

- A. Safety and Precautions
 - 1. This document does not include specific safety procedures. It is recognized that tests and inspections set forth by this specification may be potentially hazardous. Consequently, individuals performing these tests must be capable of conducting these tests in a safe manner and with complete knowledge of the hazards involved. Each person involved in this project must be provided with, and use, appropriate PPE.
 - 2. Safety practices that shall be followed include, but are not limited to, the following:
 - a. Occupational Safety and Health Act
 - b. Accident Prevention Manual for Industrial Operations, National Safety Council
 - c. Applicable state and local safety operating procedures
 - d. Owner's safety practices
 - 3. Perform all testing work in accordance with the applicable codes and standards of the following agencies except as provided otherwise herein:
 - a. InterNational Electrical Testing Association - NETA ATS latest Edition: Acceptance Testing Specifications, and/or NETA MTS latest Edition: Maintenance Testing Specifications.
 - b. National Fire Protection Association - NFPA

- 1) ANSI/NFPA 70: National Electrical Code
- 2) ANSI/NFPA 70B: Recommended Practice for Electrical Equipment Maintenance
- 3) NFPA 70E: Electrical Safety Requirements for Employee Workplaces

B. TEST INSTRUMENTS

1. All test equipment shall be in good mechanical and electrical condition.
2. The electrical testing firm shall have a calibration program that assures that all applicable test instruments are maintained within rated accuracy.
3. The accuracy shall be directly traceable to the National Institute of Standards and Technology (NIST).
4. Instruments shall be calibrated in accordance with the following frequency schedule:
 - a. Field instruments: Analog and Digital, 12 months maximum
 - b. Laboratory instruments: 12 months
 - c. Leased specialty equipment: 12 months where accuracy is guaranteed by lessor
5. Dated calibration labels shall be visible on all test equipment or calibration certification shall be included in the project report discussed above.
6. Records, which show date and results of instruments calibrated or tested, shall be kept up-to-date.
7. Up-to-date instrument calibration instructions and procedures shall be maintained for each test instrument.
8. The calibrating standard shall be of higher accuracy than that of the instrument tested.

C. DIVISION OF RESPONSIBILITY

1. The Electrical Testing Firm shall notify the customer immediately upon the discovery of any customer electrical equipment that is defective, dangerous or obviously unreliable.
2. The Electrical Testing Firm will be supplied with the following for the purposes of completing this project:
 - a. Accurate single-line schematic and physical layout drawings identifying each cable circuit to be tested
 - b. Access to each point of attachment where PD measurements will be made.

3.11. POWER CABLE TESTS

- A. Perform a continuity check and a 1,000 volt DC megger test on 600 volt power cables No. 4 AWG and larger.
 - 1. The megger test shall be performed between each pair of conductors and from each conductor to ground.
 - 2. The megger test shall be performed for 15 seconds or until the insulation resistance value stabilizes.
 - 3. The insulation resistance between conductors and from each conductor to ground shall be 100 megohms minimum in one minute or less. In addition, the lowest insulation resistance value shall not differ from the highest value by more than 20 percent.

- B. CONTROL CABLE TESTS
 - 1. Perform a continuity check on control and Instrumentation wiring.

- C. SECONDARY SWITCHGEAR AND SWITCHBOARD TESTS
 - 1. Perform a continuity check and 1,000 volt DC megger test on buses, and on main and feeder breakers.
 - 2. Perform a primary current Injection test and a 'Ducter' (contact resistance) test on main breakers.
 - 3. Perform a 1,000-volt DC megger test and a turns-ratio test on CT's and PT's.
 - 4. Calibrate the metering.
 - 5. Verify proper operation of all indicating lights and replace bulbs as necessary.
 - 6. Verify proper operation of all space heaters.

- D. SERVICE, DISTRIBUTION AND MOTOR CONTROL EQUIPMENT TESTS
 - 1. Perform a 1,000-volt megger test on buses, motor starters and disconnect switches. This test may be combined with the feeder cable megger test by testing the devices and terminated cables together.
 - 2. Perform a continuity check on motor control circuits and control panel internal wiring.
 - 3. Perform an operational test on the controls.
 - 4. Perform a continuity check and a 1,000-volt DC megger test on 3 phase distribution and isolation transformers.

- E. MOTOR TESTS
 - 1. Perform a 1,000-volt megger test on 460 volt, 3 phase motors, and a 500 volt megger test on 200 volt, 3 phase motors.

2. "Bump" motors to verify proper direction of rotation.
3. Run motors and check for vibration.

F. GROUNDING TESTS

1. Measure the resistance to ground of each ground rod before connection to the other ground rods. The resistance shall not exceed 10 ohms.
2. Measure the resistance to ground of the total ground system with all connections completed. The resistance shall not exceed 2 ohms for primary services or 5 ohms for secondary services.
3. Tests of the resistance to ground shall be made using either the three point method or the fall-of-potential method.
4. Perform a continuity check from equipment ground bus bars and ground lugs to the ground system.

3.12. SUPPLEMENTARY SPECIFICATION FOR ENERGIZING OIL FILLED TRANSFORMERS RATED 15KV OR LESS

- A. The Electrical contractor shall advise the owner 10 working days 'in advance of his intention of energizing any new transformer. The owner at his option might want to witness this procedure.
- B. It is the Electrical Contractors responsibility when operating over current protective devices (and taking voltage readings with electrical measuring instruments where needed) to wear the proper Protective Clothing (Arc Flash) for the system being worked on.
- C. Confirm that the protective device on the primary side of the transformer is open and locked out and tagged out.
- D. Ensure there are no grounds connected to any of the transformer primary or secondary conductors.
- E. Ensure all primary and secondary conductors at the Transformer are connected and torqued to the correct level.
- F. Confirm that the transformer is properly grounded to the specified grounding system.
- G. Confirm that the primary conductors have been connected and torqued to the correct level.
- H. Confirm that the secondary conductors have been connected to the correct equipment on the secondary side and that the conductors are connected and torqued to the correct level.
- I. Ensure that all the protective devices on the secondary side (Main Circuit Breaker and Feeder Circuit Breakers) are open.
- J. Ensure that the transformer is filled with oil to the correct level.
- K. After confirming items 1 through 10 have been completed proceed as follows.

- L. Clear the area surrounding the transformer to be energized and remove the locked out and tagged primary protective notice.
- M. Wearing the proper protective clothing as stated above:
 - 1. Close the primary protective device to the transformer.
 - 2. With the primary protective device closed to the transformer the transformer should be energized (audible humming) indicating magnetizing current.
 - 3. If phase rotation is essential to the correct operation of the secondary equipment this should be checked at this point. If necessary open the primary protective device and make the necessary corrections and re-energize.
 - 4. If all the above items are completed proceed as follows,
- N. Wearing the proper protective clothing as stated above:
 - 1. Confirm the correct voltage is available on the Secondary Side of the Transformer
 - 2. Close the Main Secondary Circuit Breaker
 - 3. It is the Electrical Contractors responsibility to ensure all conductors connected after the Main Secondary Circuit Breaker has been checked for continuity and are free of any grounds before closing any secondary protective devices.

END OF SECTION

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SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01. SCOPE OF WORK

- A. Provide labor, materials, equipment, transportation and perform operations necessary or incidental to the proper execution and completion of the electrical work, whether specifically mentioned or not, and as directly indicated or reasonably implied by the Drawings and Specifications.

1.02. CODES AND STANDARDS

- A. Provide equipment and materials which conform to, and perform the installation thereof in accordance with the following codes and industry standards. The applicable version of each shall be that in effect as of the date of the Contract:

1. California Electrical Code (CEC).
2. Titles 8, 19 and 24 of the California Code of Regulations (CCR).
3. American National Standards Institute (ANSI).
4. California State Fire Marshal (CSFM).
5. Underwriters' Laboratories (UL).
6. National Electrical Manufacturers' Association (NEMA).
 - a. Institute of Electrical and Electronics Engineers (IEEE).
 - 1) National Electrical Safety Code (NESC).
 - a) Electrical Safety Orders.
 - b) Other applicable local codes and ordinances.

- B. Where the authority-having-jurisdiction makes an interpretation or decision, as is their prerogative in accordance with the Code, such direction shall be considered a part of these Contract Documents as if contained herein. With respect to completing the intent of the Contract Documents, comply with any and all requirements of the authority-having-jurisdiction and utility company field inspectors, at no additional cost.

- C. The above referenced codes and standards are considered to be absolute minimum requirements. The Drawings and Specifications shall take precedence over the above referenced codes and standards where materials or workmanship of higher quality or larger size is indicated. Nothing in these Drawings or Specifications shall be construed to allow work not conforming to the applicable codes and standards.

1.03. REVIEW OF CONTRACT DOCUMENTS

- A. Examine all relevant Contract Documents including Drawings, Specifications, and Shop Drawings in order to become acquainted with the Work of other installers whose activities will adjoin or be affected by the Electrical Work.

1.04. PERMITS, LICENSES, AND FEES

- A. Procure and pay for all permits, licenses and fees that are required to carry out and complete the Electrical Work.

1.05. SITE VERIFICATION OF INFORMATION

- A. Visit the project site prior to submitting a bid and verify the condition, location and dimensions of buildings, equipment, and facilities. Become acquainted with conditions under which the Work is to be performed and which may affect the cost thereof.
- B. Verify at the project site, the accuracy of information shown on the Drawings regarding existing equipment, materials, and facilities. This includes, but is not limited to, size, type, rating, quality, age, and serviceability. No allowance will be made on behalf of the Contractor for extra expenses resulting from the failure to discover conditions affecting the Work.

1.06. WORKING SPACE

- A. Maintain adequate work space around, and access to, electrical and mechanical equipment in strict accordance with the applicable Codes. Verify during the course of construction that sufficient space will be available for the installation equipment, fixtures, etc.

1.07. MATERIALS AND SUBSTITUTIONS

- A. Materials shall be new, high quality, free from defects, of standard make, and of the brand or grade as shown on the Drawings or specified herein. Specific trade names are used in the Drawings and Specifications in order to establish the standard grade and characteristics of said items. This does not imply the right upon the part of the Contractor to use other materials or methods without the approval of the Architect.
- B. Electrical materials and equipment shall bear the label of, or be listed by, the Underwriters' Laboratories (UL) wherever standards have been established and label service is regularly furnished by that agency. Comply with the installation and application requirements of UL as documented in their published directories.
- C. Unless specifically noted, equipment and systems shall be the product of a manufacturer who has been in the manufacture of, and has nationally distributed catalogs covering the ratings and specifications of, said equipment or systems, for a period of not less than five (5) years.
- D. Maintain uniformity throughout the Project by making use of only one make or brand of material for each material used.
- E. Substitutions of materials or methods will only be allowed if such items are approved in writing by the Engineer as equal in quality and utility to the specified items. Submit a list of proposed substitutions within ten (10) days of the award of the Contract. Include on the list the original manufacturer's name and model number, the proposed manufacturer's name and model number, catalog cut sheets, ratings, sizes, performance curves, shop

drawings, and other data as may be required to demonstrate equality to the specified item.

- F. The approval of a substitution does not authorize any deviation from the utility, size, function, or durability of the specified item unless specifically pointed out and requested in the proposed substitution list, and said deviation is approved in writing by the Engineer. Responsibility of the Contractor for dimensional considerations or space conflicts is not relieved by the approval of a substitution.
- G. If requested by the Engineer, submit samples of materials and equipment for approval prior to installation.

1.08. ELECTRICAL SUBMITTALS

- A. See the General Conditions for conditions of submittal approval and general requirements for submission of shop drawings.
- B. Submit a minimum of five copies (or more as required by the General Conditions) of electrical shop drawings and manufacturer's cut sheets for equipment and materials as noted in each electrical specification section. Bind the submittals as complete volumes according to classification of equipment such as power, lighting, fire alarm, etc. When possible, make all electrical submittals at the same time.
- C. Submit shop drawings and supporting data as instruments of the Contractor. Stamp each item in the submittal documents with the Contractor's stamp, thereby stating that the equipment meets all requirements and conditions of the Drawings and Specifications. In particular, certify that the items shown on the shop drawings conform to the dimensional, environmental, and space restrictions as pertains to all work under this Contract and the work of other parties in conjunction with this Project.
- D. Provide a blank space on the title page of each submittal classification for the Engineer's or Engineers approval stamp and comment field. The minimum size of such space shall be eight inches wide by five inches high.
- E. Arrange panelboard submittals to show bussing, circuit numbering, and branch circuit protective devices similar the schedules on the Drawings. Show elevations of switchboards, motor control centers, and distribution centers indicating the layout of devices, meters, handles, etc. Provide device ratings, circuit numbers, and nameplate descriptions in table form. Include terminal strip mounting arrangements on elevations for terminal cabinets.

1.09. DRAWINGS AND SPECIFICATIONS

- A. The data and information contained on the Drawings is as accurate as was reasonably possible at the time they were produced, but absolute accuracy is not guaranteed. Exact locations, distances, elevations, etc., will be dictated by the actual building and the conditions at the site.
- B. The layout of electrical equipment, wiring, and accessories is shown in a diagrammatic fashion (not pictorially) in order to achieve clarity and legibility. Although the size and location of electrical equipment is drawn to scale wherever possible, refer to all data in the Contract Documents and field verify this information as the project progresses. Examine architectural, structural, mechanical, and other drawings to determine the exact location of conduits, outlets, fixtures, and equipment and to note any conditions which may affect the electrical work.

- C. The Drawings and Specifications may be superseded by later detail drawings and specifications prepared by the Engineer. Conform to such detail drawings, specifications, addenda, change orders, other reasonable changes as if they are contained herein. See the General Conditions for change order cost considerations.
- D. Because the Electrical Drawings may be distorted for clarity of representation, it may be necessary to field verify the exact location of electrical outlets, lights, switches, etc. in order to conform to the architectural elements. The Engineer reserves the right to make minor changes to the locations of equipment, devices, and wiring shown on the Drawings, at no additional cost, providing the changes are ordered before the rough-in of conduit, boxes, or related items is completed, and no extra material are required.
- E. For dimensional and locational purposes, the Architectural Drawings take precedence over the Electrical Drawings. Determine the appropriate location of lighting fixtures, outlets, wall-mounted devices, etc. by studying the reflected ceiling plans, building sections, and interior elevations. Report conflicting conditions to the Engineer before rough-in for adjustments to the locations.
- F. Conduit quantities, sizes, termination points, and wiring are depicted on the Electrical Drawings. However, not all conduit bends or routing details are necessarily shown. Route conduit so as to conform to the structural conditions, avoid obstructing other trades, maintain space restrictions and keep circulation areas and access openings clear.
- G. Thoroughly examine the Contract Documents prior to submitting a bid in order to determine electrical requirements which are not necessarily indicated on the Electrical Drawings. Include sufficient allowance in the bid sum to cover the costs of these other requirements.
- H. Should the Contractor perceive that the Drawings and Specifications do not sufficiently define the intent of electrical work, contact the Engineer for clarification or additional information. The absence of such contact will be considered as evidence of understanding, on the part of the Contractor, of the intended Electrical Work and the required installation thereof.

1.10. WORKMANSHIP

- A. Constantly supervise the work personally or through an authorized and competent representative. Keep the same foreman or supervisor on the project from commencement through completion.
- B. Perform the Electrical work using the highest caliber craftsman available. Workmanship shall be first class and of the best quality available to insure a long and trouble free service life. Allow only experienced and competent workmen on the job.

1.11. COOPERATION AND COORDINATION

- A. Consult with the other installers and trades in coordinating the Work so as to avoid conflicts, omissions and delays. Cooperate with other contractors, third parties, and the Owner in order to expedite the project and provide for the proper execution of the building as a whole. Work performed without regard to other trades or the overall project scheme, may necessarily be required to be moved at the Contractor's expense.

1.12. MANUFACTURER'S DIRECTIONS

- A. Adhere to the manufacturer's directions regarding the proper installation and configuration of electrical equipment where those directions cover points not included in these Drawings and Specifications.

1.13. PROTECTION AND STORAGE

- A. Deliver electrical materials to the site new, and in unbroken packages. Provide for the temporary storage of such materials, equipment, and construction tools in accordance with the General Conditions. Protect electrical equipment and materials during transit, storage and handling to prevent damage, soiling and deterioration.
- B. During shipping storage and handling protect electrical materials from damage of any type including dust, water, over-spray, and temperature. Avoid damage during construction to the work and materials of other trades as well as the electrical work and material. Repair or replace, at the Contractor's expense, defective or damaged items such that the entire Work is completed in a condition satisfactory to the Engineer.

1.14. EXCAVATION, CUTTING, PATCHING, AND REPAIR

- A. Cut, core-drill, and demolish existing walls, floors, ceilings and other building surfaces as required for the installation of Electrical Work. Obtain the approval of the Engineer prior to performing any operation which may affect any structural elements of the building.
- B. Patch and repair wood, plaster, tile, or concrete surfaces which have been damaged by the installation of the Electrical Work so that the finished surface matches the surrounding conditions.

1.15. FLASHING, WATERPROOFING, SEALING, AND FIREPROOFING

- A. In general, install in an approved watertight manner, Electrical Work which pierces exterior walls or waterproofing membranes. Flash and counter-flash roof and wall penetrations in a manner described in other applicable sections of this Specification and as approved by the Engineer.
- B. Fit conduits passing through finished walls with steel escutcheon plates of brass, chrome, or painted finish as directed by the Engineer. Grout penetrations of floor slabs, concrete or masonry walls with an approved grout or silicone elastomeric caulk.
- C. Fire-Rated Surface:
 - 1. Where conduit penetrates fire rated surface, install fire-stopping product in accordance with manufacturer's published instructions.
 - 2. All openings through fire rated wall, floor, ceiling or roof must be sealed.
 - 3. Install galvanized sheet metal sleeves (minimum 12-gage) through opening and extending beyond minimum of one (1) inch on each side of building element.
 - 4. Pack void between sleeve and building element with backing material.
 - 5. Seal ends of sleeve with UL listed fire-resistive silicone compound to meet fire rating of structure penetrated.

D. Non-Rated Surfaces:

1. Opening through a non-fire rated wall, floor, ceiling or roof must be sealed using an approved type of material.
2. Use galvanized sheet metal sleeves in hollow wall penetrations to provide a backing for the sealant. Grout area around sleeve in masonry construction.
3. Install escutcheons or floor/ceiling plates where raceway, penetrates non-fire rated surfaces in occupied spaces.
4. Install rubber links of mechanical seal tightened in place and sized for the pipe, in exterior wall openings below grade, in accordance with the manufacturer's instructions.
5. All pipe penetrations at interior partitions and/or walls, laboratory spaces, telephone, data and communication rooms and similar spaces where the room pressure or odor transmission must be controlled, shall be sealed. Sealant shall be applied to both sides of the penetration in such a manner that the annular space between the pipe sleeve and the pipe is completely filled.

1.16. CLEANING, ADJUSTING, AND TOUCH-UP

- A. Remove on a daily basis electrical debris, scraps, packaging material and other rubbish. Dispose of such items off-site in an approved manner and debris. Maintain the site free from physical hazards at all times in accordance with OSHA regulations. See the General Conditions for additional requirements.
- B. After installation, completely clean electrical equipment, fixtures, and materials of excess paint, over-spray, plaster, cement, insulating products, and other foreign matter. Leave the Electrical Work in a clean, finished, dry, level, like new condition.
- C. Touch-up paint scratches and scuffs on electrical equipment and lighting fixtures with paint recommended by the manufacturer and matching the original item finish.
- D. Make setting, adjustments, and programming in accordance with the manufactures' operating and installation instructions. Settings and program variables will be issued by the Engineer prior to commissioning of the electrical system.

1.17. AS-BUILT DRAWINGS

- A. Throughout the project, maintain accurate and current record documents. Show on the record drawings deviations from the Electrical Drawings, locations of underground conduits and pull-boxes, and concealed equipment which is not readily apparent. Dimension the record drawings using permanent, readily identified benchmarks such as column or wall lines.
- B. At the completion of the project, present one clearly legible set of the record drawings to the Engineer.

1.18. INSPECTIONS AND TESTING

- A. Arrange for the inspection of the Work at various stages of completion by the Authority Having Jurisdiction, utility company representatives, and the Engineer. Comply with all directions and remedial measures issued thereby. Any objections to these orders on the part of the

Contractor must be presented to the Engineer in writing within forty eight (48) hours of the inspection report.

- B. Coordinate the installation of the Work so that observation of all rough-in, concealed, or underground Work can take place by the Engineer. Provide a minimum of seventy two (72) hours notice to the Engineer prior to covering up the work. Uncover Work that has not been properly observed and make repairs to restore the Work and adjoining surfaces to their proper condition at no additional cost.
- C. Perform tests of the electrical system during the course of the project and at project completion to ensure safe and proper function in accordance with the Contract Documents, manufacturers' recommendations, and applicable codes. Provide complete documentation of all test results to the Engineer prior to project completion. Testing shall include, but not necessarily be limited to, the following:
1. Test for short circuits, open circuits, neutral leakage, and improper grounds on feeders and branch circuits. Perform this test with mains in disconnect from feeders, branch circuits closed, fixtures and devices permanently connected, lamps removed from sockets and wall switches closed.
 2. Provide insulation resistance tests of all phase and neutral circuit conductors using a 500 Volt Megger for circuits of 240 Volt rating and below, and a 1000 Volt Megger for circuits of 277 volts and above. Minimum acceptable insulation resistance is one (1) megohm.
 3. Perform a ground resistance test of each main grounding electrode system, ground rod, and supplemental grounding electrode. Utilize a calibrated, direct reading, earth ground test set and make the tests using the "Three-terminal, Fall-of-Potential" method. The maximum allowable earth ground resistance is 25 ohms.
 4. Test for proper phase-to-phase and phase-to-neutral operating voltage on the main service and on each separately derived system. Perform this test at full load and at no load. With all circuits at full operating conditions, test the phase and neutral load currents using a clamp-on ammeter.
 5. Tests as required by other sections of these Specifications.
 6. Tests as prescribed by individual equipment manufacturers whether or not described in these Specifications.
- D. At project completion, demonstrate to the Engineer that the entire installation is complete, in proper operation condition and that the Contract has been properly and fully executed. Activate all circuits, lights, devices, and controls under full load and normal operating conditions. Identify faulty items and immediately replace or repair defective equipment, workmanship, and materials to like new condition and retest in the presence of the Engineer.
- E. At the completion of the Project, demonstrate to the Engineer that the entire electrical system is free from short circuits and improper grounds, or upon request of the Engineer anytime, make necessary tests under the observation of the Engineer which will ensure that electrical equipment, materials and installation methods are as specified.

1.19. GUARANTEE

- A. In accordance with Division 1 requirements.

1.20. WARRANTIES, CERTIFICATES, AND OPERATING MANUALS

- A. Properly fill out and deliver to the Engineer, all warranties, guarantees, certificates, etc. for equipment and materials that are furnished and installed under this Section of the Work. The effective date on each item shall be the date of acceptance of the work by the Owner.
- B. Deliver to the Engineer, a minimum of two (2) copies of the manufacturers' operating and maintenance manuals for major items of equipment.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 26 05 13

MEDIUM VOLTAGE CABLES

PART 1 GENERAL

1.01. SUMMARY

- A. This section covers the furnishing and installation of medium voltage cables, cable joints, terminations, connectors, cable splices, and accessories.

1.02. RELATED SECTIONS

- A. Section 26 01 26 – Maintenance Testing of Electrical Systems

1.03. REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. AEIC CS-6 - Ethylene Propylene Rubber Insulated Shielded Power Cables Rated 5 Through 69-kV.
- B. ANSI C2 - National Electrical Safety Code – latest edition
- C. ASTM B 3 - Soft or Annealed Copper Wire
- D. ASTM B 496 - Compact Round Concentric-Lay-Stranded Copper Conductors
- E. ASTM B 8 - Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- F. IEEE Std. 404 - Cable Joints for Use with Extruded Dielectric Cable Rated 5 Through 138-kV and Cable Joints for Use with Laminated Dielectric Cables Rated 2.5 through 500-kV.
- G. IEEE Std. 48 - Standard Test Procedures and Requirements for Alternating-Current Cable Terminations 2.5 through 765-kV.
- H. IEEE Std. 592 - Exposed Semi-conduction Shields on Premolded High Voltage Cable Joints and Separable Insulated Connectors.
- I. NEMA WC 8 - Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- J. NEMA WC-26 - Wire and Cable Packaging
- K. NETA ATS-2009 - National Electrical Testing Association Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- L. NFPA 70 - National Electrical Code – latest edition.
- M. UL 1072 - Medium Voltage Power Cables.

1.04. CONTRACTOR SUBMITTALS

- A. Product Data:

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1. Submit manufacturer's catalog cuts and technical data in sufficient detail and scope to verify compliance with the requirements of the contract documents for medium voltage cables, stress cones, connectors, splices and accessories.
 2. A complete itemized list of equipment and material proposed for incorporation into this work. Each entry shall include an item number, the quantity of item proposed and the name of the manufacturer of each such item.
 3. As a minimum, installation procedures for medium-voltage cable terminations and splices.
 4. Procedures shall include cable pulling plans, diagrams, instructions, and precautions required to install, adjust, calibrate and test the devices and equipment.
- B. Test Report:
1. Factory Tests.
 - a. Certified factory test reports shall be submitted for manufacturer performed routine factory tests, including tests required by standards listed in paragraph "References". Results of factory tests performed shall be certified by the manufacturer, or an approved testing laboratory, and submitted within 7 days following successful completion of the tests. The manufacturer's pass-fail criteria for tests specified in paragraph "Field Testing" shall be included.
 2. Field Testing.
 - a. Submit a proposed field test plan 20 days prior to testing the installed system. No field test shall be performed until the test plan is approved. The test plan shall consist of complete field test procedures including tests to be performed. Test equipment required, and tolerance limits. Submit the following:
 - 1) A list of equipment used, with calibration certifications.
 - 2) Copies of measurements taken.
 - 3) The dates of testing.
 - 4) The equipment and values to be verified.
 - 5) The conditions specified for the test.
 - 6) Measure overall insulation resistance to ground.
 - 7) Indicate results of cable test in tabular form and in plots of current versus voltage for incremental voltage steps, and current versus time at 30-second intervals at maximum voltage, signed and dated.
 - 8) Provide certified test report for Engineer's Review
 - 9) Cable Installation.

- 10) Site layout drawing with cable pulls numerically identified.
- 11) A list of equipment used, with calibration certifications.
- 12) The cable manufacturer and type of cable.
- 13) The dates of cable pull, time of the day, and ambient temperature.
- 14) The length of cable pull and pulling tensions.
- 15) The actual cable pulling tensions encountered during pull.

b. Certification.

- 1) **Material and Equipment.** Where material and equipment are specified to conform to the standards of the Underwriters Laboratory (UL) or to be constructed and/or tested in accordance with the standards of the American National Standards Institute (ANSI), the Institute of Electrical and Electronics Engineer (IEEE), or the National Electrical Manufacturers Association (NEMA), the contractor shall submit proof that the item provided conform to such requirements. The label of, or listing by, UL will be accepted as evidence that the item conforms. Either a certification or a published catalog specification data statement, to the effect that the item is in accordance with the referenced ANSI, IEEE and/or NEMA standard, will be acceptable as evidence that the item conforms. In lieu of such certification or published data, the contractor may submit a certificate from a nationally recognized testing agency equipped and competent to perform such services, stating that the items have been tested and that they conform to the requirements listed, including method of testing of the specified agencies.
- 2) **Cable Joints and Splices.** A certification that contains the names and the qualifications of people recommended to perform the splicing and termination of medium-voltage cables approved for installation under this contract. The certification shall indicate that any person recommended to perform actual splicing and terminations has been adequately trained in the proper techniques and have had at least three recent years of experience in splicing and terminating the same or similar types of cables approved for installation. In addition, any person recommended by the Contractor may be required to perform a practice splice and termination, in the presence of the Engineer, before being approved as a qualified installer of medium-voltage cables. If that additional requirement is imposed, the Contractor shall provide short sections of the approved types of cables along with the approved type of splice and termination kits, and detailed manufacturer's instruction for the proper splicing and termination of the approved cable types.

c. **Cable Installer Qualifications.** The Contractor shall provide at least one onsite person in a supervisory position with documented level of competency and experience to supervise all cable pulling operations. A

resume shall be provided showing the cable installers' experience in the last three years, including a list of references complete with point of contact, addresses and telephone numbers.

- C. Manufacturer's Instructions:
 - 1. Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.
 - 2. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

1.05. QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years experience.
- B. Installer:
 - 1. Company specializing in installing product specified in this section with minimum three years documented experience.
 - 2. Certified installers as specified under paragraph 'Submittals' above.

1.06. QUALITY ASSURANCE

- A. The terminating and testing of all medium voltage cables shall be performed by one of the following subcontractors:
 - 1. Power Systems Testing Co.
2267 Claremont Court
Hayward, CA 94545
Tel: (510) 783-5096
 - 2. Electro-Test, Inc. Corporate Headquarters
3470 Fostoria Way, Suite A
San Ramon, CA 94583
Tel: (888) 468-6384
 - 3. Try Co.
115 Ryan Industrial Court, Suite 107
San Ramon, CA. 94583
Tel: (925) 831-8271
 - 4. California Splicing and Testing
3725 Camino Diablo Road
P.O. Box 730
Byron, CA, 94514
Tel: (925) 516-2382
Fax: (925-516-7530)

1.07. REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70 and ANSI/IEEE C2.

- B. Furnish products listed and classified by Underwriters Laboratories, Inc. (UL), Electrical Testing Laboratories, Inc. (ETL), or other recognized and approved testing and listing agencies as suitable for the purpose specified and shown.

1.08. DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products on site under provisions of Section 01600.
- B. Accept cable and accessories on site in manufacturer's packaging. Inspect for damage.
- C. Store and protect cable and accessories from the environment in accordance with manufacturer's published instructions. Damaged items shall be replaced.

1.09. PROJECT CONDITIONS

- A. Verify that field measurements are as shown on drawings.
- B. Cable routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

PART 2 PRODUCTS

2.01. MEDIUM VOLTAGE CABLE

- A. Medium voltage cables shall be the standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 3 years prior to bid opening. Medium-voltage cables as manufactured by the following companies are acceptable.
 - 1. General Cable
 - 2. Okonite
 - 3. Pirelli Cable
 - 4. Southwire
 - 5. USA Wire & Cable
 - 6. Substitutions: Permitted.
- B. Description: Cable conductor shall be single conductor type unless otherwise indicated. Cable construction shall be Type MV-90, conforming to NFPA 70, UL 1072 and NEMA WC 8, for use in conduit and/or buried duct.
 - 1. NEMA WC 8 - Ethylene-Propylene-Rubber-Insulated (EPR) Wire and Cable for the Transmission and Distribution of Electrical Energy.
- C. Rating: Cable shall be rated for the system circuit voltage as specified on the drawings.
 - 1. 15-kV, ungrounded. 133% insulation level
- D. Withstand Voltage Ratings: As recommended in NETA ATS Table 100.6 for 15 minutes.
- E. Maximum Operating Temperatures: Per AEIC CS-6, Table A1.

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1. Normal operation: 90 degrees C
2. Emergency overload: 130 degrees C
3. Short Circuit: 250 degrees C

F. Conductor:

1. Class B stranded, compact or concentric round, soft annealed uncoated copper in accordance with ASTM B 3 and ASTM B 8 for regular concentric and compressed stranding or ASTM B 496 for compact stranding.

G. Construction:

1. Cable insulation shall be an ozone-resistant, dielectric, ethylene-propylene-rubber (EPR) insulation conforming to the requirements of NEMA WC 8. The color of the insulation compound shall be in contrast to the color of the semiconducting insulation shield in accordance with AEIC CS-6, Part B.
2. A 133 percent insulation level shall be used on all cables. Minimum insulation thickness shall be as follows:
 - a. 220 mils nominal for 15-kV rated cables.
3. Shielding: Cables shall have a semi-conducting conductor shield, a semi-conducting insulation shield, and an overall copper tape shield for each cable. The shield tape shall be sized to meet IEEE C2 requirements. The conductor stress control layer (conductor shield or screen) shall be an extruded, thermosetting, semi-conducting, polymeric compound compatible with the conductor and surrounding insulation.
4. The conductor screen shall be purposefully bonded to the insulation during the extrusion process. Every effort shall be made to eliminate any voids during this process in an effort to prevent corona at the cable core.
5. The overall jacket shall be an extruded polyvinyl chloride (PVC) or polyethylene that complies with the requirements of ICEA S-68-516, Part 4. The jacket shall be rugged, resistant to fuel oils, mineral oils, fixed alkalies, acids, industrial chemicals, and shall be sunlight resistant.

2.02. CABLE JOINTS, TERMINATIONS, AND CONNECTORS

A. Medium-Voltage Cable Joints.

1. Medium-voltage cable joints shall comply with IEEE Std. 404 and 592.
2. Joints shall be the standard products of a manufacturer and shall be either of the factory preformed type or of the kit type containing tapes and other required parts. Joints shall have ratings not less than the rating of the cables on which they are installed.
3. Splice kits may be of the heat-shrinkable type for voltages up to 15-kV, of the pre-molded splice and connect type, and conventional taped type, or the resin pressure-filled overcast taped type for voltages up to 35-kV; except that for

voltages of 7.5-kV or less a resin pressure-filled type utilizing a plastic-tape mold is acceptable.

4. Joints used in manholes, handholes, vaults and pull boxes shall be certified by the manufacturer for waterproof, submersible application.

B. Medium Voltage Separable Insulated Connectors.

1. Separable insulated connectors shall comply with IEEE Std. 386 and IEEE Std. 592 and shall be of suitable construction or standard splice kits shall be used.
2. Connectors shall be of the load break type as indicated, of suitable construction for the application and the type of cable connected, and shall include cable shield adaptors.
3. Separable insulated connectors shall not be used as substitutes for conventional permanent splices.
4. External clamping points and test points shall be provided.

C. Terminations.

1. Medium-voltage cable terminations shall comply with IEEE Std. 48 Class 1 or Class 2, of the molded elastomer, wet-process porcelain. Pre-stretched elastomer, heat-shrinkable elastomer, or taped type.
2. Acceptable elastomers are track-resistant silicone rubber or track-resistant ethylene propylene compounds, such as ethylene propylene rubber.
3. Separable insulated connectors may be used for apparatus terminations, when such apparatus is provided with suitable bushings.
4. Terminations shall be of the outdoor type unless indicate otherwise.
5. Indoor, class 2 terminations are acceptable where installed inside outdoor equipment housings that are sealed against normal infiltration of moisture and outdoor air.
6. Class 3 terminations are not acceptable.
7. Terminations, where required, shall be provided with mounting brackets suitable for the intended installation and with grounding provisions for the cable shielding, metallic sheath, and armor.

D. Factory Preformed Type.

1. Molded elastomer, wet-process porcelain, pre-stretched, and heat shrinkable terminations shall utilize factory preformed components to the maximum extent practicable rather than tape build-up.
2. Terminations shall have basic impulse levels as required for the system voltage level.
3. Leakage distance shall comply with wet withstand voltage test requirements of IEEE Std. 48 for the next higher Basic Impulse Level (BIL).

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4. Anti-tracking tape shall be applied over exposed insulation of preformed molded elastomer terminations.
- E. Taped Terminations.
1. Taped termination shall be standard termination kits providing terminal connectors, field fabricated stress cones, and rain hoods.

2.03. CABLE TERMINATIONS

- A. Manufacturers: The following manufacturers and their products are acceptable.
1. 3M (No. 5633K, with 3M No. 31145 long-barrel lugs, two-hole for NEMA standard pattern)
 2. Raychem (No. HVT-152-SG Kit, with HVS-EG External Grounding/Shield Interrupting Kit and T&B No. 54479 long-barrel lugs, two-hole for NEMA standard pattern)
 3. Kerite (No. T-4058 Terminating Kit, with T&B No. 54479 long-barrel lugs, two-hole for NEMA standard pattern)

2.04. CABLE SPLICES

- A. Manufacturers: The following manufacturers and their products are acceptable.
1. 3M (No. 5502-CI-4/0 for inline splices, No. 5719 for Tee splices)
 2. Kerite (No. S-3066 Splice Kit, with T&B No. 54012 splicers)
 3. Raychem (No. HVS-823S, with HVS-EG External Grounding/Shield Interrupting Kit and T&B No. 54012 Splicers)

2.05. TESTING BY CONTRACTOR

- A. Ensure that the cable is tested at the manufacturer's facility prior to shipping.
- B. The testing shall be performed in accordance with AEIC CS-6, Parts D, E, F and L, under the conditions specified in Part G.
- C. The partial discharge test shall be performed in accordance with AEIC CS-6, Part F. An X-Y recording graph shall be included with the certified test reports clearly showing the corona test results for each identified length of cable.
- D. A hot impulse test, performed in accordance with AEIC CS-6, Part L.1.3, shall be made on representative samplings of the cable supplied under this specification. Complete documentation of the results shall be included in the final test report package.
- E. Provide certified test reports to the Engineer within two (2) weeks after the completion of the testing program. Furnish in accordance with AEIC CS-6, Parts G.2.3 and G.2.4.

2.06. IDENTIFICATION

- A. The cable protective jacket shall have an indelible, roll-marked legend applied at least every 24 inches stating the following:

1. Manufacturer
2. Insulation thickness
3. Conductor size
4. Conductor material (copper only)
5. Rated voltage
6. Insulation level (133%)
7. Type MV-90
8. Year of manufacture

B. Comply with AEIC CS-6, Part H.

2.07. WARRANTY

A. Provide the manufacturer's standard warranty.

2.08. DELIVERY AND INSPECTION

A. Packing, Sealing and Shipping

1. Place the cable on the reels so that it will be protected from damage during shipment. Firmly and properly secure each end of the cable to the reel. Take precautions to prevent the loosening of reeled cable.
2. Prevent the ingress of moisture into the cable prior to shipping. Durably seal each end of the cable prior to shipment to prevent the ingress of moisture during shipment and later storage. If the conductor exhibits signs of slight corrosion but no pitting, Seller shall verify that cable was properly dried and retested prior to shipping, at no additional cost to the District.
3. Lag or otherwise suitably cover the reel(s) with suitable material to provide physical protection for the cable(s) during transit and ordinary storage and handling operations.

B. Reels

1. The minimum diameter of the drum of the shipping reel shall be at least that prescribed in NEMA WC 26.
2. Protect the inner or drum end of the reel to avoid damage to the cable or environmental end seal.
3. Markings: Each reel shall have a legend stating: "DO NOT LAY FLAT"
4. Manufacturer's name
5. Reel number per purchase order
6. Length of cable on reel

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7. Type cable, size, rating, and year of manufacture
8. Purchase order number
9. Delivery address as specified in purchase order

2.09. INSTALLATION SUPPORT SERVICES

- A. Submit manufacturer recommendations for maximum pulling tensions and sidewall pressures to the Engineer for review upon delivery of cable to job site.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that raceway system is installed and ready to receive cable.
- B. Pull an appropriately sized conduit mandrel completely through the installed duct(s) to ensure that duct is suitable for pulling intended cables without damage.

3.02. PREPARATION

- A. Use a lubricated swab behind a mandrel to clean conduits and ducts before pulling cables.
- B. Install new or relocated existing cable racks with porcelain insulators in manholes, vaults, or pull boxes as necessary to support cables.
- C. Coordinate the installation of the cables under this specification with the Engineer.

3.03. INSTALLATION

- A. Install cables, terminations and splices in accordance with manufacturer's instructions and ANSI/IEEE C2.
- B. Avoid abrasion and other damage to cables during installation.
- C. Use suitable lubricants and pulling equipment. Do not exceed cable pulling tensions nor bending radius restrictions.
- D. Ground cable shield at each termination and/or splice.
- E. Install cables in manholes along wall providing longest route. Arrange cables in manholes to avoid interference with duct entrances.
- F. Provide at least one full 360-degree coil wrapped around the interior of the manhole from entrance to exit, racked appropriately, to allow for splicing, tapping and/or cable movement.
- G. Install the three cables of a three-phase circuit in a triangular configuration on the cable racks - two (2) of the cables on the porcelain rack insulators and the third nestled in the groove formed by the bottom two cables. Securely bind the cables (use plastic ties) at each rack to secure them in place.
- H. Identify all cables in accessible locations per ANSI/IEEE C2-341(B)(3).

3.04. PROTECTION

- A. Protect installed cables from entrance of moisture.
- B. Do not handle with mechanized equipment such that the lifting forks will come into contact with the cable or that the weight of the cable/reel will rest on the lifting forks or any other handling medium.
- C. During the installation process, protect the cable jacket from abrasion or scuffing damage by the use of suitable cable pulling equipment.

3.05. FIELD QUALITY CONTROL

- A. Field inspection and test shall be performed under provisions of NETA ATS – 2009 as follows.
- B. Visual and Mechanical Inspection. As indicated in Section 26 01 26.
- C. Electrical Tests. As indicated in Section 26 01 26.
- D. Test Values. As indicated in Section 26 01 26.
- E. Documentation
 - 1. Provide all cable and termination operation and maintenance manuals, submittal specification sheets, installation procedures and drawings, manufacturer's test results and warranty information, and installation Subcontractor's test instrument calibration documentation. Submit to Engineer after final acceptance of Work-In-Place.

NETA ATS TABLE 100.6.1

Medium-Voltage Cables

Acceptance Test Values





Table 100.6.2					
AC Test Voltages					
Rated Voltage Phase-to-Phase kV	Conductor Size AWG or kcmil	Nominal Insulation Thickness Mils (mm)		AC Test Voltage, kV	
		100% Insulation Level	133% Insulation Level	100% Insulation Level	133% Insulation Level
		5kV	8-1000 1001-3000	90 (2.29) 140 (3.56)	115 (2.92) 140 (3.56)
8kV	6-1000 1001-3000	115 (2.92) 175 (4.45)	140 (3.56) 175 (4.45)	23 35	28 35
15kV	2-1000 1001-3000	175 (4.45) 220 (5.59)	220 (5.59) 220 (5.59)	35 44	44 44
25kV	1-3000	260 (6.60)	320 (8.13)	52	64
28kV	1-3000	280 (7.11)	345 (8.76)	56	69
35kV	1/0-3000	345 (8.76)	420 (10.7)	69	84
46kV	4/0-3000	445 (11.3)	580 (14.7)	89	116

NETA ATS 2009- TABLE 100.12.1

Bolt-Torque Value for Electrical Connections

US Standard Fasteners

Heat-Treated Steel - Cadmium or Zinc Plated

Grade	SAE 1&2	SAE 5	SAE 7	SAE 8
HEAD MARKING				
Minimum Tensile (PSI)	64K	105K	133K	150K
Bolt Diameter in Inches	Torque (Foot Pounds)			
1/4	4.0	6.0	8.0	8.0
5/16	7.0	11.0	15.0	18.0
3/8	12.0	20.0	27.0	30.0
7/16	19.0	32.0	44.0	48.0
1/2	30.0	48.0	68.0	74.0
9/16	42.0	70.0	96.0	105.0
5/8	59.0	96.0	135.0	145.0
3/4	96.0	160.0	225.0	235.0
7/8	150.0	240.0	350.0	380
1.0	225.0	370.0	530.0	570.0

NETA ATS 2009 - TABLE 100.12.2

US Standards Fasteners^a

Silicon Bronze Fasteners^{b c}

Torque (Foot Pounds)

Bolt Diameter in Inches	Non-lubricated	Lubricated
5/16	15	10
3/8	20	15
1/2	40	25
5/8	55	40
3/4	70	60

a. Consult manufacturer for equipment supplied with metric fasteners.

b. Table is based on National Coarse thread pitch.

c. This table is based on bronze alloy bolts having a minimum tensile strength of 70,000 pounds per square inch.

NETA ATS 2009 - TABLE 100.12.3

US Standard Fasteners^a

Aluminum Alloy Fasteners^{b c}

Torque (Foot Pounds)

Bolt Diameter in Inches	Lubricated
5/16	10
3/8	14
1/2	25
5/8	40
3/4	60

- a. Consult manufacturer for equipment supplied with metric fasteners.
- b. Table is based on National Coarse thread pitch.
- c. This table is based on aluminum alloy bolts having a minimum tensile strength of 55,000 pounds per square inch.

NETA ATS 2009 - TABLE 100.12.4

US Standard Fasteners^a

Stainless Steel Fasteners^{b c}

Torque (Foot Pounds)

Bolt Diameter in Inches	Uncoated
5/16	15
3/8	20
1/2	40
5/8	55
3/4	70

- a. Consult manufacturer for equipment supplied with metric fasteners.
- b. Table is based on National Coarse thread pitch.
- c. This table is to be used for the following hardware types:
Bolts, cap screws, nuts, flat washers, locknuts (18-8 alloy). Belleville washers (302 alloy).

END OF SECTION

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SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01. SUMMARY

- A. This section includes covers all labor, material, tools, equipment and services required to install building wire and cable, service entrance cable, control cables, wiring connectors and connections.

1.02. REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. ASTM B 8 - Specifications for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
- B. NECA - Standard of Installation.
- C. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- D. NFPA 70 - National Electrical Code (NEC). Latest approved edition.
- E. UL 83 - Thermoplastic-Insulated Wires and Cables.

1.03. DESCRIPTION OF WORK

- A. The requirements of this section apply to cable and wires specified on the drawings and in these specifications. The extent of electrical wire and cable work is indicated on drawings and schedules and by the requirements of this section. The applications for cable, wire and connectors required, but not limited to, are as follows:
 - 1. Power distribution circuitry.
 - 2. Appliance and equipment circuitry.
 - 3. Control wiring for motors, mechanical equipment, relays and switches, and similar mechanical-electrical devices.
 - 4. Line voltage wiring to thermostats, alarm systems and other miscellaneous equipment.

1.04. PROJECT CONDITIONS

- A. Conductor sizes are based on copper.
- B. Wire and cable routing shown on Drawings is diagrammatic unless dimensioned.
- C. Route wire and cable as required to complement project conditions.
- D. The electrical contractor shall be responsible for any and all raceways and raceway/cable supports in accordance with other sections of these specifications.

1.05. REGULATORY REQUIREMENTS

- A. Furnish products listed and classified by Underwriters Laboratories, Inc. (UL), Electrical Testing Laboratories, Inc. (ETL), or other recognized, acceptable testing and listing agencies as suitable for the purpose specified and shown.

1.06. CONTRACTOR SUBMITTALS

- A. Product Data: Submit manufacturer's catalog cuts and technical data for wire and cables.
- B. Test Report: Measure overall insulation resistance to ground. Provide test report for Engineer's Review.

1.07. CLOSEOUT SUBMITTALS

- A. Provide project record documents showing actual locations of components and circuits.

1.08. QUALIFICATIONS

- A. Manufacturer shall be a Company specializing in manufacturing products specified in this section with a minimum of five years' experience.

1.09. FIELD MEASUREMENTS

- A. Verify field measurements as indicated on drawings.

1.10. COORDINATION

- A. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.
- B. Wire and cable routing indicated is approximate unless dimensioned. Include wire and cable lengths within 10 feet of length shown.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. Domestic manufacturer regularly engaged in the manufacture of Building Wire and Cable products for at least five years as follows:
 - 1. American Wire and Cable.
 - 2. Cerro Wire and Cable Co.
 - 3. General Cable Corp.
 - 4. Okonite Co.
 - 5. Southwire
 - 6. Substitutions: Permitted

2.02. BUILDING WIRE AND CABLE

- A. Building wire and cable shall be UL83 compliant, insulated, single conductor, copper, solid or stranded, rated for 600-volts AC. The insulation shall be thermoplastic material rated for 90 degrees Celsius dry locations, 75 or 90 degrees Celsius wet locations, THW, THHN/THWN, RHW or XHHW, per ANSI/NFPA 70.
- B. Use type THW insulation for feeders and branch circuits larger than 8 AWG, unless noted otherwise.
- C. Use type THHN/THWN insulation for feeders and branch circuits 8 AWG smaller.
- D. For Interior Dry Location: Use only building wire, THHN/THWN insulation, in raceway.
- E. For Exterior Wet or Dry Locations: Use only building wire, THHN/THWN insulation, in raceway.
- F. For Underground Dry or Wet Locations: Use only RHW or XHHW insulation rated for 90 degrees Celsius, in raceway.
- G. For connections to electrical equipment, coordinate wire type with equipment manufacturer.

2.03. WIRING CONNECTORS

- A. Split Bolt Connectors:
 - 1. FCI Burndy Corp.
 - 2. Thomas & Betts Co.
 - 3. Cooper Crouse-Hinds
- B. Solderless Pressure Connectors:
 - 1. FCI Burndy Corp.
 - 2. Ideal Industries Co.
 - 3. Thomas & Betts Co.
 - 4. 3-M Co.
- C. Spring Wire Connectors:
 - 1. Ideal Industries Co.
 - 2. 3-M Co.
- D. Compression Connectors:
 - 1. FCI Burndy Corp.
 - 2. Thomas & Betts Co.

- 3. 3-M Co.

2.04. WIRE COLOR CODE

A. Color-code all conductors:

- 1. Wire sizes 10 AWG and smaller shall have integral color-coded insulation.
- 2. Wire sizes 8 AWG and larger may have black insulation but shall be identified by color-coded electrical tape at all junction, splice, pull, or termination points.
- 3. Color tape shall be applied to at least 3 inches of the conductor at the termination ends and in junction or pull boxes or where readily accessible.
- 4. Conductors for all systems shall not change color at splice points.
- 5. Where there are two or more neutrals in one conduit, each shall be individually identified with the proper circuit.
- 6. For 4 AWG and larger ground conductors, identify with green tape at both ends and all visible points, included in all junction boxes.
- 7. Each phase shall be uniquely color-coded.
- 8. Color-code wires as indicated below:

	120/240-Volts	120/208-Volts	277/480-Volts
Phase:	a - black	a - black	a - brown
	b - red	b - red	b - orange
	n - white	c - blue	c - yellow
	g - green	n - white	n - white or natural gray
		g - green	

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that work likely to damage wire and cable has been completed.
- B. Verify that raceway installation is complete and supported.

3.02. PREPARATION

- A. Completely and thoroughly clean and swab raceway before installing wire.

3.03. EXISTING WORK

- A. Remove exposed abandoned wire and cable. Patch surfaces where removed cables pass through building finishes.

- B. Disconnect abandoned circuits and remove circuit wire and cable. Remove abandoned boxes if wire and cable servicing them is abandoned and removed. Provide blank cover for abandoned boxes that are not removed.
- C. Ensure access to existing wiring connections which remain active and which require access. Modify installation or provide access panel as appropriate.
- D. Extend existing circuits using materials and methods and compatible with existing electrical installations, or as otherwise specified.
- E. Clean and repair existing wire and cable that remain or is to be reinstalled.

3.04. INSTALLATION

- A. General:
 - 1. Install wire and cable in accordance with manufacturer's instructions and NECA "Standard of Installation".
 - 2. Route wire and cable as required to meet project conditions.
 - 3. Identify and color code wire and cable. Identify each conductor with its circuit number or other designation indicated.
 - 4. Protect exposed cable from damage.
 - 5. Pull all conductors into raceway at same time.
 - 6. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
 - 7. Support cables above accessible ceiling using standard support methods to support cables from structure. Do not rest cable on ceiling panels.
 - 8. Neatly train and lace wiring inside boxes, equipment, and panelboards
- B. Cable and Wire Size:
 - 1. Conductor sizes are based on copper unless indicated as aluminum or "AL".
 - 2. Use 10 AWG conductors for 20 ampere, 120-volt branch circuits longer than 75 feet.
 - 3. Use 10 AWG conductors for 20 ampere, 277-volt branch circuits longer than 200 feet.
 - 4. Use stranded conductor for all feeders, branch and control circuits.
- C. Special Techniques - Wiring Connections:
 - 1. Clean conductor surfaces before installing lugs and connectors. Where an anti-oxidation lubricant is used, apply liberally, coating all exposed conductor surfaces.
 - 2. Use suitable cable fittings and connectors.

3. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
4. Tape un-insulated conductors and connector with two layers of half-lapped rubber insulating compound tape and two layers of half-lapped, 7-mil electrical tape, Scotch 33+, or equal.
5. Use split bolt connectors for copper conductor splices and taps, 8 AWG and larger.
6. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
7. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
8. Stranded conductors for control circuits shall have fork or ring terminals crimped on for all device terminations. Bare stranded conductors shall not be placed directly under the screws.

3.05. FIELD QUALITY CONTROL

A. Visual and Mechanical Inspection:

1. Inspect wire and cable for physical damage and proper connection.
2. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
3. Verify continuity of each branch circuit conductor.
4. Inspect compression-applied connectors for correct cable match and indentation.

B. Electrical Testing and Verification:

1. All 600 volt conductors 8 AWG and larger, shall be verified by use of a 500-volt meg-ohm-meter.
2. Perform continuity test to insure correct cable connection.
3. Correct malfunctions and/or deficiencies immediately as detected at no additional cost to the District, including additional verification testing.
4. Compile test report results and submit to Engineer for approval
5. Subsequent to final wire and cable terminations, energize all circuitry and demonstrate functional adequacy in accordance with system requirements.

C. Test Values

1. Compare bolted connection resistance to values of similar connections.
2. Bolt-torque levels should be in accordance with NETA ATS Table 10.12 unless otherwise specified by the manufacturer.

3. Minimum insulation-resistance values should not be less than 50 meg-ohms.
4. Investigate deviations between adjacent phases.

END OF SECTION

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SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01. SUMMARY

- A. This section includes grounding electrodes and conductors; equipment grounding conductors; bonding methods and materials; conduit and equipment supports; anchors and fasteners; sealing and fireproofing of sleeves and openings between conduits and wall.

1.02. REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. The standards referred to, except as modified in the Contract Documents, shall have full force and effect as though printed in these Specifications. These standards are not furnished to the Contactor since manufacturers and trades involved are assumed to be familiar with their requirements. The Contractor shall obtain copies of reference standards direct from publication sources as needed for proper performance and completion of the work.
- B. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
- C. NECA - Standard of Installation.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- E. NFPA 70 - National Electrical Code (NEC). Latest edition.
- F. UL 467 - Electrical Grounding and Bonding Equipment.

1.03. SYSTEM DESCRIPTION

- A. Grounding electrode system consists of the following elements:
 - 1. Metal underground water pipe
 - 2. Metal frame of the building
 - 3. Concrete encased electrode
 - 4. Rod electrodes
 - 5. Service equipment
 - 6. Enclosures
 - 7. Separately derived systems.

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- B. Anchor and fasten electrical products to building elements and finishes as follows:
 - 1. Concrete Structural Elements: Provide preset inserts.
 - 2. Concrete Surfaces: Provide expansion anchors.
 - 3. Interior Structural Steel: Provide appropriate size beam clamps.
 - 4. Solid Masonry Walls: Use expansion anchors and preset inserts.
 - 5. Sheet Metal: Provide sheet metal screws.

1.04. DESIGN REQUIREMENTS

- A. Furnish products listed and classified by Underwriters Laboratories, Inc. (UL), Electrical Testing Laboratories, Inc. (ETL), or other recognized, acceptable testing and listing agencies as suitable for purpose specified and shown.
- B. Grounding shall be in accordance with the National Electrical Code (NEC). Where size, type, rating and quantities indicated or specified are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.
- C. Select materials, sizes, and types of anchors, fasteners, and supports to carry at least twice the loads of equipment and raceway, including weight of wire and cable in raceway.

1.05. CONTRACTOR SUBMITTALS

- A. Product Data: Submit grounding electrodes and connections for fastening components.
- B. Test Report: Measure overall resistance to ground. Provide certified test report for Engineer's Review.

1.06. CLOSEOUT SUBMITTALS

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

1.07. QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' experience.
- B. Installer: A firm with at least five years of successful installation experience on projects with electrical grounding work similar to that required for this project.

1.08. FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01. GROUNDING SYSTEM

- A. Except as otherwise indicated, provide for each electrical grounding indicated, an assembly of materials, including, but not necessarily limited to, cable/wire, connectors,

terminals (solderless lugs), grounding rods/electrodes, bonding jumper braid, and other items and accessories needed for a complete installation. Where more than one type meets indicated requirements, selection is Installer's option. Where materials or components are not otherwise indicated, provide products as recommended by the accessories manufacturers and in compliance with the NEC, and established industry standards.

- B. All grounding materials required shall be furnished new and undamaged in accordance with the following requirements:

2.02. WIRE

- A. Service Equipment Grounding Electrode Conductor: Bare, soft-drawn copper, Class AA stranding, ASTM B 8. Size per the NEC, Article 250, unless otherwise noted.
- B. Electrical Equipment Grounding Conductor: Insulated, soft-drawn copper, Class B stranding or solid, with green-colored polyvinyl chloride insulation, UL 83, sized according to the NEC, unless otherwise noted.

2.03. MECHANICAL CONNECTORS

- A. Description: Bolt-on bronze connectors, suitable for grounding and bonding applications in configurations required for the particular installation.
- B. Manufacturer
 - 1. Burndy Corp.
 - 2. Anderson
 - 3. Thomas & Betts
 - 4. 3-M Co.

2.04. BONDING PLATES, CONNECTIONS, TERMINALS AND CLAMPS

- A. Provide electrical bonding plates, connectors, terminals and clamps, and all accessories as recommended by bonding plate, connector, terminal and clamp manufacturer for indicated applications to obtain a complete system. Components shall be high-strength, high-conductivity copper alloy.

2.05. UFER GROUND

- A. In accordance with the latest edition of the National Electrical Code.

2.06. ROD ELECTRODES

- A. Material: Copper
- B. Diameter: 5/8-inch (16 mm)
- C. Length: 10 feet (3,000 mm)

2.07. GROUNDING WELL COMPONENTS

- A. Well Pipe: 8 inches NPS (DN200) by maximum 12 inches (300-mm) long, concrete or fiberglass pipe with belled end.
- B. Well Cover: Cast iron with legend "GROUND" embossed on cover.

2.08. ANCHORS AND FASTENERS

- A. Materials and Finishes: Corrosion resistant, Heavy-duty expansion type.

2.09. FORMED STEEL CHANNEL

- A. Manufacturers:
 - 1. Unistrut
 - 2. Kindorf
 - 3. Superstrut
 - 4. B-Line
 - 5. Approved Equal
- B. Description: Galvanized steel.

2.10. SEALING AND FIREPROOFING

- A. Fire and Smoke Rated Surfaces:
 - 1. Manufacturers:
 - a. 3M CP 25WB + Caulk
 - b. 3M FS 195 wrap or strip with restricting collar
 - c. 3M CS 195 composite sheets
 - d. Proset Systems fire rated floor and wall penetrations
 - e. Dow Corning Fire Stop System
 - f. Substitutions: Not permitted.
 - 2. Non-Rated Surfaces:
 - a. Use stamped steel, chrome plated, hinged, split ring escutcheons or floor/ceiling plates for covering openings in occupied areas where conduit is exposed.
 - b. In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the conduit and the cored opening or a water-stop type wall sleeve.

- c. At interior wall or floor openings use Tremco Fyre-Sil, Sika Corp. Sikaflex la, Sonneborn Sonolastic NPT, or Mameco Vulkem 116 urethane caulk or approved equal.

3. General:

- a. Furnish UL listed products or products tested by an independent testing laboratory.
- b. Select products with rating not less than rating of wall or floor being penetrated.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify that final backfill and compaction have been completed before driving rod electrodes.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.

3.02. EXISTING WORK

- A. Modify existing grounding system to maintain continuity to accommodate renovations.
- B. Extend existing grounding system using materials and methods as specified.
- C. Install temporary wiring and connections to maintain existing systems in service during construction.
- D. Perform work on energized equipment or circuits with experienced and trained personnel following all safety rules and procedures.
- E. Remove, relocate, and extend existing installations to accommodate new construction.
- F. Repair adjacent construction and finishes that were damaged during demolition and extension work.

3.03. GROUNDING AND BONDING INSTALLATION

- A. Installation:
 - 1. Remove paint, rust, mill-oils, and surface contaminants at connection points.
 - 2. Install grounding electrode conductor and connect to reinforcing steel in slab or foundation.
 - 3. Bond together metal siding not attached to grounded structure; bond to ground.
 - 4. Bond together reinforcing steel and metal accessories.
 - 5. Bond together each metallic raceway, pipe, duct and other metal object entering enclosures and exiting slabs. Install minimum # 12 AWG bare copper conductor.

6. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
7. Connect to site grounding system.
8. Permanently ground power system in accordance with NEC, including service equipment, distribution panels, lighting panel boards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.
9. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes or metal enclosures of service equipment. Ground conduits by means of grounding bushings on terminations at panel boards with installed # 12 AWG conductor to grounding bus.
10. Ground electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC.
11. Permanently attach equipment and grounding conductors prior to energizing equipment.

3.04. GROUND CONDUCTORS

- A. Grounding conductors shall be located and connected as indicated on drawings.
- B. Ground conductors under buildings or structures shall be buried with at least 6 inches of earth cover. Buried grounding conductors extending beyond the foundations of buildings or structures shall have at least 18 inches of earth cover.
- C. Exposed conductors shall be installed inconspicuously in vertical or horizontal positions on supporting structures. When located on irregular supporting surfaces or equipment, the conductors shall run parallel to or normal to dominant surfaces.
- D. Conductors routed over concrete, steel, or equipment surfaces shall be kept in close contact with those surfaces by using fasteners located at intervals not to exceed 3 feet.
- E. Provide a separate equipment-grounding conductor for low voltage distribution systems, single or three phase feeder circuit and each branch circuit with single or three phase protective devices. Install a grounding conductor in conduit with phase and neutral conductors. Single-phase branch circuits for 120 and 277 volt lighting, receptacles, and motors shall have a phase, neutral, and ground conductors installed in the common conduit. Provide suitable bonding jumpers and approved grounding type bushings for flexible conduits used for equipment connection utilized in conjunction with the above branch circuits with. Single-phase circuits for equipment and all branch circuits installed in non-metallic or flexible conduits shall be provided with a separate grounding conductor.
- F. Ground the neutral of transformers of separately derived systems with a bare copper conductor, installed in conduit, from the neutral directly to the building interior cold water pipe or nearest solidly grounded structural reinforcing steel, in accordance with the provisions of NEC Article 250-24. Use bolted accessible connections to the ground system so that the neutral ground can be disconnected for test. Ground the system

ground conduit as detailed on drawing. Size the grounding electrode conductors in accordance with the NEC, Table 250-66, or as indicated.

3.05. CONNECTIONS

- A. All connections shall be made by the exothermic welding process, except where otherwise indicated on the drawings or in these specifications. The manufacturer's instructions on the use of exothermic welding materials shall be followed in all details. All surfaces to be joined by the welds shall be thoroughly cleaned. Paint, scale, and other deleterious substances shall be removed from surfaces of ungalvanized structural steel members by grinding. Galvanized steel surfaces shall be cleaned with emery paper. Powder and molds shall be kept dry and warm until used. Worn or damaged molds shall not be used.
- B. All exothermic welded connections shall successfully resist moderate hammer blows. Any connection which fails such test or which, upon inspection, indicates a porous or deformed weld shall be remade.
- C. All exothermic welds shall encompass 100 percent of the ends of the materials being welded. Welds, which do not meet this requirement, shall be remade.
- D. Worn, damaged, incorrectly sized, or improperly shaped molds which, in the opinion of the Engineer, do not make satisfactory welds, shall be removed from the jobsite after being physically rendered inoperable.
- E. All contact surfaces of bolted and screwed connections shall be thoroughly cleaned and coated with oxide inhibitor before being securely tightened.

3.06. CONDUIT GROUNDING

- A. All grounding bushings within all enclosures, including equipment enclosures, shall be wired together and connected internally to the enclosure grounding lug or grounding bus with a bare copper conductor. Grounding bushings shall be grounded with conductors sized in accordance with NEC, but not smaller than #8 AWG.

3.07. EQUIPMENT GROUNDING

- A. Comply with NEC 250, except where larger sizes or more conductors are indicated.
 - 1. All electrical equipment shall be connected to the grounding system with an insulated, green, stranded or solid copper equipment-grounding conductor.
 - 2. Terminate each end on suitable lug, bus, or bushing. The term "electrical equipment", as used in this article, shall include, but not be limited to, all enclosures containing electrical connections or bare conductors, except that individual devices, such as solenoids, pressure switches, and limit switches, shall be exempt from this requirement, unless the device requires grounding for proper operation.
 - 3. Large equipment, such as metal-clad or metal-enclosed switchgear, will be furnished with a grounding bus that shall be connected to the grounding system.
 - 4. Most other equipment will be furnished with grounding pads and/or grounding lugs which shall be connected to the grounding system. All ground connection surfaces shall be cleaned immediately prior to connection.

5. Contractor shall furnish all grounding material required, but not furnished with the equipment.
- B. Install equipment grounding system such that all metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment and other conductive items in close proximity with electrical circuits will operate continuously at ground potential and provide a low impedance path for possible ground fault currents.
- C. Where grounding system extension stingers are indicated on the drawings to be provided for connection to electrical equipment, the Contractor shall connect the bare grounding conductor to the equipment ground bus, pad, or lug. Except where otherwise indicated on the drawings, all equipment ground conductors that are not an integral part of a cable assembly, shall be sized in accordance with the requirements of NEC. All ground conductors installed in conduit shall be insulated.
- D. Suitable grounding facilities, acceptable to the Engineer, shall be furnished on electrical equipment not so equipped. The grounding facilities shall consist of compression type terminal connectors bolted to the equipment frame or enclosure and providing a minimum of joint resistance.
- E. The conduit system is not considered to be a grounding conductor, except for lighting fixtures. No grounding conductor shall be smaller in size than # 12 AWG, unless it is a part of an acceptable cable assembly.

3.08. GROUND SYSTEM RESISTANCE

- A. All ground resistance measurements shall be made with a three-terminal "Megger" type ground tester which applies alternating current to the electrodes and which gives a reading in direct current ohms. Two reference ground probes shall be used, and all tests shall be made in accordance with the instrument manufacturer's instructions for ground resistance testing. Some of the acceptable instruments are as follows:
 1. Megger Null Balance Earth Tester, James G. Biddle and Company.
 2. Vibroground, Associated Research, Inc.
 3. Ground-Ohmer, Herman H. Sticht Co., Inc.
- B. Submit final certified test reports of all grounding tests.

3.09. ANCHORS, FASTENERS AND SUPPORT

- A. Installation:
 1. Locate and install anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
 2. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
 3. Do not use spring steel clips and clamps.
 4. Do not use powder-actuated anchors.
 5. Do not drill or cut structural members.

- B. Supports:
1. Fabricate supports from structural steel or formed steel members. Rigidly weld members or install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
 2. Install surface-mounted cabinets and panel board with minimum of four anchors.
 3. In wet and damp locations use steel channel supports to stand cabinets and panel boards 1 inch off wall.
 4. Use sheet metal channel to bridge studs above and below cabinets and panel boards recessed in hollow partitions.

3.10. SEALING AND FIREPROOFING

- A. Fire-Rated Surface:
1. Seal opening at floor and wall as follows:
 - a. Opening through a fire rated wall, floor, ceiling or roof, must be sealed.
 - b. Install galvanized sheet metal sleeves (minimum 12-gage) through opening and extending beyond minimum of 1 inch on each side of building element.
 - c. Size sleeve allowing minimum of 1-inch void between sleeve and building element.
 - d. Pack void with backing material.
 - e. Seal ends of sleeve with UL listed fire-resistive silicone compound to meet fire rating of structure penetrated.
 2. Where conduit penetrates fire-rated surface, install fire-stopping product in accordance with manufacturer's published instructions.
- B. Non-Rated Surfaces:
1. Opening through a non-fire rated wall, floor, ceiling or roof must be sealed using an approved type of material.
 2. Use galvanized sheet metal sleeves in hollow wall penetrations to provide a backing for the sealant. Grout area around sleeve in masonry construction.
 3. Install escutcheons or floor/ceiling plates where raceway, penetrates non-fire rated surfaces in occupied spaces.
 4. Install rubber links of mechanical seal tighten in place and sized for the pipe, in exterior wall openings below grade, in accordance with the manufacturer's instructions.
 5. All pipe penetrations at interior partitions and/or walls, laboratory spaces, telephone, data and communication rooms and similar spaces where the room pressure or odor transmission must be controlled, shall be sealed. Sealant shall

be applied to both sides of the penetration in such a manner that the annular space between the pipe sleeve and the pipe is completely filled.

3.11. ACCEPTANCE TESTING

- A. Grounding and Bonding: Perform inspections and tests as outlined below (NETA ATS, Section 7.13 – Grounding Systems).
 - 1. Visual and Mechanical Inspection
 - a. Inspect ground system for compliance with drawings and specifications.
 - b. Electrical Tests (Small Systems)
 - 1) Perform ground-impedance measurements utilizing the fall-of-potential method per ANSI/IEEE Standard 81 “IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potential of a Ground System.” Instrumentation utilized shall be as defined in section 12 of the above guide and shall be specifically designed for ground impedance testing. Provide sufficient spacing so that the plotted curves flatten in the 62% area of the distance between the item under test and the current electrode.
 - c. Electrical Tests (Large Systems)
 - 1) When sufficient spacing of electrodes per Electrical Tests (Small Systems) is impractical, perform ground impedance measurements utilizing either the intersecting curves method or the slope method. (Ref. Nos. 40 and 41 in IEEE Std. 81).
 - d. Equipment Grounds
 - 1) Utilize two-point method of IEEE Std. 81. Measure between equipment ground being tested and known low-impedance grounding electrode or system.
 - 2. Test Values
 - a. The main ground electrode system impedance-to-ground shall be no greater than five (5) ohms for commercial or industrial systems and one (1) ohm or less for generating stations, transmission stations, and large industrial systems. Equipment grounds, depending on size and length of grounding conductor, should be only fractionally higher than system ground.

END OF SECTION

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01. SUMMARY

- A. Section includes conduit and tubing, surface and buried raceways, wireways, outlet boxes, pull boxes, junction boxes, and concrete handholes.

1.02. RELATED SECTIONS

- A. Section 26 05 26 – Grounding and Bonding for Electrical Systems
- B. Section 26 05 43 – Underground Ducts and Raceways for Electrical Systems

1.03. REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
- B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
- C. NECA - "Standard of Installation."
- D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- E. NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- F. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.
- G. NEMA RN 1 - Plastic Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
- H. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.
- I. NEMA TC 6 - Non-Metallic Conduit.
- J. NEMA 250 - Enclosures for Electrical Equipment (1,000 Volts Maximum).
- K. NFPA 70 - National Electrical Code (NEC). Latest approved edition
- L. UL 1 – Flexible Metal Conduit
- M. UL 6 - Rigid Metal Conduit
- N. UL 797 - Electrical Metallic Tubing
- O. UL 651 - Rigid Non-Metallic Conduit

1.04. SYSTEM DESCRIPTION

- A. Raceway, boxes and manholes located as indicated on drawings and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway, boxes and manholes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.
- B. Underground more than 5 feet (1,500 mm) outside foundation wall: Provide thick wall non-metallic conduit.
- C. Underground within 5 feet from foundation wall: Provide rigid steel or thick wall non-metallic conduit as indicated on the drawings.
- D. In or Under Slab on Grade: Provide thick wall non-metallic conduit.
- E. Outdoor Locations, Above Grade: Provide rigid steel conduit. Provide cast metal outlet, pull, and junction boxes.
- F. In Slab above Grade: Provide rigid steel conduit. Provide cast boxes.
- G. Exposed Dry Locations: Provide galvanized rigid steel conduit or intermediate metal conduit. Provide cast boxes.
- H. Concealed Dry Locations: Provide electrical metallic tubing or intermediate metal conduit. Provide cast boxes.
- I. Locations Subject to Corrosive Atmosphere: Provide PVC coated, galvanized rigid steel conduit.

1.05. CONTRACTOR SUBMITTALS

- A. In accordance with Division 1 requirements.
- B. Product Data: Submit for the following:
 - 1. Rigid steel conduit.
 - 2. Electrical metallic tubing.
 - 3. Flexible metal conduit.
 - 4. Liquid tight flexible metal conduit.
 - 5. Nonmetallic conduit.
 - 6. Raceway fittings.
 - 7. Conduit bodies.
 - 8. Surface raceway.
 - 9. Pull boxes, junction boxes and manholes.
- C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06. CLOSEOUT SUBMITTALS

- A. Project Record Documents:
 - 1. Record actual routing of conduits.
 - 2. Record actual locations and mounting heights of outlet, pull boxes, junction boxes and manholes.

1.07. DELIVERY, STORAGE, AND HANDLING

- A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- B. Protect PVC conduit from sunlight.

PART 2 PRODUCTS

2.01. CONDUIT

- A. Galvanized Rigid Steel Conduit (GRSC or RGS), couplings and elbows shall be hot-dip galvanized, rigid mild steel in accordance with ANSI C80.1 and UL 6. The conduit interior and exterior surfaces shall have a continuous zinc coating with a transparent overcoat of enamel, lacquer, or zinc chromate. Conduit shall be formed with continuous welded seams with a uniform wall thickness, in minimum 10-foot lengths, with threaded ends.
- B. Electrical Metallic Tubing (EMT). Electrical metallic tubing, including elbows and bends, shall be zinc coated, mild steel in accordance with the requirements of ANSI C80.3 and UL 797. The interior and exterior surfaces of the tubing shall have a continuous zinc coating. Conduit shall be formed with a continuous welded seam, with a uniform wall thickness, in minimum 10-foot lengths.
- C. Flexible Metal Conduit shall be galvanized steel or aluminum meeting the requirements of UL 1.
- D. Liquid-Tight Flexible Metal Conduit shall be plastic-jacketed, galvanized steel, "Sealtite" Type EF for general service areas or Type HC for high-temperature when used under raised floor or in air plenums. Conduit shall be UL listed.
- E. Non-Metallic Conduit shall be as follows:
 - 1. Schedule 40 or 80: Conduit shall be 90 C, UL 651 listed, composed of polyvinyl chloride conforming to NEMA Standard TC-2.
 - 2. Type EB: Conduit shall be Type EB for concrete encasement, UL listed, conforming to NEMA Standard TC-6.
 - 3. Type DB: Conduit shall be Type DB for direct burial, UL listed, and conform to NEMA Standards TC-6.

4. Spacers used in duct bank installations shall be high impact plastic, interlocking bases, and intermediate type spacers. Place spacers between 7 and 10 feet apart.

2.02. CONDUIT FITTINGS

- A. Couplings and Thread Protectors. Each length of threaded conduit shall be provided complete from the manufacturer with a coupling on one end and a thread protector on the other. The thread protector shall have sufficient mechanical strength to protect the threads during normal handling and storage.
- B. Metal Conduit Fittings. All metal conduit fittings shall conform to the requirements of UL 514B where this standard applies. Galvanized iron or galvanized steel fittings shall be used with steel conduit. Zinc-coated steel fittings shall be used with steel tubing. EMT fittings shall be compression type, UL approved for rain tight applications, T&B 5X2X series, and setscrew type for indoor applications, T&B HT22X series, insulated throat. Threaded fittings shall engage a minimum of five threads made up wrench-tight and be compatible with conduit.
- C. Liquid-Tight Flexible Conduit Fittings. All liquid-tight flexible conduit fittings shall be galvanized steel, T&B 53XX series insulated throat, and shall bear the UL label.
- D. Flexible Metal Conduit Fittings. Flexible metal conduit fittings shall be galvanized steel, T&B Tite-Bite.
- E. Non-Metallic Conduit Fittings. Fitting shall be of same material and strength characteristics as conduit and shall be solvent welded as recommended by manufacturer. Duct to steel adapters shall be provided as required. End bells shall be plastic, high impact, tapered to fit.
- F. Bushings. Bushings shall be provided for the termination of all conduits not terminated in hubs, couplings or insulated throat connectors. Grounding type insulated bushings with insulating inserts in metal housings shall be provided for conduit 1-1/4 inches and larger. Standard bushings shall be galvanized steel or malleable iron in all sizes.
- G. Locknuts. One interior and one exterior locknut shall be provided for all conduit terminations not provided with threaded hubs and couplings. Locknuts shall be designed to securely bond with the conduit to the box when tightened. Locknuts shall be so constructed that they will not be loosened by vibration.
- H. Unions. Watertight conduit unions shall not be used on this project.
- I. Raintight Conduit Hubs. Raintight conduit terminating hubs, where indicated on the drawings or required by these specifications, shall be Myer's rigid conduit hubs, or approved equal.

2.03. CONDUIT SUPPORTS

- A. Conduit supports shall be furnished and installed in accordance with the drawings and these specifications. Conduits shall be supported so that fittings are accessible. Support systems shall be limited to electrical conduits only.
- B. Hanger Rods. Hanger rods shall be 3/8-inch diameter galvanized threaded steel rods, minimum. Conduit racks over 18-inch wide, over one level, or supporting 2-inch GRSC or larger, shall be 1/2-inch diameter rod minimum.

- C. Conduit Clamps. Conduits in single runs or groups of two shall be supported by cast metal clamps and clamp backs. They shall be galvanized malleable iron or approved equal cast ferrous metal for steel conduit or tubing.
- D. Support Channels. Supports for banks of three or more conduits shall be constructed of support channels (Unistrut, Kindorf, Superstrut, B-Line or approved equal) with associated conduit or tubing clips. Support channels shall be steel, hot-dip galvanized after fabrication with galvanized steel clips for steel conduit or tubing.

2.04. OUTLET BOXES AND SWITCH BOXES

- A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.
- B. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported, per NEC requirements.
- C. Interior Outlet Boxes: Unless otherwise noted or shown, provide galvanized flat rolled sheet steel interior outlet wiring boxes of types, shapes and sizes, including box depths, to suit each respective location and installation; construct with stamped knockouts in back and sides, and with threaded screw holes with corrosion-resistant screws for securing box covers and wiring devices.
- D. Outlet boxes used in wet outdoor locations, surface mounted shall be cast metal (FS or FD type) with mounting lugs and gasketed covers.
- E. Interior Outlet Box Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and meeting requirements of individual wiring situations. Choice of accessories is installer's option.

2.05. MANUFACTURERS

- A. Firms regularly engaged in the manufacturing of electrical raceways of the types and capacities required, whose products have been in satisfactory use in similar service for not less than 3 years.

2.06. CLOSURE FOAM

- A. All conduit, raceways, cables and sleeves penetrations through fire rated and hazardous location walls, shafts, floor, ceilings, etc., shall be sealed with a UL-approved fire stopping system.

2.07. PULL BOXES AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, NEMA rating as indicated on drawings.
 - 1. Material: Minimum 16 gage galvanized steel.
 - 2. Cover: Stainless steel hinged cover with neoprene gasket. Cover to be secured to the body with a continuous, full length, piano type hinge and stainless steel pin on one side and captive screw on the other side. Door to be equipped with padlock hasp with sealing hole provisions.

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3. Grounding Lug: Provide #10-32 tapped hole provisions for optional ground lug kit.
 4. Collar Studs: Provide 0.375-16 collar studs for mounting optional panel.
 5. Mounting: Provide external mounting feet for secure wall mounting.
 6. Finish: Wash and phosphate undercoat with ANSI 61 gray polyester power finish.
- B. Surface-Mounted Cast Metal Box: NEMA 250, NEMA rating as indicated on drawings, flat-flanged, surface-mounted junction box:
1. Material: Cast Iron.
 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- C. Concrete pull boxes for buried conduits shall be as specified in Section 26 05 43.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify outlet locations and routing and termination locations of raceway prior to rough in.

3.02. EXISTING WORK

- A. Extend existing raceway and box installations using materials and methods compatible with existing electrical installations, or as specified.
- B. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.03. INSTALLATION OF RACEWAYS

A. Routing

1. Install raceway and boxes in accordance with NECA "Standard of Installation."
2. Conduit routing shown on drawings is diagrammatic only. Contractor shall field route conduit and raceways between equipment and devices as required to obtain a complete wiring system.
3. Except as otherwise specified all conduit shall be installed in exposed runs parallel or perpendicular to dominant surfaces with right-angle turns made of symmetrical bends or fittings.
4. Conduit shall not be installed on the outside face of exposed columns, but shall be routed on the web or on the inside of a flange of the column.
5. Except where prevented by the location of other work, a single conduit or a conduit group shall be centered on structural members.
6. Conduit shall be located at least 6 inches from hot water or steam pipes and from other hot surfaces

- B. Moisture Pockets
1. Moisture pockets shall be eliminated from conduits. If water cannot drain to the natural opening in the conduit system, a hole shall be drilled in the bottom of a pull box or a "C-type" conduit fitting provided in the low point of the conduit run.
- C. Couplings and Unions
1. Metal conduit shall be joined by threaded conduit couplings, with the conduit ends butted. The use of running threads will not be permitted.
 2. Erickson type couplings or similar unions will not be permitted.
- D. Bends and Offsets
1. Changes in direction of conduits shall be made with fittings or bends.
 2. Conduit bends shall meet the requirements of NEC or the bend radius other cable installed, whichever is more limiting, with no exception.
 3. Bends shall be made using appropriate tools or mechanical equipment. The use of a pipe tee or vise for bending conduit or tubing will not be permitted.
 4. For non-metallic conduit or plastic coated steel, approved factory bends and offsets shall be used.
 5. Conduits or tubing deformed or crushed in any way shall be removed from the job site. Install no more than the equivalent of three 90 degree bends between boxes or outlets
- E. Cutting and Threading
1. The plane of all conduit ends shall be square with the centerline.
 2. Where threads are required, they shall be cut and cleaned prior to conduit reaming.
 3. The ends of all conduit and tubing shall be reamed to remove all rough edges and burrs.
 4. Cutting oil shall be used in threading operations; the dies shall be kept sharp, and provisions shall be made for chip clearance.
 5. Threads on conduits and fittings shall be lubricated with conducting and sealing compound
- F. All steel conduit, exposed to weather or in contact with earth, shall be coated after threading with "Zincilate 810", "Zinc Rich" coating or approved equal. The Contractor shall supply this protective material and shall apply it in the field.
- G. Connections to Boxes and Cabinets
1. Conduit shall be securely fastened to all boxes and cabinets.

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2. Threads on metallic conduit shall project through the wall of the box to allow the bushing to butt against the end of the conduit.
 3. The locknuts, both inside and outside, shall then be tightened sufficiently to bond the conduit securely to the box.
 4. Locknuts on EMT box connectors shall be tightened securely to bond the connectors.
- H. All conduits entering enclosures outdoors or in wet areas shall enter through Myer's hubs, or approved equal, or threaded openings.
- I. Cleaning
1. Precautions shall be taken to prevent the accumulation of water, dirt, or concrete in the conduit.
 2. Conduit in which water or other foreign materials have been permitted to accumulate shall be thoroughly cleaned or, where such accumulation cannot be removed, the conduit shall be replaced.
- J. Empty Conduit
1. All conduits installed for future use shall have a pull line.
- K. Rooftop Conduits
1. Provide redwood sleepers on waterproof mastic base for all conduit runs exposed on roofs.
- L. Above 600-Volts
1. Conduits carrying conductors above 600-volts shall be identified with markers at 10 feet intervals indicating the voltage level and feeder designation.
- M. Ground Wire
1. A solid or stranded bare copper or green insulated copper solid or stranded ground wire shall be provided in all conduits and raceways.
- N. Galvanized Rigid Steel Conduit
1. Galvanized rigid steel conduit shall be installed in areas exposed to weather, vehicle traffic, in hazardous classified areas, for penetrations through foundations, and 10 feet before transition from below grade to 8 feet above grade, unless otherwise noted on the drawings.
 2. Conduit in contact with earth shall be protected by "Scotchwrap" 10 mil tape applied in double thickness using 50% lap turns to 6 inches above grade and 6 inches beyond transition.
 3. Expansion joints shall be used where required.
- O. Electrical Metallic Tubing

1. Electrical metallic tubing shall be installed for all circuits, indoors above concrete slab, where not subject to conditions outlined for rigid galvanized steel conduits.

P. Flexible Metal Conduit

1. Flexible conduit inserts not greater than 30 inches in length, shall be installed in all conduit runs, which are supported by both building steel and by structures subject to vibration or thermal expansion. This shall include locations where conduit supported by building steel enters or becomes supported by isolated structures on separate foundations.
2. Flexible conduit shall be installed in conduit runs, which cross expansion joints.
3. Special areas, such as plant office control rooms in which external noise is to be minimized, shall have flexible conduit in conduit runs where the runs cross from the main building framing to the control room or office framing.
4. Flexible conduit shall be installed adjacent to all equipment and devices, which move in relation to the supply conduit due to vibration, normal operation of the mechanism, or thermal expansion.
5. Conduit shall be connected to pressure switches, thermocouples, solenoids, and similar devices with flexible conduit. Flexible conduit shall be installed adjacent to the motor terminal housing for motors requiring 4-inch and smaller conduit.
6. Flexible metal conduit inserts not greater than 6 feet in length shall be installed for light fixture tap conductors.

Q. Liquid-Tight Flexible Metal Conduit

1. Liquid-tight flexible metal conduit shall be used in place of regular flexible conduit for connections to motors and transformers, in areas exposed to weather, moisture or oil, and under raised floors.

R. Non-Metallic Conduit

1. Schedule 40 or 80 shall be used for all power, signal feeders and branch circuits, in earth or enclosed in concrete, unless otherwise noted on the drawings. Conduits must be buried in earth in accordance with the NEC.
2. Type EB. May be used in lieu of Schedule 40 or 80 if encased in concrete.
3. Type DB. May be used in lieu of Schedule 40 or 80 as direct buried.

S. Conduit Support

1. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
2. Fasten conduit supports to building structures and surfaces in accordance with Section 16060.
3. Do not use wire, ceiling support wires or perforated pipe straps to support conduit. Remove any temporary installation support wire.

- T. Spacing of Supports
 - 1. Except where buried in concrete, all conduit runs shall be rigidly supported.
 - 2. Each conduit shall be supported within 1 foot of junction boxes and fittings.
 - 3. Support spacing along conduit runs shall be as follows.

Conduit Size	Maximum Distance Between Supports
½ inch through 1-1/4 inch	5 feet
1-1/2 inch and larger	10 feet

- U. Ground and bond raceway and boxes in accordance with Section 16060.

3.04. CABINET AND BOX INSTALLATION

- A. Install electrical boxes as shown on drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- B. Install electrical boxes to maintain headroom and to present neat mechanical appearance.
- C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only. In inaccessible ceiling areas, install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices with each other.
- E. Use flush mounting outlet boxes in finished areas.
 - 1. Do not install flush mounting boxes back-to-back in walls.
 - 2. Provide minimum 6-inch separation.
 - 3. Provide minimum 24-inch separation in acoustic rated walls.
 - 4. Secure flush mounting box to interior wall and partition studs.
 - 5. Accurately position to allow for surface finish thickness.
 - 6. Use stamped steel bridges to fasten flush mounting outlet box between studs.
 - 7. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
 - 8. Use adjustable steel channel fasteners for hung ceiling outlet box.
- F. Support boxes independently of conduits.

- G. Use code sized gang box where more than one device is mounted together. Do not use sectional box. Use code sized gang box with plaster ring for single device outlets.
- H. Use cast outlet box in exterior locations where exposed to the weather and wet locations (interior or exterior).
- I. Large Pull Boxes - Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.
 - 1. Interior Dry Locations - Use hinged enclosure.
 - 2. Other Locations - Use surface mounted box of appropriate location classification.
- J. Coordinate installation of electrical boxes and fittings with cable and raceway installation work. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- K. Locate boxes and conduit bodies so as to ensure ready accessibility of electrical wiring.
- L. Avoid using round boxes where conduit must enter box through side of box, which would result in difficult and insecure connections where fastened with a locknut or bushing on rounded surface.
- M. Fasten boxes rigidly to substrate or structural surfaces to which they are being mounted, or solidly embed electrical boxes in concrete or masonry as appropriate.
- N. Cabinets and boxes shall be rigidly mounted.
 - 1. Mounting on concrete shall be secured by self-drilling anchors.
 - 2. Mounting on steel shall be by drilled and tapped screw holes, or by special support channels welded to the steel, or by both.
 - 3. Cabinets shall be leveled and fastened to the mounting surface with not less than ¼-inch air space between the enclosure and mounting surface.
 - 4. All mounting holes in the enclosure shall be used.
- O. Except as prevented by the location of other work, all junction boxes and outlet boxes shall be centered on structures.
- P. Conduit openings in boxes shall be made with a hole saw or shall be punched.

3.05. BRACKETS

- A. Bracket supports shall be used where specifically indicated. Other types of hangers acceptable to the District may also be used.

3.06. ANCHORS

- A. Where supports for raceways, boxes, and cabinets are mounted on concrete surfaces, they shall be fastened with self-drilling tubular expansion shell anchors with externally split expansion shells, single-cone expanders, and annular break-off grooved chucking cones. Anchors shall be Phillips "Red Head" or approved equal.

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3.07. ADJUSTING

- A. Install knockout closures in unused openings in boxes.

3.08. CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 26 05 43

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01. SUMMARY

A. This Section includes the following:

1. Ducts in concrete-encased duct banks.
2. Hand-holes and hand-hole accessories.
3. Vaults and vault accessories.

B. Related Sections

1. Section 26 05 26 - Grounding and Bonding for Electrical Systems

1.02. SUBMITTALS

A. Product Data: For the following:

1. Vault and hand hole hardware.
2. Conduit and ducts, including elbows, bell ends, bends, fittings, and solvent cement.
3. Duct-bank materials, including spacers and miscellaneous components.
4. Warning tape.

B. Shop Drawings: Show fabrication and installation details for underground ducts and utility structures and include the following:

1. For vaults:
 - a. Duct sizes and locations of duct entries.
 - b. Reinforcement details.
 - c. Vaults cover design.
 - d. Step details.
 - e. Grounding details.
 - f. Dimensioned locations of cable rack inserts, pulling-in irons, and sumps.
2. For precast vaults and hand holes, Shop Drawings shall be signed and sealed by a qualified professional engineer, and shall show the following:
 - a. Construction of individual segments.

- b. Joint details.
 - c. Design calculations.
- C. Coordination Detailing Activity Drawings: Show duct profiles and coordination with other utilities and underground structures. Include plans and sections drawn to scale, and show all bends and location of expansion fittings. Refer to Division 01 Section, "Coordination and Detailing Activity".
- D. Product Certificates: For concrete and steel used in underground precast vaults, according to ASTM C 858.
- E. Product Test Reports: Indicate compliance of vaults with ASTM C 857 and ASTM C 858, based on factory inspection.

1.03. QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories Including Ducts for Communications and Telephone Service: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Owner's Representative, and marked for intended use.
- B. Comply with ANSI C2.
- C. Comply with California Electric Code (NFPA 70).

1.04. DELIVERY, STORAGE, AND HANDLING

- A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.
- B. Store precast concrete units at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.
- C. Lift and support precast concrete units only at designated lifting or supporting points.

1.05. PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated.
 - 1. Notify the Owner's Representative fourteen days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner Representative's written permission.

1.06. COORDINATION

- A. Coordinate layout and installation of ducts, vaults, and handholes with final arrangement of other utilities and site grading, as determined in the field.
- B. Coordinate elevations of ducts and duct-bank entrances into vaults and handholes with final profiles of conduits as determined by coordination with other utilities and underground obstructions. Revise locations and elevations from those indicated as required to suit

field conditions and to ensure duct runs drain to vaults and handholes, and as approved by the Owner's Representative.

1.07. EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish cable-support stanchions, arms, insulators, and associated fasteners in quantities equal to 5 percent of amount installed.

PART 2 PRODUCTS

2.01. PRODUCTS AND MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Underground Precast Concrete Utility Structures:
 - a. Carder Concrete Products.
 - b. Christy Concrete Products, Inc.
 - c. Elmhurst-Chicago Stone Co.
 - d. Jensen Precast.
 - e. Utility Vault Co.
 - f. Wausau Concrete Co.
 - g. Or equal.
2. Frames and Covers:
 - a. Alhambra Foundry
 - b. Campbell Foundry Co.
 - c. East Jordan Iron Works, Inc.
 - d. McKinley Iron Works, Inc.
 - e. Neenah Foundry Co.
 - f. Or equal.
3. Nonmetallic Ducts and Accessories:
 - a. Arnco Corp.
 - b. Beck Manufacturing Inc.
 - c. Cantex, Inc.

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- d. Certainteed Corp.; Pipe & Plastics Group.
- e. ElecSys, Inc.
- f. Electri-Flex Co.
- g. Lamson & Sessions; Carlon Electrical Products.
- h. Manhattan/CDT/Cole-Flex.
- i. Spiraduct/AFC Cable Systems, Inc.
- j. Or equal.

B. Or Equal: Where products are specified by manufacturers name and accompanied by the term "or equal", comply with provisions in Division 01 Section "Product Requirements", Part 2 "Product Substitutions" Article. Specific procedures must be followed before use of an unnamed product or manufacturer.

2.02. CONDUIT

A. Conduit and fittings are specified in Division 26 Section "Raceways and Boxes for Electrical Systems."

2.03. DUCTS

A. Rigid Nonmetallic Conduit: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by the same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.04. HAND HOLES

A. Precast Handholes: Reinforced concrete, monolithically poured walls and bottom, with steel frame and access door assembly as the top of hand hole. Duct entrances and windows shall be located near corners to facilitate racking. Pulling-in irons and other built-in items shall be installed before pouring concrete. Cover shall have nonskid finish and legend. Unit, when buried, shall be designed to support AASHTO H10 loading for sidewalk and landscaped areas and HS20 for roadways, parking lots and loading docks.

B. Cover Legend:

- 1. "HIGH VOLTAGE"
- 2. "ELECTRIC"
- 3. "TELECOM"
- 4. "FIRE ALARM"
- 5. "CATV"
- 6. Other distinct systems as applicable.

2.05. ACCESSORIES

- A. Duct Spacers: Rigid PVC interlocking spacers, selected to provide minimum duct spacings and cover depths indicated while supporting ducts during concreting and backfilling; produced by the same manufacturer as the ducts.
- B. Handhole Frames and Covers:
 - 1. Comply with AASHTO loading specified for handhole;
 - 2. Traffic-rated, multipiece, bolted checker-steel cover.
- C. Pulling Eyes in Walls: Eyebolt with reinforcing-bar fastening insert 2-inch- diameter eye and 1-by-4-inch bolt.
 - 1. Working Load Embedded in 6-Inch, 4000-psi Concrete: 13,000-lbf minimum tension.
- D. Pulling and Lifting Irons in Floor: 7/8-inch- diameter, hot-dip-galvanized, bent steel rod; stress relieved after forming; and fastened to reinforced rod. Exposed triangular opening.
 - 1. Ultimate Yield Strength: 40,000-lbf shear and 60,000-lbf tension.
- E. Bolting Inserts for Cable Stanchions: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2-inch ID by 2-3/4 inches deep, flared to 1-1/4 inches minimum at base.
 - 1. Tested Ultimate Pullout Strength: 12,000 lbf minimum.
- F. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless-steel expander clip with 1/2-inch bolt, 5300-lbf rated pullout strength, and minimum 6800-lbf rated shear strength.
- G. Cable Stanchions: Hot-rolled, hot-dip-galvanized, T-section steel; 2-1/4-inch size; punched with 14 holes on 1-1/2-inch centers for cable-arm attachment.
- H. Cable Arms: 3/16-inch- thick, hot-rolled, hot-dip-galvanized, steel sheet pressed to channel shape; 12 inches wide by 14 inches long and arranged for secure mounting in horizontal position at any location on cable stanchions.
- I. Cable-Support Insulators: High-glaze, wet-process porcelain arranged for mounting on cable arms.
- J. Grounding Materials: Comply with Division 26 Section "Grounding and Bonding for Electrical Systems."
- K. Duct-Sealing Compound: Non-hardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Capable of withstanding temperature of 300 deg F without slump and of adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.
- L. Warning Tape: Underground-line warning tape specified in Division 26 Section "Identification for Electrical Systems."

2.06. CONSTRUCTION MATERIALS

- A. Seal vault section joints with sealing compound recommended by the vault manufacturer.
- B. Mortar: Comply with ASTM C 270, Type M, except for quantities less than 2.0 cu. ft. where packaged mix complying with ASTM C 387, Type M, may be used.
- C. Concrete: Use 3000-psi- minimum, 28-day compressive strength and 1-inch maximum aggregate size. Concrete and reinforcement are specified in Division 03 Section "Cast-in-Place Concrete." Provide red dye added to concrete during batching for medium voltage as follows:
 - 1. 2.0 lbs. of dye per 94 lb. bag of cement.
 - a. Color: Davis Color No. 1117.

PART 3 EXECUTION

3.01. APPLICATION

- A. Underground Ducts for Electrical Cables Higher than 600 V: Type EPC-40-PVC, concrete-encased duct bank.
- B. Underground Ducts for Communication Circuits: Type EPC-40-PVC, direct-buried duct bank, except use Type EPC-80-PVC when crossing roads.
- C. Vaults: Underground precast concrete utility structures.

3.02. EARTHWORK

- A. Excavation and Backfill: Comply with Division 31 Section "Earthwork" but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- C. Restore all areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary top soiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.
- D. Restore disturbed pavement. Refer to Division 32 Section "Paving Systems."

3.03. CONDUIT AND DUCT INSTALLATION

- A. Exercise care in excavating, trenching, and working near existing utilities. Locate any existing buried utilities before excavating.
- B. Duct bank trench shall be shored, framed and braced for installing ducts. Frames, forms, and braces shall be either wood or steel. Variations in outside dimensions of the installed duct bank shall not exceed 2 inches on the vertical or the horizontal from the design. Remove forms and bracing after 24 hours and before backfilling.
- C. Slope: Pitch ducts a minimum slope of 1:300 down toward vaults and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two vaults

to drain in both directions. Duct banks shall be laid to a minimum grade slope of 4 inches per 100 feet. This slope may be from one vault to the next or both ways from a high point between vaults, depending upon the contour of the finished grade.

- D. Duct banks shall be installed so that the top of the concrete encasement shall be no less than 36 inches below grade or pavement for primary 12K power, and not less 24 inches below finished grade or pavement for communications. As a general rule, depths shall be a minimum of three feet, but not more than six feet.
- E. Curves and Bends: Use manufactured 60 inch minimum elbows for stub-ups at equipment, communication pull boxes or enclosures and at building entrances. Use manufactured long sweep bends with a minimum radius of 25 feet, both horizontally and vertically, at other locations. Manufactured long radius bends may be used in runs of 100 feet or less on approval from the Owner's representative. Vertical feeder sweep into buildings shall be coated steel.
- F. Use solvent-cement joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in the same plane.
- G. Duct Entrances to Vaults and Handholes: Space end bells approximately 10 inches o.c. for 5-inch ducts and vary proportionately for other duct sizes. Change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line. Grout end bells into vault walls from both sides to provide watertight entrances. Where connection to bulkhead of duct bank is made to vaults or existing duct banks, the concrete encasement shall be doweled with on No. 4 reinforcement rod 36 inches long per conduit to the existing encasement.
- H. Building Entrances: Make a transition from underground duct to conduit at least 10 feet outside the building wall. Use fittings manufactured for this purpose. Follow the appropriate installation instructions below:
 - 1. Concrete-Encased Ducts: Install reinforcement in duct banks passing through disturbed earth near buildings and other excavations. Coordinate duct bank with structural design to support duct bank at wall without reducing structural or watertight integrity of building wall.
 - 2. Direct-Buried, Non-encased Ducts at Non-waterproofed Wall Penetrations: Install a Schedule 40, galvanized steel pipe sleeve for each duct. Caulk space between conduit and sleeve with duct-sealing compound on both sides for moisture-tight seal.
 - 3. Waterproofed Wall and Floor Penetrations: Install a watertight entrance-sealing device with sealing gland assembly on the inside. Anchor device into masonry construction with one or more integral flanges. Secure membrane waterproofing to the device to make permanently watertight.
- I. Concrete-Encased, Nonmetallic Ducts: Support ducts on duct spacers, spaced as recommended by manufacturer and coordinated with duct size, duct spacing, and outdoor temperature. Install as follows:
 - 1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts and secure separators to earth and to ducts to prevent floating during concreting. Stagger spacers approximately 6 inches between tiers. Tie entire assembly together using fabric straps; do not use tie wires or

reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

2. Duct joints in concrete may be placed side by side horizontally, but shall be staggered at least 6 inches vertically. Joints shall be made in accordance with manufacturer's recommendations for the particular type of duct and coupling selected. In the absence of specific recommendations, plastic duct connections shall be made by brushing a plastic solvent cement on the inside of a plastic coupling fitting and on the outside of duct's ends. The duct and fitting shall then be slipped together with a quick one-quarter turn to set the joint.
3. Concreting: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Use a plank to direct concrete down sides of bank assembly to trench bottom. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application. Pour each run of envelope between vaults or other terminations in one continuous operation. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing rod dowels extending 18 inches into concrete on both sides of joint near corners of envelope. At connection to vaults, dowel concrete encasement with one No. 4 reinforcing bar 36 inches long per duct.
4. Reinforcement: Reinforce duct banks where they cross disturbed earth and where indicated.
5. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
6. Minimum Clearances between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services, and 4 inches between power and signal ducts.
7. Depth: Install top of duct bank at least 24 inches below finished grade in no traffic areas and at least 30 inches below finished grade in vehicular traffic areas, unless otherwise indicated.

J. Direct-Buried Ducts: Support ducts on duct spacers, spaced as recommended by manufacturer and coordinated with duct size, duct spacing, and outdoor temperature. Install as follows:

1. Separator Installation: Space separators not more than 4 feet center-to-center along entire length of duct bank including top pipes.
2. Install expansion fittings as shown on Shop Drawings.
3. Trench Bottom: Continuous, firm, and uniform support for duct bank. Prepare trench bottoms as specified in Division 31 Section "Earthwork" for pipes less than 6 inches in nominal diameter.
4. Backfill: Install backfill as specified in Division 31 Section "Earthwork." After installing first tier of ducts, backfill and compact. Repeat backfilling after placing each tier. After placing last tier, hand-place backfill to 4 inches over ducts and

hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, complete backfilling normally. Do not place backfill for a period of at least 24 hours after pouring of concrete.

5. Minimum Clearances between Ducts: 3 inches between ducts for like services and 6 inches between power and signal ducts.
 6. Depth: Install top of duct bank at least 36 inches below finished grade, unless otherwise indicated.
- K. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased duct banks. Align tape parallel to and within 3 inches of the centerline of duct bank.
- L. Stub-ups: Use rigid steel conduit for stub-ups to equipment. For equipment mounted on outdoor concrete bases, extend steel conduit a minimum of 5 feet from edge of base. Install insulated grounding bushings on terminations. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches of concrete. Galvanized steel conduits installed below grade shall be painted with two coats of Koppers Bitumastic paint before installing in ground.
- M. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
- N. Pulling Cord: Install 100-lbf- test nylon cord in ducts, including spares.

3.04. VAULT AND HANDHOLE INSTALLATION

- A. Elevation: Install vaults with rooftop at least 15 inches below finished grade. Install handholes with depth as indicated. Where indicated, cast hand hole cover frame directly into roof of hand hole and set roof surface 1 inch above grade. Place and align precast vaults to provide horizontal tolerance of 2 inches in any direction and vertical alignment with not greater than 1/8 inch maximum tolerance for 6 foot of depth. Completed vault shall be rigid, true to dimensions and alignment, and shall be watertight.
- B. Drainage: Install drains in bottom of units where indicated. Coordinate with drainage provisions indicated. Sumps shall be knocked out at time of installation.
- C. Access: Install cast-iron frame and cover.
1. Install precast collars and rings to support frame and cover and to connect cover with roof opening. Provide moisture-tight masonry joints and waterproof grouting for cast-iron frame to chimney.
 2. Set frames in paved areas and traffic ways flush with finished grade. Set other frames 1 inch above finished grade.
- D. Waterproofing: Apply waterproofing to exterior surfaces of units after concrete has cured at least three days. Apply according to Division 07 Section "Cold-Fluid Applied Water Proofing." After ducts have been connected and grouted, and before backfilling, waterproof joints and connections and touch up abrasions and scars. Waterproof exterior of vault and hand hole chimneys after brick mortar has cured at least three days. Seal vault section joints with sealing compound recommended by the vault manufacturer. Penetration into vaults and/or boxes shall be sealed. Provide conduit duct plugs for

unused terminator openings of spare conduits in vault. Do not water seal top removable cover until cable pulling has been completed.

- E. Damp proofing: Apply damp proofing to exterior surfaces of units after concrete has cured at least three days. Apply according to Division 07 Section "Bituminous Damp proofing." After ducts have been connected and grouted, and before backfilling, damp proof joints and connections and touch up abrasions and scars. Damp proof exterior of vault and hand hole chimneys after brick mortar has cured at least three days.
- F. Interior walls and ceiling shall be primed and painted with two coats flat white paint.
- G. Hardware: Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated.
- H. Field-Installed Bolting Anchors: Do not drill deeper than 3-7/8 inches for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.
- I. Grounding: Install ground rod through floor in each structure with top protruding 6 inches above floor. Seal floor opening against water penetration with waterproof nonshrink grout. Ground exposed metal components and hardware with bare-copper ground conductors. Train conductors neatly around corners. Use cable clamps secured with expansion anchors to attach ground conductors.
- J. Precast Concrete Vault Installation: comply with ASTM C 891.
 - 1. Install units level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances.
 - 2. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth. Provide a minimum 6-inch level base of ¾ inch crushed rock under vault to ensure uniform distribution of soil pressure on floor.

3.05. FIELD QUALITY CONTROL

- A. Testing: Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
- B. Grounding: Test vault grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."
- C. Duct Integrity: Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of the duct. If obstructions are indicated, remove obstructions and retest.
- D. Correct installations if possible and retest to demonstrate compliance. Remove and replace defective products and retest.

3.06. CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of vaults, including sump. Remove foreign material.
- C. After the duct line has been completed, a brush with stiff bristles shall be pulled through each duct to make certain that no particles of earth, sand or gravel have been left in the line. (Mandrels not less than 12 inches long, having a diameter approximately 1/4 inch less than inside diameter of the duct, shall be pulled through each duct). Leave a 3/8"-inch minimum polypropylene pull rope in each duct for future use.

END OF SECTION

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SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01. SUMMARY

A. The extent of the electrical systems and equipment requiring identification is shown on the drawings, and the extent of identification required is specified herein and in individual sections of work requiring identification. The types of electrical identification specified in this section include the following:

1. Buried cable warnings.
2. Cable/conductor identification.
3. Operational instructions and warnings.
4. Danger signs.
5. Equipment/system identification signs.

1.02. REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. NFPA 70 National Electrical Code (NEC). Latest approved edition.
- B. APWA ULCC Uniform Color Code for Buried Utilities.
- C. ANSI Z535.1 Safety Color Code.

1.03. System Description:

- A. Identify all electrical equipment as stated below:
1. All transformers shall be identified by 1-inch high block letters cut in stencil and applied with yellow paint on a flat-black background. The transformer number, primary and secondary voltages, and the kVA shall be shown.
 2. All panelboards, distribution or electrical equipment enclosure shall be identified by nameplates. The circuit number, voltage, and phase shall be shown.
 3. Identify by the circuit number shown on the drawings all receptacles and lighting switches by using ¼-inch high white characters on ½-inch wide black stick-on tape placed on the wall directly above the device if the device is wall mounted. Place the tape on the device enclosure if the device is not wall mounted.
 4. All motors, starters, disconnect switches, and control devices shall be identified by circuit number, with ¼-inch high white characters on a ½-inch wide black stick-on tape.
 5. All branch circuits in outlet boxes shall be identified with circuit number using wrap-around labels.

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6. All underground raceway or cable shall be marked with buried warning tape along its entire length.
7. All exposed raceway longer than 10 feet in length shall be identified.
8. Furnish all panelboards with a complete 5-inch by 7-inch typewritten directory mounted in the inner door under a clear plastic cover set in a metal frame.

1.04. SUBMITTALS

- A. Catalog data for nameplates, labels, and markers.
- B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.05. REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70 – National Electrical Code.
- B. Furnish products listed and classified by Underwriters' Laboratories, Inc. (UL), Electrical Testing Laboratories, Inc. (ETL), or other recognized, approved testing and listing agencies as suitable for the purpose specified and shown.

PART 2 PRODUCTS

2.01. NAMEPLATES AND LABELS

- A. Nameplates
 1. Engraved three-layer laminated plastic, white letters on black background for normal power and white letters on red background for emergency power. Communications and control cabinets shall be labeled with white letters on green background.
 2. Locations
 - a. Each electrical distribution and control equipment enclosure.
 - b. Communication cabinets.
 - c. Motor control centers, including each combination module.
 3. Letter Size
 - a. Use 1/8-inch letters for identifying individual equipment and loads.
 - b. Use 1/4-inch letters for identifying grouped equipment, loads, panelboards, and transfer switch.
 - c. Use 1/2-inch letters for identifying the main switchboard, motor control centers, and large distribution switchboards.
- B. Labels

1. Adhesive tape, with 3/16-inch black letters on clear background. Use only for identification of individual wall switches and receptacles, control device stations, and multi-outlet devices.

2.02. WIRE MARKERS

- A. Vinyl or cloth tape, split sleeve or tubing-type preprinted wire markers, self-adhesive.
- B. Manufacturers:
 1. Brady
 2. Thomas & Betts
 3. 3-M Co.
- C. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, control panels, motor controllers and starters, and each load connection.
- D. Legend
 1. Power and Lighting Circuits: Branch circuit or feeder number indicated on contract drawings.
 2. Control Circuits: Control wire number indicated on shop drawings.
 3. Neutral Conductors: Clearly indicate the branch circuit or feeder number the neutral serves. In multi-wire circuits where the neutral is shared, mark the neutral with the circuit number of the "A" phase.

2.03. FASTENERS

- A. Secure all labels and nameplates with self-tapping stainless steel screws. Use contact type permanent adhesive where screws cannot or should not penetrate the substrate.

2.04. BAKED ENAMEL DANGER SIGNS

- A. Provide manufacturer's standard "DANGER" signs of baked enamel finish on 20 gage steel; of standard red, black and white graphics; 14-inch by 10-inch size except where 10-inch by 7-inch is the largest size which can be applied where needed, and except where larger size is needed for adequate vision; with recognized standard explanation wording (e.g. HIGH VOLTAGE, KEEP AWAY, BURIED CABLE, DO NOT TOUCH SWITCH).

2.05. LETTERING AND GRAPHICS

- A. Coordinate names, abbreviations and other designations used in the electrical identification work, with the corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of the electrical systems and equipment.

2.06. UNDERGROUND WARNING TAPE

- A. Three-inch minimum width, 5 mil thickness, foil bonded polyethylene tape, detectable type, with suitable continuous warning legend describing buried electrical lines. Tape color shall conform to APWA uniform color code using ANSI Z535.1 safety colors. Text shall be black, 2-inch minimum letters.

PART 3 EXECUTION

3.01. PREPARATION

- A. Degrease and clean surfaces to receive nameplates and labels.
- B. Coordination: Where identification is to be applied to surfaces that require finish, install identification after completion of painting.
- C. Regulations: Comply with governing regulations and the requests of governing authorities for the identification of electrical work.

3.02. APPLICATION

- A. Install nameplate and label parallel to equipment lines.
- B. Secure nameplate to equipment front using screws, rivets, or adhesive.
- C. Secure nameplate to outside moveable surface of door on panelboard.
- D. Cable/Conductor Identification:
 - 1. Apply cable/conductor identification on each cable and conductor in each box/enclosure/cabinet where the wires of more than one circuit or communication/signal system are present, except where another form of identification (such as color-coded conductors) is provided.
 - 2. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project electrical work.
- E. Operational Identification and Warnings
 - 1. Wherever reasonably required to ensure safe and efficient operation and maintenance of the electrical systems, and electrically connected mechanical systems and general systems and equipment, including the prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices and covers of electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for the intended purposes.
- F. Danger Signs
 - 1. In addition to the installation of danger signs required by governing regulations and authorities, install appropriate danger signs at the locations indicated and at locations subsequently identified by the Installer of electrical work as constituting similar dangers for persons in or about the project.

2. High Voltage: Install danger signs wherever it is possible, under any circumstances, for persons to come into contact with electrical power of voltages higher than 120 volts.
 3. Critical Switches/Controls: Install danger signs on switches and similar controls, regardless of whether concealed or locked up, where untimely or inadvertent operation (by anyone) could result in significant danger to persons, or damage to or loss of property.
- G. Equipment/System Identification Signs
1. Install an engraved plastic-laminate sign on each major unit of electrical equipment in the building; including the central or master unit of each electrical system and the communication/signal systems, unless the unit is specified with its own self-explanatory identification or signal system.
 2. Except as otherwise indicated or specified, provide single line of text, 1/2-inch high lettering on 1-1/2-inch high sign (2-inch high where two lines are required), white lettering in black field.
 3. Provide text matching terminology and numbering of the contract documents and shop drawings.
 4. Provide signs for each unit of the following categories of electrical work
 - a. Major electrical switchboard
 - b. Electrical substation
 - c. Motor control center
 - d. Fire alarm control panel and annunciators.
- H. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrata with fasteners, except use adhesive where fasteners should not or cannot penetrate the substrata.
- I. Identify underground conduits using underground warning tape. Install one tape per trench at 6 inches below finished grade.

END OF SECTION

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SECTION 26 05 73

ELECTRICAL SYSTEMS ANALYSIS

PART 1 GENERAL

1.01. SUMMARY

- A. Section includes electrical systems analysis to result in short circuit, device coordination, and arc flash studies for electrical equipment provided, or modified under this contract.

1.02. REFERENCES

- A. ANSI/IEEE C57.12.00 General Requirements for Liquid-Immersed Distribution, Power and Regulating Transformers.
- B. IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.
- C. IEEE 399 – Recommended Practice for Power Systems Analysis.
- D. NFPA 7DE – Standard for Electrical Safety in the Workplace

1.03. SYSTEM DESCRIPTION

- A. Equipment and component titles used in the studies shall be identical to the equipment and component titles shown on the Drawings.
- B. Perform complete fault and arc flash calculations for each proposed source combination.
- C. Source combination may include utility supply circuits, large motors, or generators.
- D. Utilize proposed load data for the study obtained from Contract Documents.
- E. Existing Equipment:
 - 1. Include fault contribution of existing motors in the study.
 - 2. City will provide files for an existing SKM model of the existing plant system.

1.04. SHORT CIRCUIT STUDY

- A. General:
 - 1. Use cable impedances based on copper conductors.
 - 2. Use bus impedances based on copper bus bars.
 - 3. Use cable and bus resistances calculated on use of typical dimensions of shielded cables with 133 percent insulation levels.
 - 4. Use 600-volt cable reactances based on use of typical dimensions of THHN/THWN conductors. For medium voltage cables, use the dimensions of Type HV-105 cable.

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5. Use transformer impedances 92.5 percent of “nominal” impedance based on tolerances specified in ANSI C57.12.00.
- B. Provide:
1. Calculation methods and assumptions.
 2. Selected base per unit quantities.
 3. One-line diagrams.
 4. Source impedance data, including electric utility system and motor fault contribution characteristics.
 5. Impedance diagrams.
 6. Zero sequence impedance diagrams.
 7. Typical calculation.
 8. Tabulations of calculated quantities.
 9. Results, conclusions, and recommendations.
- C. Calculate short circuit interrupting and momentary (when applicable) duties for an assumed three-phased bolted fault at each:
1. Switchgear bus.
 2. Main disconnect switch.
 3. Low voltage disconnect switches.
 4. Motor control centers.
 5. All branch circuit panelboards.
 6. Other significant locations throughout the system.
 7. Future load contributions as shown on one-line diagram.
- D. Provide bolted line –to-ground fault current study for areas as defined for three-phase bolted fault short circuit study.
- E. Provide bolted line-to-line fault current study for areas as defined for three-phase bolted fault short circuit study.
- F. Verify equipment and protective devices are applied within their ratings.

1.05. PROTECTIVE DEVICE COORDINATION STUDY

- A. Provide protective device coordination time-current curves for distribution system, graphically displayed on conventional log-log curve sheets.

- B. Each curve sheet to have title and one-line diagram that applies to specific portion of system associated with time-current curves on that sheet.
- C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.
- D. Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
- E. Plot characteristics on curve Sheets:
 - 1. Main switchgear (M2).
 - 2. Medium voltage equipment relays.
 - 3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
 - 4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.
 - 5. Pertinent transformer full-load currents at 100 and 600 percent.
 - 6. Transformer magnetizing inrush currents.
 - 7. Transformer damage curves.
 - 8. ANSI transformer withstand parameters.

1.06. ARC FLASH HAZARD ANALYSIS

- A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2004, Annex D.
- B. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.
- C. The Arc-Flash Hazard Analysis shall include all significant location in 240 volt and 208 volt systems fed from transformers equal to or greater than 125 kVA where work could be performed on energized parts.
- D. Safe working distances shall be based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm².
- E. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations.
- F. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for all normal and

emergency operation conditions. The minimum calculation will assume that the utility contribution is at a minimum and will assume a minimum motor contribution (all motors off). Conversely, the maximum calculation will assume a maximum contribution from the utility and will assume the maximum amount of motors to be operating. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable.

- G. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators should be decremented as follows:
 - 1. Fault contribution from induction motors should not be considered beyond 3-5 cycles.
 - 2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g. contributions from permanent magnet generators will typically decay from 10 per unit to 3 per unit after 10 cycles).
- H. For each equipment location with a separately enclosed main device (where there is adequate separation between the line side terminals of the main protective device and the work location), calculations for incident energy and flash protection boundary shall include both the line and load side of the main breaker.
- I. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.
- J. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.
- K. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, maximum clearing time based on the specific location shall be utilized.

1.07. TABULATIONS

- A. General Data:
 - 1. Short circuit reactance's of rotating machines.
 - 2. Cable and conduit material data.
 - 3. Bus data.
 - 4. Transformer data.
 - 5. Circuit resistance and reactance values.
- B. Short Circuit Data:

1. Fault impedances.
2. X to R ratios.
3. Asymmetry factors.
4. Motor contributions.
5. Short circuit kVA.
6. Symmetrical and asymmetrical fault currents.

C. Recommended Protective Device Settings:

1. Circuit Breakers:
 - a. Adjustable pickup.
 - b. Adjustable time-current characteristic.
 - c. Adjustable instantaneous pickup.

1.08. STUDY ANALYSES

A. Written Summary:

1. Scope of studies performed.
2. Explanation of bus and branch numbering system.
3. Prevailing conditions.
4. Noted equipment deficiencies.
5. Results of short circuit, coordination and arc flash studies.
6. Comments or suggestions.

B. Suggest changes and additions to equipment rating and/or characteristics.

C. Provide arc flash labels for new equipment with the following information:

1. Flash hazard boundary.
2. Flash hazard energy (cal/cm^2).
3. PPE category.
4. Limited approach distance.
5. Restricted approach distance.
6. Prohibited approach distance.

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- D. Notify ENGINEER in writing of existing circuit protective devices improperly rated for new fault conditions.

1.09. SUBMITTALS

- A. Shop Drawings: Provide five copies of study in hard cover, three-ring binders, to include:
 - 1. Short circuit study.
 - 2. Protective Device Coordination Study: Submit within 90 days after approval of the short circuit study.
 - 3. Arc Flash study.

1.10. QUALITY ASSURANCE

- A. Short circuit and protective device coordination studies shall be prepared by the manufacturer furnishing the equipment for incoming service in accordance with IEEE 242 and IEEE 399.

1.11. SEQUENCING AND SCHEDULING

- A. The short circuit and protective device coordination studies shall be completed prior to Project Substantial Completion. Utilize characteristics of as-installed equipment and materials.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.01. GENERAL

- A. Adjust relay and protective device settings according to values established by coordination study.
- B. Make minor modifications to equipment as required to accomplish conformance with the short circuit and protective device coordination studies.
- C. Apply arc flash labels to equipment as required by California Electrical Code Article 110-16, and NFPA 70E.
- D. Notify ENGINEER in writing of existing circuit protective devices improperly rated for new fault conditions.

END OF SECTION

SECTION 26 13 26

MEDIUM VOLTAGE METAL-CLAD SWITCHGEAR

PART 1 GENERAL

1.01. SUMMARY

- A. This section includes medium voltage metal-clad circuit breaker switchgear, 125VDC subsystem, and associated auxiliary equipment. The equipment shall consist of Single Aisle, Non-Arc Vented switchgear with horizontal draw-out type vacuum circuit breakers.

1.02. RELATED SECTIONS

- A. Section 13 34 23 – Prefabricated Structures
- B. Section 26 33 00 – 125 VDC System

1.03. REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. ANSI C37.20.2 - Standard for Metal-Clad Switchgear.
- B. ANSI C37.04 - Standard Rating Structure for AC High Voltage Circuit Breakers
- C. ANSI C37.06 - AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis – Preferred Ratings and Related Required Capabilities
- D. ANSI C37.90 - Relays and Relay Systems associated with Electric Power Apparatus
- E. ANSI C37.20.7 - Guide for Testing Medium Voltage Metal-Enclosed Switchgear for Internal Arcing Faults
- F. NFPA 70 - National Electric Code

1.04. CONTRACTOR SUBMITTALS

- A. Submit shop drawings and product data for approval and final documentation. The submittal package shall be complete in all respects for submittal to, and approval by, Pacific Gas and Electric.
- B. Documents for Approval:
 - 1. General arrangement drawing showing dimensioned elevation and floor plan, side views, foundation details and one-line diagram
 - 2. Equipment outline dimensions and detail drawings
 - 3. Panel arrangement drawing showing layout of devices on the panel doors
 - 4. Three line diagrams
 - 5. Schematics

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6. Bill of material
 7. Nameplate engraving drawings
 8. Battery and charger sizing calculations and information on maximum available battery short circuit current
 9. Battery disconnect switch voltage, current, short circuit withstand rating and details
 10. Battery and charger weight
 11. Material safety data sheet for battery electrolyte
 12. Documentation showing the battery is designed for 20-year life.
 13. Seismic bracing recommendations of battery rack and charger
 14. Installation, Operation and Maintenance Manuals
- C. Final Documents: Record documentation to include:
1. Wiring diagrams
 2. Recommended spare parts list
 3. Instruction manual
 4. Certified inspection and test reports
- D. Product Data:
1. Include features, characteristics, and ratings of individual circuit breakers and other components.
- E. Shop Drawings:
1. Detail equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, and location and size of each field connection.
 2. Nameplate legends.
 3. Bus configuration with size and number of conductors in each bus run, including phase, neutral, and ground conductors of main and branch buses.
 4. Current ratings of buses.
 5. Short-time and short-circuit ratings of switchgear assembly.
 6. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

1.05. MANUFACTURER QUALIFICATIONS

- A. Firm with at least 5 years experience in manufacturing switchgear. The manufacturer of the switchgear assembly shall also manufacture the medium voltage circuit breakers.

1.06. DELIVERY, STORAGE, AND HANDLING

- A. Deliver in convenient shipping groups. Shipping groups shall not exceed 8 ft. in length.
- B. Circuit breakers shall be shipped inside their respective cells.
- C. Shipping split connection material (e.g., busbars, splice bars, hardware, insulation boots) shall be secured in the unit in which they will be installed, for convenience during installation.

PART 2 PRODUCTS

2.01. MANUFACTURERS

- A. The metal – clad switchgear assembly shall be manufactured by:
1. ABB
 2. Eaton
 3. Siemens
 4. Square D Co.
 5. Approved equal.

2.02. RATINGS

- A. System Configuration: Switchgear suitable for application in three-phase, 60-Hz, ungrounded system.
- B. Circuit breaker and switchgear ratings shall be based on “constant kA” ratings and ANSI/IEEE C37.04-1999.
- C. Electrical Ratings:
1. Nominal System Voltage, kV: 12.47
 2. Maximum Design Voltage, kV: 15
 3. BIL Impulse Level, kV: 95
 4. Nominal Interrupting Capacity –500MVA class, 18kA @ 15.0kV
 5. Main-Bus Continuous: 1200 Amps.
 6. Circuit Breaker interrupting Time: 5 cycles maximum

7. Voltage range factor (K): 1.0
8. Momentary withstand and closing and latching current: 39 kA rms and 65 kA peak.

2.03. SWITCHGEAR CONSTRUCTION

- A. The switchgear enclosure shall be of metal-clad construction as described in ANSI standards.
- B. The switchgear shall be factory assembled into convenient shipping groups and tested, and of a coordinated design so that shipping groups are easily connected together at the site into a continuous line-up. Necessary connecting materials shall be furnished.
- C. The switchgear assembly shall consist of one or more vertical sections, each of which shall have as appropriate for the application:
 1. Main bus compartment
 2. Primary connection compartment housing cable / bus duct connections, current transformers and surge protection equipment
 3. Primary circuit breaker compartment
 4. Auxiliary compartment housing voltage and control power transformers.
 5. Low voltage compartment housing relays, instruments and other low voltage equipment, as indicated in the detailed specification. The low voltage compartment shall be mounted on the equipment compartment and shall be of modular construction, capable of being field-mounted if necessary.
- D. Each main bus compartment shall contain copper bus bars (silver plated at electrical connection points) 3 phase, 3– wire, fully insulated epoxy powder coating (sleeve type insulation is not permitted), with joints covered with preformed PVC boots held together with nylon hardware for easy installation and removal during servicing. Taped joints are not permitted except in unusual joint configurations. The ground bus shall be silver-plated copper; in minimum size of 1/4 by 2 inches and shall extend full length of switchgear.
- E. Each circuit breaker compartment shall include:
 1. Hinged front door, interlocked with the breaker to prevent racking unless the door is closed. The door may not be opened until the breaker is in the disconnected position.
 2. Primary and secondary disconnecting devices
 3. Secondary disconnects. The secondary connections shall engage automatically during the racking operation when the breaker is moved from the disconnect position to test position. Secondary disconnects using plug and socket arrangement with an umbilical cord is not permitted. Also, no manual intervention to make the secondary connections shall be permitted.
 4. Mechanical position indication shall be visible with door closed.

5. Circuit breaker driven automatic shutters. Shutters shall be independently operated and shall have provisions for installation of padlocks on each shutter to prevent inadvertent opening.
6. Safety interlocks.
7. The racking mechanism of the circuit breaker shall be integral with the circuit breaker to minimize alignment problems and facilitate inspection and maintenance. Racking mechanisms installed directly in the switchgear structure, or which permit exposure to primary conductors during maintenance is not acceptable.
8. Each auxiliary compartment shall include the following:
 - a. A separate compartment front panel for each draw out position.
 - b. Necessary terminal blocks, control wiring, blocks, and buses
 - c. VT, CPT or fuse rollouts, if needed
9. Secondary compartment shall include:
 - a. Hinged front door
 - b. Necessary terminal blocks, control wiring, blocks, and buses
 - c. Engraved unit nameplate.
 - d. Primary cable compartment shall be accessible from the rear of the switchgear.
10. The framework and panels shall either be galvanized or shall be chemically cleaned, hot phosphate treated, rinsed and oven-dried and given an electrostatically applied coat of ANSI 61 polyester urethane paint. The paint shall withstand 600 hours of salt spray.
11. The indoor enclosure shall be constructed of bolted sheet steel material.

2.04. SWITCHGEAR DESIGN FEATURES

- A. Seismic Capability: The switchgear shall be capable of maintaining structural integrity as applicable for the specified UBC zone.
- B. The switchgear shall meet the requirements of Pacific Gas and Electric, as communicated in the Electric and Gas Service Requirements, also known as the "Green Book".

2.05. COMPONENTS

- A. Instrument Transformers: Comply with IEEE C57.13.
- B. Potential Transformers: Secondary voltage rating of 120 V and accuracy class of 0.3 with burdens of W, X, and Y.

- C. Current Transformers: Ratios as indicated; burden and accuracy class suitable for connected digital relays, meters, and instruments.
- D. Multifunction Protective Relaying: Microprocessor-based 3-phase relays shall be UL listed or UL recognized. Protective relays shall be provided as follows:
 - 1. The main utility breaker relays shall be Schweitzer Engineering Laboratory (SEL) model 700G. Provide primary and backup relays per Pacific Gas & Electric requirements.
 - 2. The generator relay relays shall be Schweitzer Engineering Laboratory (SEL) model 700G.
 - 3. The distribution breaker relays shall be Schweitzer Engineering Laboratory (SEL) model 751.
- E. AC control power shall be furnished from internal control power transformers. An automatic transfer switch, located in a switchgear auxiliary compartment, shall select between the energized sources. The load terminals will be connected to external panelboard.
- F. DC Control Power Subsystem
 - 1. DC control power shall be provided by a 125VDC battery system mounted external from the switchgear as specified below. The battery system shall be sized to carry the switchgear continuous load for 8hr after loss of charger output, and in addition, shall be capable of tripping and closing all of the medium voltage circuit breakers twice at the end of the period. For purposes of this requirement, all of the medium voltage circuit breakers will be operated simultaneously.
 - 2. Battery: Lead-calcium type in sealed, clear plastic or glass containers, complete with electrolyte, fully charged, and arranged for shipment with electrolyte in cells. Each container weighs not more than 70 lb (32 kg) and contains not more than three cells. Batteries are suitable for service at an ambient temperature ranging from minus 18 to 40 deg C. BAE Secura OPzS.
 - 3. Rack: Provide a two-step rack that fits available space indicated. Batteries shall be provided with necessary electrical connections between cells and between rows of cells and include two flexible connectors with bolted-type terminals for output leads. BAE AR1-2T1R-CFC2B00-060.
 - 4. Accessories: Include the following:
 - a. Thermometers with specific-gravity correction scales.
 - b. Hydrometer syringes.
 - c. Wall-mounted, nonmetallic storage rack fitted to store above items.
 - d. Set of cell numerals.
 - 5. Charger: LaMarche TPSD. Static-type silicon rectifier equipped with automatic regulation and provision for manual and automatic adjustment of the charging rate. Unit automatically maintains output voltage within 0.5 percent from no load to rated charger output current, with ac input-voltage variation of plus or minus 10

percent and input-frequency variation of plus or minus 3 Hz. Other features of charger include the following:

- a. DC ammeter.
 - b. DC Voltmeter: Maximum error of 5 percent at full-charge voltage; operates with toggle switch to select between battery and charger voltages.
 - c. Ground Indication: Two appropriately labeled lights to indicate circuit ground, connected in series between negative and positive terminals, with midpoint junction connected to ground by normally open push-button contact.
 - d. Alarms for Loss of AC, Low Battery and Ground.
 - e. Capacity: Sufficient to supply steady load, float-charge battery between 2.20 and 2.25 V per cell, and equalizing charge at 2.33 V per cell.
 - f. Charging-Rate Switch: Manually operated switch provides for transferring to higher charging rate. Charger operates automatically after switch operation until manually reset.
 - g. AC power supply is 120 V, 60 Hz, subject to plus or minus 10 percent variation in voltage and plus or minus 3-Hz variation in frequency. After loss of ac power supply for any interval, charger automatically resumes charging battery. Charger regulates rate of charge to prevent damage due to overload and to prevent fuses or circuit breakers from opening.
 - h. Protective Feature: Current-limiting device or circuit, which limits output current to rating of charger but does not disconnect charger from either battery or ac supply; to protect charger from damage due to overload, including short circuit on output terminals.
 - i. Electrical Filtering: Reduces charger's audible noise to less than 26 dB.
- G. Control Wiring: Factory installed, complete with bundling, tytraps, and protection where necessary, and complying with the following:
1. Flexible conductors of No. 14 AWG for wires across hinges, control and CT and VT circuits and for interconnections between shipping units.
 2. Conductors sized according to NEC/NFPA 70, National Electrical Code for the duty required.

2.06. VACUUM CIRCUIT BREAKERS

- A. Vacuum Circuit Breakers: Circuit breakers shall be horizontal draw-out vacuum type. The circuit breakers shall employ a motor charged spring stored-energy operating mechanism to provide high speed closing and opening of the contacts. The closing springs shall be normally charged by the motor, but shall be able to be charged manually for maintenance or when needed. The circuit breaker shall include the following features:
- B. Circuit-Breaker Design: The vacuum interrupters shall be mounted in individual pole units, replaceable as a unit.

- C. Contact-Wear Indicator: Readily accessible to field maintenance personnel.
- D. Spare Auxiliary Contacts: Four minimum. Additional contacts shall be provided on the cell wall as specified.
- E. Operating Mechanism: Electrically charged, stored-energy operated.
- F. Closing Speed of Moving Contacts: Independent of both control and operator.
- G. Design of Mechanism: Permits manual charging of mechanism
 - 1. Spring charging: 125Vdc
 - 2. Closing: 125Vdc
 - 3. Tripping: 125Vdc
- H. The operating mechanism shall be located on the front of the circuit breaker, easily accessible for inspection or maintenance. It shall not be necessary to elevate the circuit breaker or tip the circuit breaker on its side in order to inspect or maintain the operating mechanism.
- I. A single visual check, requiring no special tools, shall be sufficient to verify both spring pressure and contact wear. This simple visual indicator shall be identical across all breaker ratings. Confusing maintenance procedures such as separate contact erosion and wipe measurements or designs, which require special gauges or tools, will not be permitted.
- J. Circuit-Breaker Tripping Provisions: Shunt tripping coil for tripping with protective or lockout relays or control switch or manual command signal from the relay. Also, manual tripping by means of mechanical push button on the breaker shall be provided.
- K. Circuit Breaker Closing Provisions: Closing coil for closing by electrical signal from circuitry or control switch or manual command signal from the relay. Also, manual closing by means of mechanical push button on the breaker shall be provided.
- L. The current transfer path from the interrupter moving stem to the breaker primary conductors shall not use brush, roller or wiping contacts or other forms involving moving parts. Only permanently bolted or permanently bonded current transfer path such as flexible copper laminations with long mechanical life will be permitted.
- M. Circuit breaker racking mechanism shall be an integral part of the breaker instead of the cell in order to avoid alignment problems.
- N. It shall be possible to test the breaker in the "Test" position inside the cell without the use of additional cables or couplers.
- O. Vacuum interrupters and circuit breaker shall be manufactured by the same manufacturer.
- P. Vacuum interrupter selected shall limit the chopping currents to below 5 amperes to obviate the need for surge protection against switching transients except for load devices with less than full BIL insulation (e.g., dry type transformers, motors, reactors).

- Q. In order to minimize the spare breaker inventory, design shall prevent lower rated breakers from being installed in higher rated cells but shall allow higher rated breakers to be installed in lower rated cells.

2.07. ACCESSORIES

- A. Provide a cabinet for storage of small accessories for the switchgear as required.
1. Circuit breaker racking tool
 2. Circuit breaker compartment door tool
 3. Circuit breaker manual spring charging tool
 4. Manual circuit breaker trip & close tool
 5. Relay and meter test plugs for draw-out devices that accept test plugs.
- B. Supply one breaker dolly. Breaker dolly is to be stored inside the circuit breaker compartment.
- C. Spare Fuses: Six, of each type and rating of control circuit fuse used. Include spares for potential transformer fuses, and control power fuses.
- D. Electric racking control cable and control devices for use when electric racking breakers are specified.

2.08. IDENTIFICATION

- A. Storage for Manual: Include a rack or holder for the switchgear instruction manual and the switchgear arrangement drawing.
- B. Provide taped mimic bus on each switchgear section.

PART 3 EXECUTION

3.01. INSTALLATION

- A. General:
1. Install metal-clad switchgear in accordance with manufacturer's written instructions.
 2. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, brackets, and temporary blocking of moving parts from switchgear units and components.
- B. Connections
1. Connect switchgear ground bus to common building ground indicated on Drawings.
 2. Tighten bus joint, connector, and terminal bolts according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

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- C. Adjusting
 - 1. Protective-Relay Settings: Verify that settings shown in the Coordination Study are appropriate for final system configuration and parameters. Where discrepancies are found, recommend final relay settings for approval before making final adjustments.
- D. Cleaning
 - 1. Inspect interior and exterior of installed switchgear. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.
- E. Protection
 - 1. Temporary Heating: Apply temporary heat to switchgear, according to manufacturer's written recommendations, throughout periods when switchgear environment is not controlled for temperature and humidity within manufacturer's stipulated service conditions.
- F. Demonstration
 - 1. Provide a factory-authorized service representative to train District's maintenance personnel in the following:
 - a. In procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
 - b. Review data in the maintenance manuals.
 - 2. Schedule training with District with at least fourteen (14) days' advance notice.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 GENERAL

1.01. SUMMARY

- A. Section Includes lighting and appliance branch-circuit panelboards.

1.02. ACTION SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

- B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

1.03. CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.04. MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.

1.05. QUALITY ASSURANCE

- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.

1.06. PROJECT CONDITIONS

- A. Environmental Limitations:
 - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Owner no fewer than five days in advance of proposed interruption of electric service.
 - 2. Do not proceed with interruption of electric service without Owner's written permission.
 - 3. Comply with NFPA 70E.

1.07. COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 PRODUCTS

2.01. GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Enclosures: Surface-mounted cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

3. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Same finish as panels and trim.
4. Directory Card: Inside panelboard door, mounted in transparent card holder.

B. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

C. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Compression type.
3. Ground Lugs and Bus-Configured Terminators: Compression type.

D. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

E. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.02. LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- B. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- C. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.03. DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- B. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02. INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- C. Mount panelboard cabinet plumb and rigid without distortion of box.
- D. Install overcurrent protective devices and controllers not already factory installed.
- E. Install filler plates in unused spaces.
- F. Comply with NECA 1.

3.03. IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 26 05 53.
- B. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53.

3.04. ADJUSTING

- A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.01. SECTION INCLUDES

A. Wiring devices are defined as single discrete units of electrical distribution systems that are intended to carry but not utilize electric energy. The types of general purpose wiring devices required for the project include, but are not limited to the following line voltage devices:

1. Connectors
2. Plugs
3. Receptacles
4. Switches
5. Wall plates

1.02. RELATED SECTIONS

- A. Section 260500 - Common Work Results for Electrical
- B. Section 262726 - Identification for Electrical Systems

1.03. REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. IEC 529 - Degrees of Protection provided by Enclosures.
- B. NEMA WD 1 - General Purpose Wiring Devices
- C. NEMA WD 6 - Wiring Device Configurations.

1.04. CONTRACTOR SUBMITTALS

- A. Product Data:
 1. Catalog cut of each device showing Manufacturer name, catalog number, voltage and current rating and dimensions.

1.05. REGULATORY REQUIREMENTS

- A. Furnish products listed and classified by UL, ETL, or other recognized, acceptable testing and listing agencies as suitable for the purpose specified and shown.

PART 2 PRODUCTS

2.01. GENERAL

- A. Provide factory fabricated wiring devices in the type, color, electrical rating for service indicated, and/or as shown on the drawings.

2.02. MANUFACTURERS

- A. Provide products produced by one of the following for each type of wiring device:

1. Appleton
2. Arrow-Hart, Inc.
3. Bryant Electric Co.
4. Crouse-Hinds Co.
5. General Electric Co.
6. Hubbell Wiring Device Division
7. Pass & Seymour
8. Pyle National
9. Russell & Stoll
10. Slater
11. Wiremold (multi-outlet assemblies)
12. Or Approved Equal

2.03. WALL SWITCHES

- A. Provide specification grade, quiet type, flush, 1-pole, 2-pole, three and four-way toggle switches, 20 ampere, 120/277-volts AC, with mounting yoke insulated from mechanism equipped with plaster ears and side wired screw terminals, white plastic body with Decora rocker style action.

1. Device Number: #5621-2W, #5622-2W, #5623-2W, #5624-2W
2. Manufacturers: Leviton (or equal by Hubbell, Pass & Seymour, Cooper)

2.04. RECEPTACLES

- A. Provide specification grade, grounding type, heavy-duty, Decora receptacles with white plastic body, green hexagonal equipment ground screw terminal and grounding poles internally connected to mounting yoke; metal plaster ears; side wiring as follows:

1. Duplex Receptacle: Two pole, 3 wire, 20-ampere, 125-volt duplex receptacle, NEMA configuration 5-20R unless otherwise indicated. Leviton #5362-W (or equal by Hubbell, Pass & Seymour, Cooper).

2. GFCI Receptacle: Two pole, 3 wire, 20-ampere, 125-volt duplex receptacle with integral ground fault circuit interrupter to meet regulatory requirements. Leviton #T7899-W (or equal by Hubbell, Pass & Seymour, Cooper)
3. Special Purpose: Two pole, 3 wire, 20-ampere, 125-volt single receptacle, twist-lock, NEMA configuration L5-20R as indicated.
4. Special Purpose Receptacle: Type as required meeting the requirements of this Section and the equipment shown on the drawings and elsewhere specified.

2.05. PLUGS AND CONNECTORS

- A. Comply with NEMA Standards Publication No. WD-1. Provide 20 ampere, 125-volts, bakelite body connectors, 3-wire grounding, parallel blades, double wipe contact, with cord clamp.
- B. Matching Insulgrip, corrosion resistant nylon plugs, IP20, shall be provided for each twist-lock type receptacles unless indicated otherwise.
- C. Manufacturers: Hubbell, Pass & Seymour, Bryant, or Approved Equal.

2.06. WALL PLATES

- A. Decorative Cover Plate: High impact, smooth nylon and smooth satin in finished areas. Color of nylon cover plate shall be ivory unless noted otherwise. Stainless steel cover plate in unfinished areas or where device is embedded in concrete.
- B. For areas where two separate power sources are provided, each power source receptacle shall have a different color cover plate such as black, gray, or brown. Emergency power source receptacles shall have a red cover plate.
- C. Weatherproof Cover Plate: Gasketed cast metal with hinged gasketed device cover. Cover for duplex devices shall be designed such that each device is independently covered.

2.07. HAZARDOUS RATED AREAS

- A. Switches, receptacles and other devices installed in hazardous areas shall be explosion-proof type in accordance with NFPA 70 and as shown on drawings.

PART 3 EXECUTION

3.01. EXAMINATION

- A. Verify outlet boxes are installed at proper height.
- B. Verify wall openings are neatly cut and will be completely covered by wall plates.
- C. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- D. Inspect each item of materials or equipment immediately prior to installation, and reject damaged and defective items.

3.02. PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface, if necessary.

- B. Clean debris from all boxes.

3.03. INSTALLATION

- A. Install wiring devices where indicated, in accordance with the manufacturer's written instructions, the applicable requirements of the NEC and the NECA "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve the intended function.
- B. Comply with the manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in the contract documents.
 - 1. Install devices plumb and level. Install switches with OFF position down
 - 2. Install vertically oriented grounded receptacles with grounding pole on top
 - 3. Connect wiring device grounding terminal to equipment grounding conductor.
 - 4. Connect isolated ground (IG) receptacle equipment (yoke) grounding terminal only at metallic box with bonding jumper
 - 5. Install decorative plates on switch, receptacle, and blank outlets in finished areas
 - 6. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets in utility areas. (Does not include multi-outlet assemblies, other similar locations.).
 - 7. Identify wiring devices as specified in Section 262726.

3.04. INTERFACE WITH OTHER PRODUCTS

- A. Coordinate locations of outlet boxes to obtain mounting heights compliant with ADA. See drawings for specific mounting heights

3.05. FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.
- F. Verify that each telephone and data jack is properly connected and circuit is operational.

3.06. ADJUSTING

- A. Adjust devices and wall plates to be flush, plumb and level.

END OF SECTION

SECTION 26 51 00

LIGHTING

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Interior lighting fixtures, hangars, trim and diffusers.
- B. Exterior lighting fixtures and poles.
- C. Supports, suspension systems, and blocking.

1.02. REFERENCES

- A. ANSI/NFPA 101 - Life Safety Code.
- B. International Electrotechnical Commission (IEC)
 - 1. IEC 801-2 Electrostatic Discharge Testing Standard.
 - 2. IEC/EN 60669-2-1 Switches for household and similar fixed electrical installations - electronic switches.
- C. Illuminating Engineering Society of North America (IESNA)
 - 1. LM-79 – Electrical and Photometric Measurements of Solid State Lighting Products.
 - 2. LM-80 – Measuring Lumen Maintenance of LED Light Sources.
- D. National Electrical Manufacturer's Association (NEMA) SSL-1 – Electronic Drivers for LED Devices, Arrays, or Systems.
- E. Underwriters Laboratories, Inc. (UL) 8750 – Light Emitting Diode (LED) Light Sources for Use in Lighting Products

1.03. SUBMITTALS

- A. Product Data
 - 1. Light fixtures.

1.04. EXTRA MATERIALS

- A. LED Fixtures
 - 1. Provide 5 percent or two, whichever is greater, of each complete interior LED fixture type for Owner stock for future replacement.
 - 2. Provide one of each complete exterior LED wall or pole mount fixture for Owner stock for future replacement.

1.05. WARRANTY

- A. Fixtures and ballasts shall have a minimum five year warranty.

PART 2 PRODUCTS

2.01. LIGHT FIXTURES – GENERAL

- A. Provide lighting fixtures and accessories complete and ready for operation. Furnish the fixtures as indicated on the Drawings and as listed in the fixture schedule. Verify in all cases, the lengths and quantity of fixtures necessary to achieve the indicated results.
- B. All lighting fixtures shall have published photometric tests conducted by Electrical Testing Laboratories. Make available the test results upon request. Testing shall include candlepower distribution curves, total fixture efficiency, brightness and shielding angles in longitudinal and transverse directions.
- C. Provide lighting fixtures in the finishes and colors as noted on the Drawings.
- D. Provide the UL and IBEW labels on all lighting fixtures.
- E. Observe the requirements of the CBC Section 2606 regarding plastic lighting diffusers. Fixtures and auxiliary equipment mounted against combustible material shall be approved for such installation.
- F. Make-up fixtures with Type AF or equal fixture wire. Provide an identified, approved landing lug for equipment ground wires.

2.02. LED LIGHT FIXTURES

A. General

- 1. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.
- 2. LED light fixtures shall be a factory assembled luminaire including all required driver and light engine modules integral to and within a single housing. Lead lengths between driver and light engine shall not exceed 3 feet. Remote luminaire/driver installations are not acceptable.
- 3. LED light fixtures shall be Reduction of Hazardous Substances (RoHS) compliant.

B. LED Driver Modules

- 1. Description: Universal voltage switching-mode LED driver module with a rated lifetime of not less than 50,000 hours when operated at an ambient temperature of less than 60-degrees C.
- 2. LED drivers shall include native 0-10V dimming capabilities without additional control devices or field-installed circuitry. Integral short-circuit, open-circuit and overload fault protection to prevent driver failure.

3. LED drivers shall be capable of producing adequate output current to produce the specified light levels. Compatibility of driver and LED light engine must be tested and ensured by driver manufacturer.
4. Minimum efficiency: 85% at full load.
5. Minimum Operating Ambient Temperature: -20° C (-4° F).
6. Input Voltage: 120V to 277V (±10%) AC at 60Hz. Drivers that require DC input shall include an integral converter that accepts standard line voltage AC.
7. Power Factor: ≥ 0.95.
8. Total Harmonic Distortion: ≤ 20% and meet ANSI C82.11 maximum allowable THD requirements
9. Designed and tested to withstand electrostatic discharges up to 15,000 V without impairment per IEC 801-2.
10. Electrolytic capacitors to operate at least 20 degrees C below the capacitor's maximum temperature rating when the driver is under fully-loaded conditions and case temperature is 62 degrees C.
11. Maximum inrush current of 2 amperes for 120-Volt and 277-Volt drivers.
12. Withstand up to a 4,000 volt surge without impairment of performance as defined by ANSI C62.41 Category A.
13. Inaudible in a 27 dBA ambient.

C. LED Light Engine Modules

1. Minimum CRI: 80.
2. Color Temperature: 3500K, unless otherwise noted.
3. Minimum Rated Life: 50,000 hours as per LM79.

PART 3 EXECUTION

3.01. GENERAL

- A. Install fixtures in straight, true lines and without visible gaps between fixtures and building surfaces and between fixtures in continuous rows. For linear wall mounted fixtures, ensure that the wall surface is finished flat, straight, and free of imperfections prior to mounting the fixtures. Replace or repair lighting fixture installations that are out of plumb or that have obvious gaps or misalignment.
- B. Provide fixtures with the appropriate trim frames, flanges, canopies, and finish accessories to accommodate the ceiling conditions. Prior to ordering fixtures, and throughout the Project, verify the exact ceiling types, finishes, and thicknesses and coordinate the fixture installation therewith.
- C. Refer to the Drawings, particularly the architectural elevations and reflected ceiling plans, in determining the exact mounting location and height of lighting fixtures. For wall mounted

or suspended fixtures that do not have the mounting heights clearly indicated, contact the Owner for clarification prior to ordering pendants and installing the fixtures.

- D. Provide final touchup painting to repair fixture finishes which are nicked or marred during installation. Obtain the paint from the fixture manufacturer.

3.02. AUDIBILITY

- A. Fixtures shall be free from any undesirable hum, vibration, or noise. Provide lighting equipment suitable for the intended ambient sound levels. Where necessary to meet this criteria, provide additional means of sound deadening, whether or not specifically indicated. Fixtures that are found to be unsatisfactory in the opinion of the Owner shall be removed and replaced at the Contractor's expense.

3.03. SUPPORTS AND BLOCKING

- A. Provide hangers, suspension cables, and blocking for lighting fixtures that will provide support independent of suspended ceilings, ceiling or wall surfaces, and electrical outlet boxes. Exception: Fixtures less than 12 inches in all dimensions and weighing less than six pounds may be permitted to be supported from the electrical outlet box if the box itself is independently supported by blocking or hangars.
- B. Refer to the Drawings for specific blocking details and seismic mounting details for lighting fixtures.

3.04. EXTERIOR POLE MOUNTED FIXTURES AND BOLLARDS

- A. Provide pole base footings in accordance with the Drawings. Footings shall be reinforced concrete with anchor bolts sized and located in accordance with the manufacturer's recommendations for the geographic locality. Provide reinforced concrete in accordance with the requirements as stipulated elsewhere in these Specifications. Forms for pole bases shall be placed using resin-lined Sonotube concrete forms or Approved Equal to give a smooth finished appearance. Patch and sack cracks and voids in the bases to match the surrounding surface.
- B. Verify the exact location of underground facilities in the vicinity of pole bases prior to boring holes and bring potential conflicts to the attention of Owner. Use an anchor bolt template as provided by the manufacturer for the placement of anchor bolts and substantially brace the forms to ensure that the base remains straight and plumb. Refer to the Drawings for fixture orientation and alignment, and utilize a transit site or snap line to verify same.
- C. Exposed surfaces of concrete bases or footing shall be finished smooth without cracks, voids, or jagged edges. Chamfer and float the base after pouring concrete to achieve a finished appearance. In order to allow leveling of the pole, install the pole base-plate one inch above the top of the concrete footing. Level the pole plumb and pack the space under the base-plate with Embecco dry pack grout.
- D. For fixtures with adjustable aiming or reflectors, arrange to perform a final adjustment of aiming at night under the direction of Owner.

3.05. OBSTRUCTIONS

- A. Verify throughout the Project that mounting locations and suspension systems remain free of obstructions. Suspended or pendant mounted fixtures must be free to swing 45 degrees

in all directions without hitting obstructions or other fixtures. Provide seismic rated swivel ball hangars for pendant mounted lighting fixtures to achieve the proper swing.

END OF SECTION

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SECTION 31 00 00

EARTHWORK

PART 1 GENERAL

1.01. THE REQUIREMENT

- A. The Contractor shall provide all materials, equipment, and labor necessary to perform and complete all earthwork as shown on the Drawings and as specified herein.
- B. The work of this Section includes all earthwork required for construction of the project. Such earthwork shall include, but may not necessarily be limited to, site preparation, rough grading, the loosening, removing, loading, transporting, depositing, and compacting in its final location of all materials wet and dry, as required for the purposes of completing the work; the supporting of structures above and below the ground; all backfilling around structures and all backfilling of trenches and pits; the disposal of excess excavated materials; borrow of materials to make up deficiencies for fills; and all other incidental earthwork.

1.02. RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02 00 10 – Site Conditions

1.03. REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. State Codes:
 - 1. California Labor Code.
 - 2. Construction Safety Orders of the State of California.
- B. State of California (Caltrans) Standards, latest edition:
 - 1. Standard Specifications:
 - 2. Section 25 – Aggregate Subbases.
 - 3. Section 26 – Aggregate Bases.
 - 4. Section 68 – Subsurface Drains.
 - 5. Section 88 – Engineering Fabrics
 - 6. CMM "Materials Manual"
- C. Commercial Standards:
 - 1. ASTM C 117 Test Method for Materials Finer than 75 microns (No. 200) Sieve in Mineral Aggregates by Washing.
 - 2. ASTM C136 Method for Sieve Analysis of Fine and Coarse Aggregates
 - 3. ASTM D 422 Test Method for Particle-Size Analysis of Soils.
 - 4. ASTM D 698 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.

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5. ASTM D 1556 Test Method for Density of Soil in Place by the Sand-Cone Method.
6. ASTM D 1557 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54-kg) Rammer and 18-in. (457-mm) Drop.
7. ASTM D 1633 Test Method for Compressive Strength of Molded Soil-Cement Cylinders.
8. ASTM D 2419 Method for Sand Equivalent Value of Soils and Fine Aggregate.
9. ASTM D 2487 Test Method for Classification of Soils for Engineering Purposes.
10. ASTM D 2844 Test Method for Resistance R-Value and Expansion Pressure of Compacted Soils.
11. ASTM D 2922 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
12. ASTM D2991 Test Method for Density of Soil in Place by Nuclear Methods
13. ASTM D 3017 Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
14. ASTM D 3776 Test Methods for Mass per Unit Area (Weight) of Woven Fabric.
15. ASTM D 3786 Method of Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method.
16. ASTM D 4253 Test Methods for Maximum Index Density of Soils Using a Vibratory Table.
17. ASTM D 4254 Test Methods for Minimum Index Density of Soils and Calculation of Relative Density.
18. ASTM D 4318 Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
19. ASTM D 4491 Test Methods for Water Permeability of Geotextiles by Permittivity.
20. ASTM D 4632 Test Method for Grab Breaking Load and Elongation of Geotextiles.
21. ASTM D 4751 Test Method for Determining the Apparent Opening Size of a Geotextile.
22. OSHA Occupational Safety and Health Administration.

1.04. CONTRACTOR SUBMITTALS

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

- B. The Contractor's attention is directed to the provisions for "Shoring and Bracing Drawings" in Section 6705 of the California Labor Code. The Contractor, prior to beginning any trench or structure excavation 5 feet deep or over, shall submit to the Engineer for review for compliance with Section 6705 the Contractor's detailed plan showing design of all shoring, bracing, sloping of the sides of excavation, or other provisions for worker protection against the hazard of caving ground during the excavation of such trenches or structure excavation. If such plan varies from the shoring system standards established in the Construction Safety Orders of the State of California, such alternative system plans shall be prepared, stamped and signed by a civil or structural engineer licensed in the State of California at the Contractor's expense.
- C. Certificates of Compliance: Certificates of Compliance shall be provided for all products and materials proposed to be used under this Section.
- D. For all materials that are not pre-approved by the Owner or Owner's Representative, the Contractor shall designate the source and/or submit samples of all materials in advance of their use for required testing and Engineer's approval. All testing costs shall be at the Contractor's expense.
- E. Submit a construction drainage plan showing the collection and disposal of surface and subsurface water that may be encountered in the course of construction.
- F. Prior to commencing any excavation, the subcontractor shall submit a shoring plan in accordance with the requirements in Section 31 41 00 - Shoring and Trench Safety.
- G. Prior to commencing any excavation, Contractor shall submit a trenching plan for approval by the Engineer.
- H. Contractor shall submit material disposal plan including haul routes.

1.05. QUALITY ASSURANCE

- A. General: All soils testing will be done by a certified testing laboratory at the Contractor's expense.
- B. Where soil material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with ASTM D 1557. Where cohesionless, free draining soil material is required to be densified to a percentage of relative density the calculation of relative density will be determined in accordance with ASTM D 4253 and D 4254. Field density in-place tests will be performed in accordance with ASTM D 2922, or by such other means acceptable to the Engineer.
- C. In the case that the first test of the fill or backfill shows non-compliance with the requirements, the Contractor shall accomplish such remedy as may be required to ensure compliance. Subsequent re-testing to show compliance shall be at the Contractor's expense.
- D. The Contractor shall notify the Engineer at least 48 hours prior to performing any excavation.
- E. Delineate area to be excavated and contact the Regional Notification Center, Underground Service Alert (USA North) at 811, a minimum of 2 working days prior to any excavation in accordance with Section 4216 of the California Government Code.
- F. Field Measurements: Verify that survey benchmark and intended elevations for the work are as indicated.

PART 2 PRODUCTS

2.01. SUITABLE BACKFILL AND FILL MATERIALS

- A. Suitable backfill shall be a selected or processed clean, fine earth, rock, or sand, free from objectionable material, vegetation, or other deleterious substances.
- B. The following types of backfill materials are designated and defined as follows:
1. TYPE 1. Sand shall be material with 100 percent passing a 3/8-inch sieve, at least 90 percent passing a No. 4 sieve, and a sand equivalent value not less than 30.
 2. TYPE 2. Class 2 Aggregate Base shall be crushed rock aggregate base material meeting the requirements of Section 26, "Aggregate Bases," for 3/4-inch maximum grading, of the Caltrans Standard Specifications.
 3. TYPE 3. Class 1, Type A or B, Permeable Material shall be crushed stone, or gravel, durable and free from slaking or decomposition under action or alternate wetting or drying, uniformly graded, and shall meet the requirements of Section 68-2.02F(2) for Class 1, "Permeable Material," of the Caltrans Standard Specifications.
 4. TYPE 4. Class 2 Permeable Material shall be crushed rock or gravel, durable and free from slaking or decomposition under the action of alternate wetting or drying, uniformly graded, and shall meet the requirements of Section 68-2.02F(3) for Class 2 "Permeable Material," of the Caltrans Standard Specifications.
 5. TYPE 5. Manufactured Backfill shall be manufactured, angular, granular, crushed stone, rock, or slag with 100 percent passing a one-inch sieve and less than one percent passing a No. 4 sieve.
 6. TYPE 6. Controlled Low Strength Materials (CLSM) – shall conform to the requirements of Section 02320 "Controlled Low Strength Materials (CLSM)."
 7. TYPE 7. Native material shall be material obtained from on-site excavations, provided the materials are not classified as unsuitable by the Engineer. Native material shall be free of stones, lumps, broken concrete, bituminous surfacing over 2 inches in diameter, objectionable material, vegetation, and deleterious substances. Additionally, all native material used as compacted fill shall meet the same property requirements as for Engineered Fill specified in this specification under Type 10.
 8. TYPE 8. Topsoil material may be selected excavated material, graded, free of roots, rocks larger than 4 inches, subsoil, debris, and large weeds.
 9. TYPE 9. Class 2 Aggregate Subbase shall conform to the grading and quality requirements of Section 25, "Aggregate Subbases" of the Caltrans Standard Specifications. At the option of the Contractor, the grading for either 1-1/2 maximum or 3/4-inch maximum shall be used. Once a grading has been selected, the grading shall not be changed without the Engineer's approval.
 10. TYPE 10. Engineered Fill or import soil used as engineered fill shall consist of a soil or soil-rock mixture that meets the material properties given below:
 - Free of rock in excess of 2 inches in size.
 - Free of organics, debris or other deleterious materials.
 - Free of recycled materials such as asphalt concrete, concrete, bricks etc.
 - Granular in nature, well graded, and contains sufficient binder to allow utility trench to stand open.
 - Plasticity Index of 4 to 12.

Non-expansive with R-value of 30 minimum.
100% passing 3-inch sieve size, 70 – 100% passing the 3/4-inch sieve size, and
0 – 30% passing the No. 200 sieve size.
Liquid limit < 30.

11. TYPE 11. Lightweight Fill shall consist of a soil/soil-rock mixture or cellular concrete that meets the material properties given below:
Free of rock in excess of 2 inches in size.
Free of organics, debris or other deleterious materials.
Free of recycled materials such as asphalt concrete, concrete, bricks etc.
Granular in nature, well graded, and contains sufficient binder to allow utility trench to stand open.
Unit weight of 64 pounds per cubic foot.
Cellular concrete shall have a compressive strength at 28 days between 50 and 150 psi.

2.02. UNSUITABLE BACKFILL AND FILL MATERIALS

- A. Unsuitable soils for backfill material shall include soils which, when classified under ASTM D 2487, fall in the classifications of Pt, OH, or OL. Types CH and MH soils will be permitted in unimproved areas only where required compaction and stability can be demonstrated. In addition, any soil which cannot be compacted sufficiently to achieve the percentage of maximum density specified for the intended use shall be classified as unsuitable material.
- B. Any material determined to be hazardous is defined as unsuitable material.
- C. Washed, smooth rock (pea gravel) is classified as unsuitable material except where specifically called out in the Drawings.

2.03. USE OF SUITABLE BACKFILL AND FILL MATERIAL TYPES

- A. The Contractor shall use the types of materials as designated herein for all required backfill construction.
- B. Backfill material types shall be used in conformance with the following provisions:
1. Over-excavation backfill shall be material with 100 percent passing a 2-inch sieve, 90 to 100 percent passing a 1-1/2-inch sieve, 5 to 30 percent passing a 3/4-inch sieve, 5 to 20 percent passing a 3/8-inch sieve and 0 to 4 percent passing a No. 200 sieve. Over-excavation backfill shall be completely wrapped with geotextile fabric.
 2. bedding backfill as shown on the Plans shall be sand, meeting the requirements of Product Type 1.
 3. Trench Zone backfill, as defined under PART 3 - EXECUTION of this Section herein, shall be Class 2 Aggregate Base in paved areas and road shoulders, meeting the requirements of Product Type 2. Trench zone backfill in unimproved areas shall be suitable native meeting the requirements of Product Type 7 or Class 2 Aggregate Base.
 4. Final Zone backfill, as defined under PART 3 - EXECUTION of this Section herein, shall consist of the following materials for each condition listed below.
Final Zone backfill at paved areas and road shoulders shall be Class 2 aggregate base, meeting the requirements of Product Type 2.
Final Zone Backfill in unimproved areas shall be topsoil, meeting the requirements of Product Type 8.

Final Zone backfill in landscape areas shall be Native Fill, meeting the requirements of Product Types 7. Topsoil and amendments shall be Product Type 8.
Final Zone backfill under graveled roads shall be Class 2 aggregate base, meeting the requirements of Product Type 2.

5. Structures. Backfill materials around structures shall be Class 2 aggregate base, meeting the requirements of Product Type 2.
6. Fill. Fill materials shall be as called out for that specific area on the Drawings.
7. Pavement Base Course. Backfill materials under pavement base course shall be Class 2 Aggregate Base or Class 2 Aggregate Subbase, meeting the requirements of Product Types 2 or 9.
8. Stabilization Zone backfill, as defined under PART 3 - EXECUTION of this Section herein, shall be Permeable Material, meeting the requirements of Product Types 3 or 4 and always wrapped in geotextile fabric.

2.04. GEOTEXTILE FABRIC

- A. Geotextile fabric shall be non-woven synthetic fabric meeting the requirements of Section 96-1.02B, "Filter Fabric," of the Caltrans Standard Specifications. Filter fabric shall be non-woven synthetic fabric with a minimum Grab Strength of 150 pounds; a minimum Burst Strength of 300 pounds, a minimum Puncture Strength of 310 pounds, a Water Flow Rate of at least 40 gal/min/sf, and an Apparent Opening Size of between 60 and 70.

2.05. STEEL PLATE

- A. When steel plate bridging is provided in lieu of backfill and temporary asphalt, it shall conform to Section 602.1 of the Caltrans Encroachment Permit Manual, with the following minimum thicknesses:

B.	Trench Width	Minimum Plate Thickness
C.	(10") 0.25 m	(1/2") 13 mm
D.	(1' - 11") 0.58 m	3/4") 19 mm
E.	(2' - 7") 0.80 m	(7/8") 22 mm
F.	(3' - 5") 1.04 m	(1") 25 mm
G.	(5' - 3") 1.60 m	(1 1/4") 32 mm
- H. For spans greater than 5 feet-3 inches, a structural design shall be prepared by a California registered civil engineer.

PART 3 EXECUTION

3.01. GENERAL

- A. Regulatory Requirements: Conform to applicable codes and all local, state and federal regulations for disposal of debris and use of herbicides. Burning of debris, lumber, or scrap will not be permitted.

B. Preparation:

1. Sawcut paving, curbs, gutters, and other structures between portion to remain and portion to be removed.
2. Identify required lines, levels, contours, and datum.
3. All areas that will receive engineered fill shall be stripped of organics (e.g., shrubs, weeds, grasses, root systems, etc.) and any manmade deleterious materials, down to relatively undisturbed, native materials. Resultant holes created by removal of these objects shall be cleared of loose material and dished to provide access for compaction equipment.
4. All areas that will receive engineered fill shall be scarified to a minimum depth of 8 inches, moisture conditioned to a soil moisture content between 2 and 6 percent over optimum, and re-compacted to a minimum relative compaction of 90 percent as determined by ASTM D1557. If subsurface shrinkage cracks are present, the depth of scarifying and moisture conditioning shall extend to the maximum depth of cracking.

C. Protection:

1. Locate, identify, and protect utilities that remain from damage.
2. Protect trees, plant growth, and features designated to remain as final landscaping.
3. Protect benchmarks and existing structures that are to remain from damage or displacement.

D. Clearing:

1. Clear areas required for access to site and execution of work. Contractor shall notify Engineer of proposed trees to be removed that are 6-inches or over in diameter, measured at 1-foot above the existing grade, and obtain Engineer's approval prior to removing said trees. Trees to be removed less than 6-inches in diameter do not need prior approval. Contractor shall remove all felled trunks and branches from the site. Stumps do not need removal, except for the tree to be removed at the future IPA slab, or unless the Contractor requires the trunks to be removed for the performance of their work. All excavated trunks shall be removed from the site.
2. Remove paving, curbs and gutters, fences, posts, or structures indicated on the drawings.
3. Remove trees and shrubs indicated. In areas to be filled and under structures and roads, remove stumps, and main root system to a depth of not less than 24 inches below the original ground surface. Depressions made by grubbing are to be filled with structural backfill to the original surface in accordance with this Section unless further excavation is required.
4. Clear undergrowth and dead wood without disturbing subsoil.

E. Removal: Remove debris, rock, and extracted plant life from site.

F. Top Soil Excavation:

1. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded.

2. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Spread excess topsoil not being reused evenly on site.

3.02. EXCAVATION

A. General

1. Over-Excavation: When ordered by the Engineer, whether or not indicated on the Drawings, excavations shall be over-excavated beyond the depth shown and will not be paid for as extra work. Such over-excavation shall be to the depth ordered. The excavation shall then be backfilled to the grade of the bottom of the excavations shown on the Contract Drawings. Any over-excavation carried below the grade ordered, specified, or shown shall be backfilled to the required grade and densified with the specified material and compaction. Such work shall be performed by the Contractor at its own expense.
2. Disposal of Excess Excavated Material: The Contractor shall remove and dispose of all excess excavated material to a suitable site. The proper and legal disposal shall be the responsibility of the Contractor.
3. Machine slope banks to angle of repose or less, unless shored. In those cases where excavations are shored, soils at the site shall be considered to meet the OSHA definition of "Type C" soil for the purposes of shoring design, unless evaluated to be other than "Type C" by a registered engineer.
4. Excavation cut not to interfere with normal 45 degree bearing splay of foundations.
5. Grade top perimeter of excavation to prevent surface water from draining into excavation.
6. Hand trim excavation as needed. Remove loose matter.
7. Remove lumped subsoil, boulders, organic material and rock.
8. Notify the Engineer promptly in writing of unexpected subsurface conditions before such conditions are disturbed and discontinue affected work in area until notified to resume work.
9. Stockpile excavated material on site and remove excess material not being reused from site. Cover stockpiled material to protect from rain and wind. Take preventive measures to ensure that water containing soil from excavations or stockpiles does not enter storm drains.
10. Steel Plate
 - a. General: When backfilling operations of any excavation cannot be properly completed within a work day, steel plate bridging with a non-skid surface and shoring may be required to preserve unobstructed traffic flow and to protect biological resources from entering the open excavation.
 - b. When steel plate bridging is required, the following conditions shall apply:
 - 1) Steel plates used for bridging must extend a minimum of 12 inches beyond the edges of the trench or excavation.
 - 2) Steel plate bridging shall be installed to operate with minimum noise.
 - 3) The trench shall be adequately shored to support the bridging and traffic loads.
 - 4) Temporary paving with cold asphalt concrete shall be used to feather the edges of the plates for plate installation in paved areas.

- 5) Bridging shall be secured against displacement by using adjustable cleats, shims or other devices.
- c. Steel plate bridging and shoring in paved areas shall be installed using the following methods:
 - 1) Approaching plate(s) and ending plate (if longitudinal placement) shall be attached to the roadway by a minimum of 2 dowels pre-drilled into the corners of the plate and drilled 2 inches into the pavement. Subsequent plates are butted to each other. Fine graded asphalt concrete shall be compacted to form ramps, maximum slope 8.5 percent with a minimum 12 inch taper to cover all edges of the steel plates. When steel plates are removed, the dowel holes in the pavement shall be backfilled with either graded fines of asphalt concrete mix, concrete slurry or an equivalent slurry.

B. Pipeline and Trench Excavation

1. Trench Width: Unless otherwise shown or directed, excavation for pipelines and utilities shall be open-cut trenches. Trench widths shall be kept as narrow as is practical for the method of densification selected by the Contractor, but shall have a minimum width at the bottom of the trench equal to the outside diameter of the pipe plus 12 inches.
2. Subgrade: The surface of the subgrade after compaction shall be hard, uniform, smooth, self-draining, and true to grade and cross section.
3. Trench Bottom: The pipe/conduit bedding shall be given a final trim establishing grade such that each pipe/conduit section when first laid will be continually in contact with the bedding along the extreme bottom of the pipe. Rounding out the trench bottom or bedding to form a cradle for the pipe/conduit will not be allowed. The Contractor shall excavate for bell holes and fittings.
4. Open Trench: The maximum amount of open trench permitted in any one location shall be the length necessary to accommodate the amount of pipe installed and backfilled in a single day. All trenches shall be fully backfilled at the end of each day or, in lieu thereof, shall be covered by heavy steel plates adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each day. The above requirements for backfilling or use of steel plate may not be waived.
5. Where pipelines are to be installed in embankment or structure fills, the fill shall be constructed to a level a minimum of 2 feet above the top of the pipe, as directed by the Engineer, or as recommended by the pipe manufacturer, whichever is greater, before the trench is excavated.

C. Structure Excavation

1. Except when specifically provided to the contrary, excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the work. The removal of said materials shall conform to the lines and grades shown on the Drawings or ordered by the Engineer. Unless otherwise provided, the entire construction site shall be stripped of all vegetation and debris, and such material shall be removed from the site prior to performing any excavation or placing any fill. The Contractor shall furnish, place, and maintain all supports and shoring that may be required for the sides of the excavations, and all pumping, ditching, or other measures required for the removal or exclusion of water, including storm water, groundwater, and wastewater reaching the site of the work from any source so as to

prevent damage to the work or adjoining property. Excavations shall be sloped or otherwise supported in a safe manner in accordance with applicable State safety requirements and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926). The limits of structure excavation shall be a minimum of 12 inches beyond the outside edge of the structure, and at a minimum no larger than necessary to facilitate backfill, compaction and testing operations. For structures poured against undisturbed soil the width of the structure wall shall be no more than 2 inches greater than specified or shown on the Drawings.

2. Except where otherwise specified for a particular structure or as directed by the Engineer, excavation shall be carried to the grade of the bottom of the structure. When directed by the Engineer, areas beneath minor structures shall be over-excavated. When such over-excavation is directed, both over-excavation and subsequent backfill to the required grade shall be performed. After over-excavation is performed and before backfill is placed, the exposed surface shall be scarified to a depth of 6 inches, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain 90 percent of maximum density.

D. Pavement Base Course Excavation

1. Roadway excavation shall conform to Section 19-1, "General" and Section 19-2, "Roadway Excavation" of the Caltrans Standard Specifications, except the reference to Section 19-5, "Compaction," is deleted, and except that Section 19-1.03B, "Unsuitable Material," is modified as follows:
When directed by the Engineer, the Contractor shall excavate the unstable or unsuitable underlying material to the depth determined by the Engineer.

E. Paving Removal

1. All edges of asphalt, armor coats or seal coats shall be cut vertically, with a neat, square edge.
2. In all cases existing paving shall be cut out after construction and just prior to final paving to a point at least six (6) inches beyond each side of the trench line. If the trench line is within three (3) feet of any structure the pavement shall be removed and replace to the structure.
3. Asphalt grindings can be reused as backfill for pipeline trenching if the grindings comply with the gradations specified in this Section of these Specifications; however, any pavement removed and not used to backfill the trench shall be removed from the site and disposed of properly.
4. Contractor's attention is directed to Section B-53, Protection of Person and Property of the General Conditions. Pavement removal and replacement operations shall be performed in such a manner as adjacent pavement and subgrade are not disturbed. In the event that material underlying adjacent pavement is disturbed, Contractor shall cut back pavement and recompact it at the Contractor's expense, to a relative compaction of not less than 95%.

3.03. BACKFILL

A. General

1. Backfill shall not be dropped directly upon any structure pipe, or conduit. Backfill shall not be placed around nor upon any structure for a minimum of 72 hours or until the

concrete has attained sufficient design strength to withstand the loads imposed, whichever is greater.

2. Except for Product Type 3B material being placed in over-excavated areas or trenches and unless specifically excepted by the Engineer, backfill shall not be placed until after all water is removed from the excavation.
3. **Placing and Spreading of Backfill Materials**
 - a. Backfill materials shall be placed and spread evenly in horizontal layers. The backfill layers shall be evenly spread so that when compacted, each layer shall not exceed 6 inches in thickness.
 - b. During spreading, each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer and uniformity of moisture throughout backfill materials. Pipe Zone backfill materials shall be manually spread around the pipe so that when compacted, the Pipe Zone backfill will provide uniform bearing and side support.
 - c. Where the backfill material moisture content is below the optimum moisture content, water shall be added before or during spreading until the proper moisture content is achieved.
 - d. Where the backfill material moisture content is too high to permit the specified degree of compaction, the material shall be dried or replaced until the moisture content is satisfactory.
 - e. Backfill shall be mechanically compacted by means of tamping rollers, sheepsfoot rollers, pneumatic tire rollers, vibrating rollers, or other mechanical tampers. All such equipment shall be of a size and type subject to review by the Engineer. Impact-type pavement breakers (stompers) will not be permitted. Permission to use specific compaction equipment shall not be construed as guaranteeing or implying that the use of such equipment will not result in damage to adjacent ground, existing improvements, or new improvements. The Contractor shall make its own determination in this regard.
 - f. Material for mechanically compacted backfill shall be placed in lifts which, prior to compaction, shall not exceed the thickness specified below for various types of equipment:
 - 1) Vibratory equipment, including vibratory plates, vibratory smooth-wheel rollers, and vibratory pneumatic-tired rollers - maximum lift thickness of 2 feet.
 - 2) Rolling equipment, including sheepsfoot (both vibratory and non-vibratory), grid, smooth-wheel (non-vibratory), pneumatic-tired (non-vibratory), and segmented wheels - maximum lift thickness of 1 foot.
 - 3) Hand-directed mechanical tampers-maximum lift thickness of 4 inches.
 - g. Mechanically compacted landfill shall be placed in horizontal layers of thickness not exceeding those specified above, compatible to the material being placed and the type of equipment being used. Each layer shall be evenly spread, moistened or dried, if necessary, and then tamped or rolled until the specified relative compaction has been attained.

B. Pipe and Utility Trench Zones and Backfill

1. **Trench Backfill Requirements:** The pipe class has been structurally designed based upon the trench configuration previously specified herein.
 - a. The Contractor shall maintain the previously specified trench width up to a horizontal plane lying 12 inches above the top of the pipe/conduit bank.
 - b. If, at any location under said horizontal plane, the Contractor slopes the trench walls or exceeds the maximum trench widths indicated the Pipe Zone, backfill shall be "improved" or the pipe class improved at no additional cost to the Owner or Owner's Representative. "Improved" backfill shall mean pipe bedding or other equivalent materials acceptable to the Engineer.

- c. If the allowable deflection specified for the pipe/conduit is exceeded, the Contractor shall expose and reround or replace the pipe/conduit, repair all damaged lining and coating, and reinstall the Pipe Zone material and Trench Zone backfill as specified.
 - d. All trenches shall have a minimum of 2 inches of temporary asphalt placed daily and maintained unless final paving can be completed in the same day. Temporary asphalt shall be placed flush with adjacent pavement grade.
 - e. Steel plates may be used to cover open trenches in-lieu of backfill and temporary asphalt pavement.
 - f. For any new trench installation that crosses under an existing electric, gas, telephone, or cable TV utility pipe(s) or conduit(s) the Contractor shall replace the existing backfill material around the existing utility pipe(s) or conduit(s) with sand. Sand shall be placed from a plane 6 inches below the bottom of the lowest utility pipe or conduit to a plane 12 inches above the top of the highest utility pipe or conduit, and for the full width of the new trench. Sand backfill shall be compacted to 95 percent maximum density in conformance with Paragraph Compaction, as specified below. Prior to any new trench installation crossing under existing storm or sanitary sewer, the contractor shall contact the Engineer and obtain direction on alignment, elevation, fill material and other items with regards to crossing design prior to proceeding. Depending the extent of the requested changes, sewer crossings not shown on plans may be paid for as a contract change order.
2. Bedding: The bedding is defined as that portion of the Pipe Zone lying between a plane 6 inches below the bottom surface of the pipe, and the springline of the pipe.
 - a. Sand Bedding shall be provided for all pipelines.
 - b. After compacting the bedding the Contractor shall perform a final trim for establishing grade, such that each pipe section when first laid will be continually in contact with the bedding along the extreme bottom of the pipe.
 3. Pipe Zone and Backfill:
 - a. The Pipe Zone is defined as that portion of the vertical trench cross-section lying between the springline of the pipe and a plane 12 inches above the top of the pipe.
 - b. The Pipe Zone shall be backfilled with the specified backfill material. The Contractor shall exercise care to prevent damage to the pipeline coating, cathodic bonds, or the pipe itself during the installation and backfill operations.
 4. Trench Zone and Backfill: After the Pipe Zone backfill has been placed as specified above, and after all excess water has completely drained from the trench, backfilling of the Trench Zone may proceed.
 5. The Trench Zone is defined as that portion of the vertical trench cross-section lying between a plane 12 inches above the top of the pipe and below the roadway subgrade in paved areas, or 12 inches below the finished surface grade in landscaped or unimproved areas.
 6. Final Zone and Backfill: The Final Zone is defined as the last vertical trench cross-section area above the Trench Zone, which is the roadway subgrade (AB base) and asphalt in paved areas, and the last 12 inches of the vertical trench cross-section lying between the top of the Trench Zone and the finish final grade in landscaped or unimproved areas.
 7. Stabilization Zone is defined as that portion of the vertical trench cross-section lying between a plane 6 inches below the bottom surface of the pipe, and a plane at a point 18 inches below the bottom surface of the pipe.
- C. Major Structure Backfill

1. Preparation:
 - a. If the excavation subgrade contains soft soils or if the subgrade becomes softened due to construction equipment or inadequate/incomplete groundwater cut off and/or dewatering, the soft soil shall be removed (i.e., overexcavated).
 - b. Generally compact subgrade to density requirements for subsequent backfill materials. Cut out soft areas of subgrade not capable of in situ compaction. Backfill with the type of material indicated on the Drawings and compact to density equal to or greater than requirements for subsequent backfill material.
2. Employ a placement method that does not disturb or damage foundation perimeter drainage or foundation waterproofing.

D. Pavement Base Course Backfill

1. Preparation: Prior to placement of aggregate base course material at paved areas, compact subsoil to 95% of its maximum dry density at optimum water content in accordance with ASTM D698 to the depth as indicated on the drawing, but not less than six (6) inches.
2. Tolerances:
 - a. Top Surface of Backfilling under Paved Areas: The surface of the finished aggregate base at any point shall not vary more than 1/2-inch above or below the grade shown on the drawing.
3. Paving of trench cuts shall conform to line and grade of existing pavement.
4. Damage to underlying native soils caused by the Contractor's operations shall be repaired and re-compacted under the supervision of and to the satisfaction of the Engineer at no additional cost to the Owner.

3.04. FILL

- A. Place and compact material in continuous layers not exceeding 8 inches compacted depth.
- B. Make grade changes gradual. Blend slope into level areas.
- C. Along the outer perimeter of the site (i.e., in the transition area between the finished elevated site grade and the existing grade of the surrounding field), fill slopes should be no steeper than 1.5H:1V (1.5 horizontal to 1 vertical). Fill slopes should be overbuilt and then trimmed back to expose compacted engineered fill. Compaction by track walking of slopes should not be allowed.
- D. Remove surplus fill materials from site.
- E. Tolerances
 1. Top Surface of Subgrade: Plus or minus 1/10 foot in 10 feet.
- F. Field Quality Control
 1. Field inspection and testing will be performed under provisions of Division 1.
 2. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM D1557.

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3. Compaction testing will be performed in accordance with the appropriate referenced ANSI/ASTM Standards.
4. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to the Owner.
5. Frequency of Tests: One per 1,000 cubic yards but not less than one per layer of fill and not less than one per day.

3.05. COMPACTION

A. General

1. Each layer of backfill or fill material as defined herein, shall be mechanically compacted to the specified percentage of maximum density. Equipment that is consistently capable of achieving the required degree of compaction shall be used and each layer shall be compacted over its entire area while the material is at the required moisture content range.
2. Flooding, ponding, or jetting shall not be used.
3. Removal of shoring shall not damage pipe or structures, cause settlement or heave the ground surface, or product vibrations that could damage adjacent pipe or structures. Compaction requirements must be met after shoring is removed.

B. Compaction of Trench and Structure Backfill Materials

Compaction Requirements: The compaction requirements noted herein and on the Drawings shall be in accordance with ASTM D 1557 for cohesive type materials and in accordance with ASTM D 4253 and D 4254 for "non-plastic" cohesionless free draining granular type materials. Where other agency or utility company requirements govern, the highest compaction standards shall apply.

Maximum density refers to maximum dry density according to ASTM D 1557 laboratory test procedures.

C. Compaction of Fill

Place and compact materials in continuous layers not exceeding 8 inches compacted depth, compacted to 95% of maximum density at 2 percent over optimum water content.

END OF SECTION 31 00 00

SECTION 31 10 00

SITE CLEARING

PART 1 GENERAL

1.01. SUMMARY

- A. Work Included:
 - 1. Removal of surface debris.
 - 2. Removal of vegetation.
 - 3. Topsoil excavation.
- B. Related Work Described Elsewhere:
 - 1. Section 01 57 13 – Erosion Control
 - 2. Section 01 57 19 – Environmental Requirements
 - 3. Section 01 74 00 – Site and Area Cleanup

1.02. MEASUREMENT AND PAYMENT

- A. Measurement and Payment for Site Clearing shall be included in the Bid Item to which it relates. No additional measurement or payment shall be made for the requirements of this section.

1.03. QUALITY ASSURANCE

- A. Perform Work in accordance with all applicable State and County requirements.

PART 2 PRODUCTS – (NOT USED)

PART 3 EXECUTION

3.01. DEBRIS REMOVAL

- A. Remove and dispose of all debris and other material within the working area. All material removed shall be disposed of in accordance with State and County requirements.

3.02. VEGETATION REMOVAL

- A. It shall be the Contractor's responsibility to determine the types of grasses and other vegetation to be removed, and to ensure that the replacement vegetation matches that removed in number and in kind. Should replaced vegetation, after it is established, not match the existing vegetation, the Contractor shall take whatever corrective measures are necessary, including

complete reseeding or planting to provide a restored pasture which is acceptable and approved by the District and the property owner.

- B. Refer to Section 01 57 13 – Erosion Control

3.03. TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, re-vegetated, or re-graded, without mixing with foreign materials for use in finish grading. Do not excavate wet topsoil.
- B. Remove excess topsoil not intended for reuse from site.

END OF SECTION 31 10 00

SECTION 31 23 19

DEWATERING

PART 1 GENERAL

1.01. SUMMARY OF WORK

- A. The Contractor shall keep excavations free from water during construction.
- B. Groundwater could be encountered during excavations.
- C. Groundwater shall be pumped to a percolation area consisting of a hay bale perimeter to allow it to infiltrate back into the soil (or other method proposed by the Contractor).
- D. The Contractor shall develop an excavation dewatering plan in accordance with paragraph 1.04 of this Section.

1.02. RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01 33 00 – Submittal Procedures
- B. Section 01 57 19 – Environmental Requirements
- C. Section 31 00 00 – Earthwork
- D. Section 31 41 00 – Shoring and Trench Safety

1.03. DEFINITIONS

- A. Dewatering: Practices that manage the discharge of groundwater and accumulated precipitation from a work location so that construction work may be accomplished.

1.04. SUBMITTALS

- A. Dewatering Plan: Dewatering systems shall be designed and maintained by the Contractor and shall be coordinated with the design of shoring specified in Section 31 41 00. The dewatering plan shall contain at a minimum the sizes of pumps, tanks, filtration devices, and the points of disposal. The plan shall also include alternate (contingent) systems, and the Contractor shall be prepared to alter the initial dewatering or shoring systems to meet the specified requirements.
- B. Submittals shall be in accordance with requirements given in Section 01 33 00.
- C. Product Data: Submit data for each of the following:
 - 1. Dewatering Pumps: Indicate sizes, capacities, priming methods, and engine or motor characteristics.
 - 2. Pumping equipment for control of discharge.
 - 3. Size of percolation basin(s).

1.05. COORDINATION

- A. Coordinate with the Engineer prior to the commencement of any soil excavation and groundwater discharge.

PART 2 PRODUCTS

2.01. DEWATERING EQUIPMENT

- A. Select dewatering equipment to meet specified performance requirements.
- B. Provide, operate, and maintain dewatering systems of sufficient size and capacity to allow for excavation and subsequent construction and to lower and maintain groundwater level below the lowest point of excavation. Continuously maintain excavations free of water, regardless of source, and until backfilled to final grade.

PART 3 EXECUTION

3.01. Dewatering operations

- A. Install dewatering system in accordance with the approved Dewatering Plan.
 - 1. Secure Owner approved areas for siting of groundwater percolation basins. Locate system components to allow continuous dewatering operations without interfering with the excavation Work.
 - 2. Install the dewatering system in accordance with State, local and Unified Building Code standards.
- B. Remove water from the excavation in accordance with the approved Dewatering Plan.
 - 1. Keep excavations free from water during construction.
 - 2. Treat all water from the dewatering operations as required for removal of sediment prior to discharge.
 - 3. Draw down the static water level a minimum of 2 feet below the bottom of excavations to maintain the undisturbed state of natural soils and allow the placement of any fill to the specified density.
 - 4. Operate dewatering systems continuously until backfill has been completed to 1 foot above the normal static groundwater level.
 - 5. Control the release of groundwater to its static level to prevent disturbance of the natural foundation soils or compacted fill and to prevent flotation or movement of structures or pipelines.
 - 6. Control groundwater to prevent softening of the bottom of excavations, or formation of "quick" conditions. Dewatering systems shall not remove natural soils.
 - 7. Control surface runoff to prevent entry or collection of water in excavations.
 - 8. Discharge water as required in a manner that will not cause erosion or flooding, or otherwise damage existing facilities, completed work, or adjacent property.
- C. Notify Engineer and stop excavation work should the dewatering system not adequately control water within the excavation.
 - 1. Supplement or modify dewatering system and provide other remedial measures to control water within excavation.
 - 2. Demonstrate dewatering system operation complies with performance requirements before resuming excavation operations.
- D. Maintain all equipment in an operable state.
 - 1. Inspect equipment daily and repair or replace as needed.
 - 2. Clean accumulated sediment from basins as needed.
- E. Remove dewatering systems after dewatering operations are discontinued.
 - 1. Repair damage caused by dewatering systems or resulting from failure of systems to protect property.

END OF SECTION 31 23 19

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SECTION 31 41 00

SHORING AND TRENCH SAFETY

PART 1 GENERAL

1.01. SUMMARY OF SECTION

- A. Principle items specified herein are:
 - 1. Shoring required for general safety, worker protection, and protection of adjacent property from the hazards of caving ground.
 - 2. Trench excavations
 - 3. Structural excavations

1.02. MEASUREMENT AND PAYMENT

- A. Measurement and payment for Shoring and Trench Safety shall be included in the Bid Item to which it relates. No additional measurement or payment will be included for the requirements of this section.

1.03. RELATED SECTIONS

Related work specified in other sections:

- A. General Conditions, Section B-53 – Protection of Person and Property
- B. Section 03 48 00 – Precast Concrete Utility Boxes
- C. Section 31 00 00 – Earthwork
- D. Section 31 23 19 – Dewatering

1.04. REFERENCED CODES AND SPECIFICATIONS

The following standards apply:

- A. Cal/OSHA, State of California Administrative Code, Title 8; Industrial Relations, Chapter 4, Subchapter 4, Construction Safety Orders.
- B. Occupational Safety and Health Administration (OSHA) Regulations, 29 CFR Part 1926 Subpart P - Excavations.
- C. Where any of these are in conflict, the more stringent requirements shall be adhered to.

1.05. CONTRACTOR'S RESPONSIBILITIES FOR SAFETY

- A. The Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons (including employees) and property during performance of the Work. This requirement shall apply continuously and not be limited to normal working hours.

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- B. The duty of the Owner and Engineer to conduct construction review of the Contractor's performance is not intended to include a review or approval of the adequacy of the Contractor's safety supervisor, the safety program, or any safety measures taken in, on, or near the construction site.
- C. The Owner and Engineer will review the submittal of the Contractor's proposed shoring system to verify the general scope of the Work, to determine that qualified professional engineering services are used and to determine that appropriate construction techniques are proposed for use. This review shall not in any way be construed to relieve the Contractor from sole responsibility for the design and safety of such shoring.
- D. The Contractor shall appoint a supervisory employee who shall be responsible for determining which of the engineered shoring systems (if alternates are provided) shall be used depending on local soil type, water table, etc.

1.06. PERMIT

- A. For trenches or excavations five feet or more in depth, obtain from the State Division of Industrial Safety a permit for such excavation; submit a copy of the permit to the Engineer, prior to initiating any work requiring said permit.

1.07. SAFETY ORDERS

- A. The Contractor shall have copies or suitable extracts of the Construction Safety Orders of Cal-OSHA at the worksite.
- B. All work shall comply with the provisions of these and all other applicable laws, ordinances and regulations.

1.08. SUBMITTALS

Submit the following in accordance with Section 01 33 00 – Submittal Procedures:

- A. Trench Safety Plan:
 - 1. For trenches or excavations five feet or more in depth, the Contractor shall submit to the Engineer a detailed plan design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazards of caving ground. The design shall be coordinated with the dewatering plan (Section 31 23 19). Such plans shall be submitted at least ten (10) working days before the Contractor intends to begin trenching or excavation work. Submittal shall be for trench work and work at vaults, horizontal directional drilling entry/exit points, and other cuts 5 feet or more in depth. NOTE: Water table and moisture content will vary with rainfall and cause varying soil strength.
 - 2. Groundwater may be present in trench backfill of existing utilities. Contractor shall design shoring and dewatering systems to mitigate against washout of materials from existing utility trenches. Reconstruction of the structural section of the road will be completed at the Contractor's expense.
 - 3. The trench safety plan shall be prepared, stamped, and signed by a civil or structural engineer registered in California. Stamped and sealed copies of calculations necessary to obtain approval of the systems shall be submitted also. These plans shall be available at all times at the job site.

4. Nothing herein shall be deemed to allow the use of a shoring, sloping, or protective system less effective than that required by the Construction Safety Orders of the Division of Industrial Safety.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01. REMOVAL OF SHORING

- A. Removal of shoring shall not damage pipe or structures, cause settlement or heave the ground surface, or produce vibrations that could damage adjacent pipe or structures.
- B. Minimum compaction requirements must be met after shoring is removed.

PART 4 TESTING

No field testing is required.

END OF SECTION 31 41 00

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SECTION 32 12 00

PAVING SYSTEMS

PART 1 GENERAL

1.01. DESCRIPTION

- A. Work covered in this section consists of performing all operations necessary to repair paved areas affected by Contractor's operations. Items covered under this section include subgrade preparation, base, aggregate base, and Hot Mix Asphalt (HMA) paving.
- B. General intent: All paved surfaces shall be replaced in a manner which will result in a surface equal to or better than that existing prior to construction operations. Asphalt paving shall be replaced with a minimum thickness of 0.25'. See details on the Contract Drawings.

1.02. MEASUREMENT AND PAYMENT

- A. Measurement and payment for paving shall be included in the bid item to which it relates. No additional measurement or payment will be included for the requirements of this section.
- B. Class II aggregate base will be paid for under other pertinent bid items. No additional measurement and payment will be included for the installation of Class II aggregate base as it pertains to paving.
- C. Section 31 00 00 – Earthwork

1.03. REFERENCES

- A. State of California, Business and Transportation Agency, Department of Transportation (Caltrans), Standard Specifications, latest edition excluding measurement and payment items.
- B. State of California, Business and Transportation Agency, Department of Transportation (Caltrans), Standard Plans.

1.04. QUALITY ASSURANCE

- A. Qualifications of workers: Provide sufficient skilled workers and supervisors who shall be present at all times during execution of this portion of the Work and who shall be thoroughly familiar with the type of construction involved and the materials and techniques specified.

1.05. SUBMITTALS

- A. Contractor shall submit samples of aggregate base, crushed rock, and aggregate for asphalt concrete prior to actual construction. Periodic tests of the material may also be made during construction. Contractor shall submit in written certifications materials testing reports, job-mix formulas, and other pertinent information demonstrating that materials and methods comply with the Contract requirements.
- B. Hot Mix Asphalt (HMA) Mix Design a minimum of two weeks prior to pavement.

1.06. PRODUCT HANDLING

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- A. All products described herein shall be handled in conformance with the applicable provisions of the Caltrans Standard Specifications.
- B. Submit load slips for asphalt concrete to Engineer.

PART 2 PRODUCTS

2.01. AGGREGATE BASE

- A. Aggregate Base shall be per Section 26 of the Caltrans Standard Specifications.
- B. Aggregate Base shall be placed on an unyielding excavated and drained subgrade. All aggregate base backfill subgrade shall be compacted to a relative compaction of 95%.
- C. Aggregate base shall be Class 2, 1/2 inch maximum grading conforming to Section 26 of Caltrans Standard Specifications.
 - 1. Add to section 26-1.02 B of the Caltrans Standard Specifications:
 - a. The aggregate shall have at least 50% crushed particles with at least one fractured face.

2.02. PAINT BINDER (TACK COAT)

- A. Paint binder shall conform to Section 39-4 of Caltrans Standard Specifications.
- B. Tack coat if utilized shall be emulsified asphalt Grade, SS1, and shall conform to Section 94, "Asphaltic Emulsions", of the State Standard Specifications.

2.03. HOT MIX ASPHALT

- A. Asphalt concrete Type B shall be per Section 39-1.01 of the Caltrans Standard Specifications.
- B. Asphalt binder per Section 39-1.02C of the Caltrans Standard Specifications
 - 1. Liquid anti-stripping agent (LAS) shall be added to the asphalt binder at a rate of 0.5% by weight of asphalt binder. The LAS shall be AD-here LOF 65-00 or equivalent, and shall be stored, measured, and blended with the asphalt binder in accordance with the anti-stripping agent manufacturer's recommended practice. The LAS can be added at the asphalt plant or at the refinery. When added at the asphalt plant, the equipment shall indicate and record the amount of LAS added. If added at the refinery, the shipping ticket from the refinery shall certify the type and amount of LAS added.
 - 2. Add to section 39-1.02C of the Caltrans Standard Specifications:
 - a. Asphalt Binder used in HMA Type B must be PG 64-16.
- C. Aggregate per Section 39-1.02E of the Caltrans Standard Specifications:
 - 1. Add to section 39-1.02E of the Caltrans Standard Specifications:
 - a. Aggregate used in HMA Type B must comply with ½-inch HMA Types A and B gradations.

- D. The asphalt concrete mixture, for asphalt concrete surface and asphalt concrete base, shall conform to the following requirements:
1. Minimum tensile strength ratio (TSR) of 70, and a minimum dry tensile strength of 65 pounds per square inch, based on California Test Method 371.
 2. At any time during the first 12 months from the time of placement of the asphalt concrete, the surface shall be visually inspected by the District. If signs of stripping of binder from aggregate or loss of aggregate is apparent, the District shall core the asphalt concrete surface. The core samples shall be tested for TSR. Asphalt concrete with a TSR less than 70 shall be remediated by the Contractor as required by the Engineer.
 3. An HMA mix design shall be submitted to the Engineer two weeks prior to the commencement of paving operations.

PART 3

PART 3 EXECUTION

3.01. PROTECTION OF EXISTING PAVED SURFACES

- A. During the entire construction period, the Contractor shall take care to protect existing pavement and sealed surfaces. Backhoes and trenchers must have street pads. Metal tipped pads will not be allowed. Surfaces scarred by cleanup or excavation equipment shall be repaired in a manner satisfactory to the Engineer. Any and all damage caused by the Contractor's operations to existing roads and streets shall be repaired by the Contractor to at least the original condition and to the satisfaction of the Engineer, at no additional cost to the Owner.
- B. If pavement is damaged due to excessive loading near the trench wall causing openings in the pavement, full depth structural section replacement will be required as directed by the Owner. If pavement restoration comes to within 4 feet from the edge of the pavement, pavement shall be replaced to the edge of pavement.

3.02. PAVING REMOVAL

- A. Sawcutting shall be required for all paved surfaces.

3.03. AGGREGATE BASE

- A. Aggregate base shall be spread and compacted according to Caltrans Standard Specification Section 26. Compact to 95 percent relative compaction.

3.04. PAINT BINDER (TACK COAT)

- A. Paint binder application shall conform to the provisions of Section 39 of the Caltrans Standard Specifications. Areas to be primed are all areas to be paved. Paint binder shall be used on existing asphalt and concrete surfaces.
- B. Where temporary paving has been removed, the Contractor shall re-compact. A tack coat shall be applied to all existing or temporary pavement that will be in contact with the final pavement.

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- C. Apply paint binder at 0.10 gallons per square yard over existing paved areas.
- D. The cost of applying tack coat will be included in the Contract Price and no additional compensation will be allowed therefor.

3.05. HOT MIX ASPHALT SURFACING

- A. Paving shall be conducted in accordance with the requirements listed in Section 39 of the Caltrans Standard Specifications.
- B. Place asphalt within eight (8) hours of applying primer or tack coat.
- C. Paving shall be done under suitable weather conditions for such operations. Temperature shall be as specified in Section 39-3.04 of the Caltrans Standard Specifications. Rain, snow or other inclement weather will be cause for discontinuing paving Work. The Engineer shall have the authority for determining whether weather conditions are sufficient cause to discontinue paving.
- D. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- E. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.06. TRENCH PATCHING

- A. All trench patches shall conform to the Contract Drawings and Caltrans Standard Specifications.

3.07. MAINTENANCE

- A. Until the permanent pavement is placed, the base rock or temporary asphaltic plant mix at the surface of the trench/excavated area shall be maintained at all times at a grade level with the adjacent pavement. Continuous inspection and maintenance of the excavated area will be required. Lights and barriers shall be maintained on all Work that is not safe for travel until such time as is made safe.

3.08. CONTRACTOR'S RESPONSIBILITY

- A. Settlement of replaced pavement over trenches/excavated areas within the 12-month warranty period shall be considered the result of improper or inadequate compaction of the subbase or base materials. The Contractor shall promptly repair all pavement deficiencies noted during the warranty period.

END OF SECTION 32 12 00

SECTION 32 31 13

FENCES AND GATES

PART 1: GENERAL

1.01 SUMMARY

- A. Section includes: 1) Fence framework, fabric, and accessories; 2) Excavation for post bases; 3) Concrete foundation for posts and center drop for gates; and 4) Manual gates and related hardware.

1.02 RELATED SECTIONS

Related work specified in other sections:

- A. Section 03 30 00 - Cast-in-Place Concrete

1.03 REFERENCE CODES AND STANDARDS

The following Standards apply:

- A. ASTM International (ASTM):
1. ASTM A121 - Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.
 2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 4. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
 5. ASTM A491 - Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
 6. ASTM A817 - Standard Specification for Metallic-Coated Steel Wire for Chain-Link Fence Fabric and Marcellled Tension Wire.
 7. A1011/A1011M-07 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
 8. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
 9. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
 10. ASTM F552 - Standard Terminology relating to Chain Link Fencing.
 11. ASTM F567 - Standard Practice for Installation of Chain-Link Fence.
 12. ASTM F626 - Standard Specification for Fence Fittings.
 13. ASTM F668 - Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric.

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14. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates.
15. ASTM F934 - Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
16. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
17. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
18. ASTM F1183 - Standard Specification for Aluminum Alloy Chain Link Fence Fabric.
19. ASTM F1184 - Standard Specification for Industrial and Commercial Horizontal Slide Gates.
20. ASTM F1345 - Standard Specification for Zinc - 5% Aluminum -Mischmetal Alloy-Coated Steel Chain-Link Fence Fabric.

1.04 SUBMITTALS

Submit the following in accordance with Section 01 33 00 Submittal Procedures:

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
- C. Product Data: Submit data on materials, posts, accessories, installation instructions, fittings and hardware.

1.05 SYSTEM DESCRIPTION

- A. Fence Height: as indicated on Drawings.
- B. Line Post Spacing: as indicated on Drawings.

1.06 QUALITY ASSURANCE

- A. Perform installation in accordance with ASTM F567.
- B. Perform Work in accordance with specified standards.
- C. Maintain one copy of each document on site.

1.07 QUALIFICATIONS

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

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.
- B. Identify each package with manufacturer's name.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Framing (Steel): ASTM F1083 Schedule 40 galvanized steel pipe, welded construction, minimum yield strength of 25 ksi; coating conforming to ASTM F1043 Type A on pipe exterior and interior.
- B. Concrete: Type specified in Section 03 30 00.

2.02 GATES

- A. General:
 - 1. Gate Types, Opening Widths and Directions of Operation: As indicated on Drawings.
 - 2. Factory assemble gates.
 - 3. Design gates for operation by one person.

2.03 FINISHES

- A. Components: Galvanized to ASTM A153/A153M, 2.0 oz/sq ft coating.
- B. Hardware: Galvanized to ASTM A153/A153M, 2.0 oz/sq ft coating.
- C. Accessories: Galvanized to ASTM A153/A153M, 2.0 oz/sq ft coating.

PART 3: EXECUTION

3.01 INSTALLATION

- A. Install framework, accessories and gates in accordance with manufacturer's instructions.
- B. Fence shall be erected in straight lines between angle points in accordance with manufacturer's recommendations, these Specifications, and the Drawings.
- C. Support gates from gate posts. Do not attach hinged side of gate from building wall.
- D. Install posts with 6 inches maximum clear opening from end posts to buildings, fences and other structures.
- E. Excavate holes for posts to diameter and spacing indicated on Drawings without disturbing underlying materials.
- F.

3.02 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Control: Tolerances.
- B. Maximum Variation From Plumb: 1/4 inch.
- C. Maximum Offset From Indicated Position: 1 inch.
- D. Minimum distance from property line: 6 inches.

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PART 4: TESTING [NOT USED]

END OF SECTION 32 31 13

PART 5
APPENDICES

Appendix A
Geotechnical Investigation: 12 kV Switchgear Relocation



Geotechnical Investigation

12kV Switchgear Relocation

Humboldt County, CA

Humboldt Bay Municipal
Water District





August 23, 2019

Mr. John Friedenbach
Humboldt Bay Municipal Water District
828 Seventh Street
Eureka, California 95501

**RE: Geotechnical Investigation
12kV Switchgear Relocation
Humboldt County, California**

Dear Mr. Friedenbach,

GHD is pleased to present the attached report containing the results of our geotechnical investigation for the proposed 12 kV Switchgear Relocation in Humboldt County, California. It is our understanding that the proposed project includes placing a 12kV Switchgear utility system to replace the current system. The planned improvement will require constructing a concrete slab, enclosure, conduits and wiring.

The accompanying report presents our findings, conclusions, and recommendations developed from our geotechnical investigation. Contained in the report are geotechnical design criteria and recommendations for design and construction of the proposed improvements. The results of the subsurface exploration and laboratory testing programs, which form the basis of our recommendations, are also included in the report. On the basis of our investigation, the site is suitable, from a geotechnical perspective, to receive the planned improvements provided the recommendations presented in the report are incorporated into the design and construction of the project.

If you have any questions regarding the information contained in this report, or if we may be of further assistance, please do not hesitate to contact us.

Sincerely,
GHD Inc.

Eric S. Smith P.E.
Project Engineer

Christopher D. Trumbull, P.E., G.E., D.GE
Senior Geotechnical Engineer





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Appendix C	Geotechnical Laboratory Test Results



Distribution

To: Humboldt Bay Municipal Water District

John Friedenbach

828 Seventh Street

Eureka, CA 95501

From: GHD

Christopher Trumbull, P.E., G.E., D.GE

Eric S. Smith, P.E.

4080 Plaza Goldorado Circle, Suite B

Cameron Park, CA 95682



1. Introduction

This report presents the findings, conclusions, and recommendations developed from a geotechnical engineering investigation for the 12kV Switchgear Replacement Project in Humboldt County, California. The investigation was conducted in accordance with a Standard Form Agreement between Humboldt Bay Municipal Water District and GHD Inc. dated November 15, 2018.

1.1 Project Description

The Project is located at the Humboldt Bay Municipal Water District, Essex Control Facility in Humboldt County, California, as shown on Figure A-1 Vicinity Map. Our understanding of the proposed project includes installing a new switchgear approximately 80 feet to the southeast of the existing switchgear. The project will require constructing an approximately 15 x 35 foot concrete slab, concrete ramp or stairs, a vault structure, enclosure, and new service drop down. Earthwork is expected to consist of 1 to 3 feet of cut and fill.

1.2 Purpose and Scope of Work

The purpose of this study was to evaluate the suitability of the project site from a geotechnical perspective for the proposed improvements. The main objectives of the investigation were to characterize the subsurface materials, perform engineering analyses, develop geotechnical recommendations and criteria, and document our findings, conclusions, and recommendations in this report.

The scope of the geotechnical investigation included the following tasks:

- A review of published geologic and geotechnical material pertaining to the site vicinity
- A field exploration program consisting of two exploratory boring drilled to an approximate depth of 16½ feet below ground surface (bgs)
- Geotechnical laboratory testing on select soil samples collected from the boring
- Engineering analyses to develop geotechnical design criteria and recommendations for the proposed project
- Preparation of this report

2. Field Exploration and Laboratory Testing

2.1 Field Exploration

The field exploration was performed on July 26, 2019 and included the drilling of two exploratory test borings at the approximate location shown on Figure A-2, Exploration Map, included in the Appendix. A representative of GHD was present to observe the drilling and log the borings.



The borings were located in the field based on estimated distances from existing features and aerial maps. The borings were drilled to a maximum depth of approximately 16½ feet bgs utilizing a trailer-mounted drill rig equipped with 4-inch-diameter solid-flight augers. As drilling proceeded, relatively undisturbed samples were obtained by driving a 3-inch O.D., Modified California split-spoon sampler into the boring bottom in accordance with ASTM D3550. The sampler was driven into the in-situ soils under the impact of an automatic hammer with a weight of 140 pounds and a drop of 30 inches. The number of blows required for each 6-inch increment of drive were recorded and the cumulative blow count for the 12 inches of drive (following the first 6 inches of “seating” drive), or fraction thereof where resistance was encountered, is presented in the logs of borings. The blow counts presented in the logs are uncorrected and shown as they were recorded in the field. Both the samples and drill cuttings were visually classified in the field based on the Unified Soil Classification System (USCS) in general accordance with ASTM D2488.

The standardized N_{60} value is also presented and is calculated based on field blow counts and coefficients for hammer energy correction to normalize the automatic hammer blow count to the energy of the original SPT rope and cathead hammer (approximately 60 percent), borehole diameter to normalize the blow count for the diameter of the borehole, sampler type to account for the type of sampler and the presence of liners, and rod length to normalize the blow count to a standard length of 33 feet.

Subsurface conditions encountered are summarized in Section 3.3. Logs of the boring were prepared based on the field logging, visual examination of the soil samples, and the results of laboratory testing in general accordance with ASTM D2487. The soil boring key and the logs of borings are presented in Appendix B.

2.2 Geotechnical Laboratory Testing

Laboratory testing was conducted on disturbed soil samples recovered during the site investigation. Tests conducted include the following:

- Standard Test Method for Particle-Size Analysis of Soils (ASTM D422)
- Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass (ASTM D2216)
- Standard Test Methods for Laboratory Determination of Density (Unit Weight) of Soil Specimens (ASTM D7263)
- Method of Testing Soils and Waters for Sulfate Content (CTM 417)
- Method of Testing Soils and Waters for Chloride Content (CTM 422)
- Method for Determining Field and Laboratory Resistivity and pH Measurements for Soil and Water (CTM 643)
- Standard Test Method for Measurement of Oxidation-Reduction Potential (ORP) of Soil (ASTM G200)
- Sulfate Reducing Bacteria (AWWA C105/A25.5)

Laboratory test results are presented in Appendix C.



3. Geologic and Subsurface Conditions

3.1 Site Description

The municipal water district facility is located northeast of Arcata, along the south bank of the Mad River and north of West End Road in Humboldt County, California as shown on Figure 1, "Vicinity Map" in Appendix A. The project site for the planned improvements is situated on a vacant area located on the rear south side of the existing facility and adjacent to the asphalt paved public county road. The topography of the site consists of a relatively level bench area and then slopes downward toward the north, at an approximate 2:1 (H:V) slope, dropping 10 to 15 vertical feet. Vegetation on the site consists of several mature trees, overgrown brush and weeds, and native grass. The general vicinity is moderately rural with surrounding woodlands and sparsely separated single-family residences.

3.2 General Geology and Faulting

The site is located along the south bank of the Mad River. The referenced geologic deposits for the site are mapped as late Pleistocene and middle Miocene aged marine and non-marine overlap deposits and late and early Cretaceous and late Jurassic aged Melange deposits (McLaughlin, et. al. 2000). The marine and non-marine deposits consist of thin-bedded to massive, weakly lithified siltstone, fine-to medium-grained sandstone, silty to diatomaceous mudstone and locally soft, scaly mudstone. Locally includes lenses of pebble to boulder conglomerate, carbonate concretions, abundant molluscan fossils, woody debris, and horizons of rhyolitic volcanic ash. Melange deposits consist of subequal amounts of metasandstone and meta-argillite. The subsurface deposits encountered during our exploration general resemble the mapped deposits.

Based on our review of the USGS Quaternary Fault and Fold Database, the nearest active faults displaying recent (Holocene) movement is the Mad River fault zone located approximately 185 feet south and the Bald Mountain-Big Lagoon fault zone located 6.5 miles north. The project site is not located within an Alquist-Priolo Earthquake Fault Zone.

3.3 Subsurface Conditions

Based on our field exploration and laboratory analysis, the subsurface materials generally consist of an assortment of sand, silty, clay and gravel. At the surface and extending 1½ to 8 feet bgs the material consist of medium dense, low plastic, poorly graded silty sand with gravel, underlain by medium dense, gravel with sand and silty and stiff to very stiff lean clay with sand and gravel until boring termination 16½ feet bgs. Detailed descriptions of the subsurface materials encountered are presented in the logs of borings in Appendix B.

3.4 Groundwater Conditions

Free groundwater was not encountered at the time of drilling. However, due to the proximity to Mad River, Humboldt Bay and the Pacific Ocean, fluctuations in groundwater depths can vary due to river level, seasonal rainfalls, and subsurface stratifications. Groundwater presence and dewatering



is not expected to be an issue during construction, but recommendations can be provided if necessary.

4. Conclusions

On the basis of this investigation, the site is suitable, from a geotechnical perspective, to receive the planned improvements provided the recommendations presented in the report are incorporated into the design and construction of the project.

4.1 Ground Shaking

The site is located at 40.907 latitude, -124.055 longitude in an area generally characterized as having high seismicity, and strong ground shaking should be expected during seismic events. The SEAOC/OSHPD Seismic Design Maps website was used with ASCE 7-10 provisions, risk category IV, and Site Class “D” (stiff soil) to generate the Peak Ground Acceleration (PGA) for the site location. Results indicate the site-modified PGA is 1.2g for the maximum credible earthquake.

4.2 Corrosion

A soils corrosivity analysis was performed to assist in estimating the potential for deterioration of buried ferrous metals and concrete. Corrosion testing was performed on a sample from Boring B-1, and the results are summarized in Table 4.1. Detailed laboratory results are included in Appendix C.

Table 4.1 Soil Corrosion Results

Sample No.	Depth (ft)	pH	Minimum Resistivity (ohm-cm)	Water Soluble Sulfates (ppm)	Water Soluble Chlorides (ppm)	Redox Potential (mV)
1-1	5	5.81	5000.0	4.1	1.2	(+) 194

4.2.1 Corrosion Potential for Ferrous Metals

To evaluate the potential for external corrosion potential on ferrous metals from soil, the 10-point system in C105/A21.5 (ANSI/AWWA 1999) was used, which resulted in 1 point for the sample analyzed. The long life of historical unprotected pipe in soil with less than 10 points indicates a non-corrosive environment (AWWA 2005) to ferrous metals.

4.2.2 Corrosion Potential for Reinforced Concrete

According to ACI 318, a sulfate concentration of less than 1,000 parts per million is considered “not applicable.” Reinforced concrete exposed to elevated levels of water soluble chlorides should be designed to minimize potential intrusion of chloride ions to the reinforcing steel per ACI 318; this is not anticipated to be an issue for the current project.



4.2.3 Summary of Results

The provided corrosion test results are only an indicator of potential soil corrosivity for the sample tested at the selected depth interval. It is possible that corrosion potential can vary by sample location and depth. Based on the results of the tested sample, the soil may be generally characterized as noncorrosive toward ferrous metals. A detailed analysis of the corrosion test results was not included in the scope of services and is, therefore, not included in this report. If a detailed analysis of the corrosion test results is needed, a corrosion engineer should be consulted.

5. Recommendations

5.1 Earthwork

5.1.1 Site Preparation

Site preparation should include stripping of surface vegetation, including the root zone, in proposed fill placement areas or improvement areas. Proposed fill placement should be placed and compacted as recommended in this report. Voids or depressions created by the removal of buried objects and tree roots should be cleaned of all loose soil and debris and backfilled with engineered fill, placed and compacted as described below.

5.1.2 General Subgrade Preparation

To provide uniform support for the proposed improvements, the subgrade in all areas to receive structural improvements, including engineered fill and structure foundations, should be scarified to a depth of at least 8 inches, moisture conditioned as necessary, and compacted as engineered fill. Any soft or loose subgrade should be excavated to firm, native material and replaced with engineered fill. Upon completion of subgrade preparation, engineered fill should be placed as described below. Fill on slopes should be placed with a keyway and benched as described below. In addition, for the construction of the proposed stairway or ramp structure, preparation of the subgrade should contain a keyway excavated a minimum of 8-inches deep at the bottom step or toe of the structure, with a gradient of no less than 5 percent.

5.1.3 Engineered Fill

Engineered fill should consist of a homogenous mixture of soil and rock free of vegetation, organic material, rubbish, and/or rubble. Highly plastic or organic soils should not be used for engineered fill but may be placed in landscape areas. It is anticipated that most of the soil generated from onsite excavations should be suitable for use as engineered fill.

Imported materials to be used as engineered fill should meet the specifications listed in the table below. GHD should be provided test results and observe and approve import fill submittals in writing prior to the material being brought on site.



Table 5.1 Import Fill Specifications

Atterberg Limits (ASTM D4318)	Particle Size (ASTM C136 or D422)
PI < 15 LL < 40	100% passing the 6-inch sieve minimum of 85% passing the 2½ inch sieve maximum of 30% passing the #200 sieve

5.1.4 Benching and Keying Fills

For fills placed on slopes, the following recommendations apply. Slopes with inclinations of 6:1 (H:V) or steeper should be benched during placement of engineered fill. The benches should consist of a level surface excavated at least 4 feet horizontally into native subgrade. The benches should continue progressively up the slope at vertical increments of not greater than 3 feet. Fill placed on slopes that are steeper than 4:1 (H:V) should be keyed into firm native soil or weathered rock at the toe of the fill slope. The bottom of the keyway should extend a minimum of 3 feet below downslope grade and have a minimum width of 10 feet (extending beneath the toe of the fill slope with a gradient of no less than 5 percent). Sub-drainage of the keyways may be necessary and should be determined by GHD in the field at the time of construction.

5.1.5 Compaction

Engineered fill should be moisture conditioned as necessary, placed in horizontal loose lifts not exceeding 8 inches in thickness, and compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM D1557 for fills less than 5 feet in thickness. For fills thicker than 5 feet, fill should be compacted to 95 percent of the maximum dry density as determined by ASTM D1557. Placement of fill material should be verified by a GHD representative on a continuous basis. Nuclear density testing should be performed at a frequency of one per 5,000 cubic yards.

5.1.6 Fill Slopes

Fill slopes should be constructed at an inclination no steeper than 2:1 (H:V), should be laterally over-built at least one foot, and the slope face trimmed back to firm, compacted material.

5.1.7 Cut Slopes

Cut slopes should be excavated as not to exceed a 2:1 (H:V) inclination. A v-ditch should be constructed above cut slopes to prevent water from entering and potentially entering the cut slope area.

5.1.8 Trench Backfill and Pipe Bedding

Trench backfill should meet the engineered fill specifications detailed in Table 5.1. Trench backfill should be placed in lifts not exceeding 12 inches in thickness and compacted to 95 percent of ASTM D1557 by mechanical means only (no jetting). Pipe bedding should conform to the pipe manufacturer's or Civil Engineer's recommendations. Trench backfill should be tested every lift at a frequency of 300 linear feet per lift.



5.2 Foundations

5.2.1 Mat Foundation

The proposed improvements may be supported on a mat foundation with a minimum depth of 6 inches bgs. The foundation should be designed using allowable bearing capacities of 3,000 pounds per square foot (psf) for dead loads and 4,000 psf for dead plus live loads (an ultimate bearing capacity of 9,000 psf). The allowable bearing capacity can be increased by one-third for all loads including wind and seismic provided the requirements of the CBC are met. The total settlement is anticipated to be less than 1 inch, with differential settlement of ½ inch over 20 feet.

5.2.2 Passive Resistance

Passive earth resistance or passive earth pressure is the amount of resistance provided by the soil in response to a movement of a structure resulting in a compressive force upon the soil. A passive earth pressure of 300 pounds per cubic foot (pcf) should be used if. A friction coefficient of 0.3 is recommended. If the structure is poured against neatly excavated soil without the use of forms, both the friction coefficient and the passive resistance may be used in design. Passive earth pressures provided herein assume that the zone of interest is above the groundwater table and on a relatively level surface. If a structure is above a 2:1 slope projected from the bottom of the footing, the passive pressure will be translated to the structure.

5.2.3 Modulus of Subgrade Reaction

The modulus of subgrade reaction of 200 pounds per cubic inch may be used for the foundation design.

5.2.4 Foundation Excavation Observation

GHD geotechnical staff should observe all foundation excavations prior to placing reinforcing steel or concrete to verify that the structures are founded on the appropriate materials.

5.3 Seismic Design

The seismic design criteria for the site listed in the table below were developed in accordance with ASCE 7-10 based on the subsurface information obtained from the geotechnical investigation and the SEAOC/OSHPD website.

Table 5.2 Seismic Design Criteria

Parameter	Recommended Value	Reference (ASCE 7-10)
Site Class	D	Table 20.3-1
Risk Category	IV	Table 1.5-1
Mapped MCE spectral response at short period (S_s)	2.925	Figure 22-1
Mapped MCE spectral response at 1 sec period (S_1)	1.157	Figure 22-2
Site coefficient (F_a)	1.0	Table 11.4-1
Site coefficient (F_v)	1.5	Table 11.4-2



Table 5.2 Seismic Design Criteria

Parameter	Recommended Value	Reference (ASCE 7-10)
MCE spectral response acceleration for short period (S_{MS})	2.925	Equation 11.4-1
MCE spectral response acceleration for 1 sec period (S_{M1})	1.735	Equation 11.4-2
Design Spectral Acceleration for short period (S_{DS})	1.95	Equation 11.4-3
Design Spectral Acceleration for 1 sec period (S_{D1})	1.157	Equation 11.4-4
Mapped Peak Ground Acceleration	1.209	Figure 22-7

5.4 Surface Drainage and Erosion Control

Drainage around foundations and structures should be constructed in a way such that soils near the structures do not become saturated. In general, all construction surfaces should be graded to drain to prevent water from ponding. Unpaved surfaces adjacent to foundations should be graded no flatter than 2 percent. In the case where an uphill slope exists above the proposed improvement, we recommend adequate draining existing between the toe of slope and proposed improvements to direct runoff around and away from structures such as surface V-ditches or sub-drainage system.

Based on our field borings, the site consists of near surface medium dense sand and gravel on a sloping terrain and may be susceptible to surface erosion or washout. This may include temporary practices such as erosion control fencing and/or straw wattles and permanent solutions consisting of placing hydro-seed for vegetation to grow and establish a root zone. Erosion control measures should be designed by the Civil Engineer and properly implemented by the contractor. Best Management Practices to reduce erosion and transport of soil particles or turbid water into the drainage course flowing from the construction site must be employed. All conditions of existing water quality regulatory agency permits must be adhered to.

5.5 Plan Review and Construction Observation

GHD geotechnical staff should review the project plans and specifications during the construction document phase to evaluate if they are consistent with the recommendations presented herein. The conclusions and recommendations contained in this report are contingent upon GHD being retained to provide intermittent observation and appropriate field and laboratory testing during site preparation to evaluate if the subsurface conditions are as anticipated. If the subsurface conditions are observed to be different from those described in this report, GHD should be notified immediately so that the changed conditions can be evaluated and our recommendations revised, if appropriate. The recommendations in this report are contingent upon prompt notification and review of changed conditions.

6. References

American Society of Civil Engineers. 2010. "ASCE Standard 7-10, Minimum Design Loads for Buildings and Other Structures."



ANSI/AWWA. 1999. "C105/A21.5, American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems."

AWWA. Bonds et al. 2005. "Corrosion and Corrosion Control of Iron Pipe, AWWA Journal 97.6."

California Building Standards Commission. 2016. "2016 California Building Code, California Code of Regulations."

Hart, E.W. and Bryant, W.A. 1997. "Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps," California Department of Conservation, Division of Mines and Geology, Special Publication 42, Interim Revision 2007.

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Structural Engineers Association of California. SEAOC/OSHPD. Visited 7/8/19.

<https://seismicmaps.org>

U.S. Geologic Survey. Unified Hazard Tool. Visited 7/8/19

<https://earthquake.usgs.gov/hazards/interactive/>

7. Limitations

This Geotechnical Investigation ("Report"):

- Has been prepared by GHD for the Humboldt Bay Municipal Water District (District). under the professional supervision of those senior staff whose seals and signatures appear herein
- May only be used and relied on by the District, which is responsible to ensure that all relevant parties to the project, including designers, contractors, subcontractors, etc., are made aware of this report in its entirety
- Must not be copied to, used by, or relied on by any person other than The District without the prior written consent of GHD
- May only be used for the purpose of engineering design of the proposed structures at the project site described in this report and must not be used for any other purpose

GHD and its servants, employees and officers otherwise expressly disclaim responsibility to any person other than The City arising from or in connection with this Report.

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.

The services undertaken by GHD in connection with preparing this Report:

- In regard to site exploration and testing:
 - Site exploration and testing characterizes subsurface conditions only at the locations where the explorations or tests are performed; actual subsurface conditions between



explorations may be different than those described in this report. Variations of subsurface conditions from those analyzed or characterized in this report are not uncommon and may become evident during construction. In addition, changes in the condition of the site can occur over time as a result of either natural processes (such as earthquakes, flooding, or changes in ground water levels) or human activity (such as construction adjacent to the site, dumping of fill, or excavating). If changes to the site's surface or subsurface conditions occur since the performance of the field work described in this report, or if differing subsurface conditions are encountered, we should be contacted immediately to evaluate the differing conditions to assess if the opinions, conclusions, and recommendations provided in this report are still applicable or should be amended.

- In regard to limitations:
 - Our scope of services was limited to the proposed work described in this report, and did not address other items or areas.
 - The geotechnical investigation upon which this report is based was conducted for the proposed structures at the project site described in this report. The conclusions and recommendations contained in this report are not valid for other structures and/or project sites. If the proposed project is modified or relocated, or if the subsurface conditions found during construction differ from those described in this report, GHD should be provided the opportunity to review the new information or changed conditions to determine if our conclusions and recommendations need revision.
- Did not include evaluation or investigation of the presence or absence of wetlands
- Did not include a hazardous material investigation
- Did not include a landslide evaluation
- Did not include a fault investigation

GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect. There is no warranty, either expressed or implied. GHD accepts no liability regarding completeness or accuracy of the information presented and/or provided to us, or any conclusions and decisions which may be made by the client or others regarding the subject site/project. Verification of our conclusions and recommendations is subject to our review of the project plans and specifications, and our observations of construction.

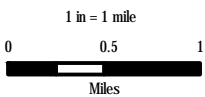
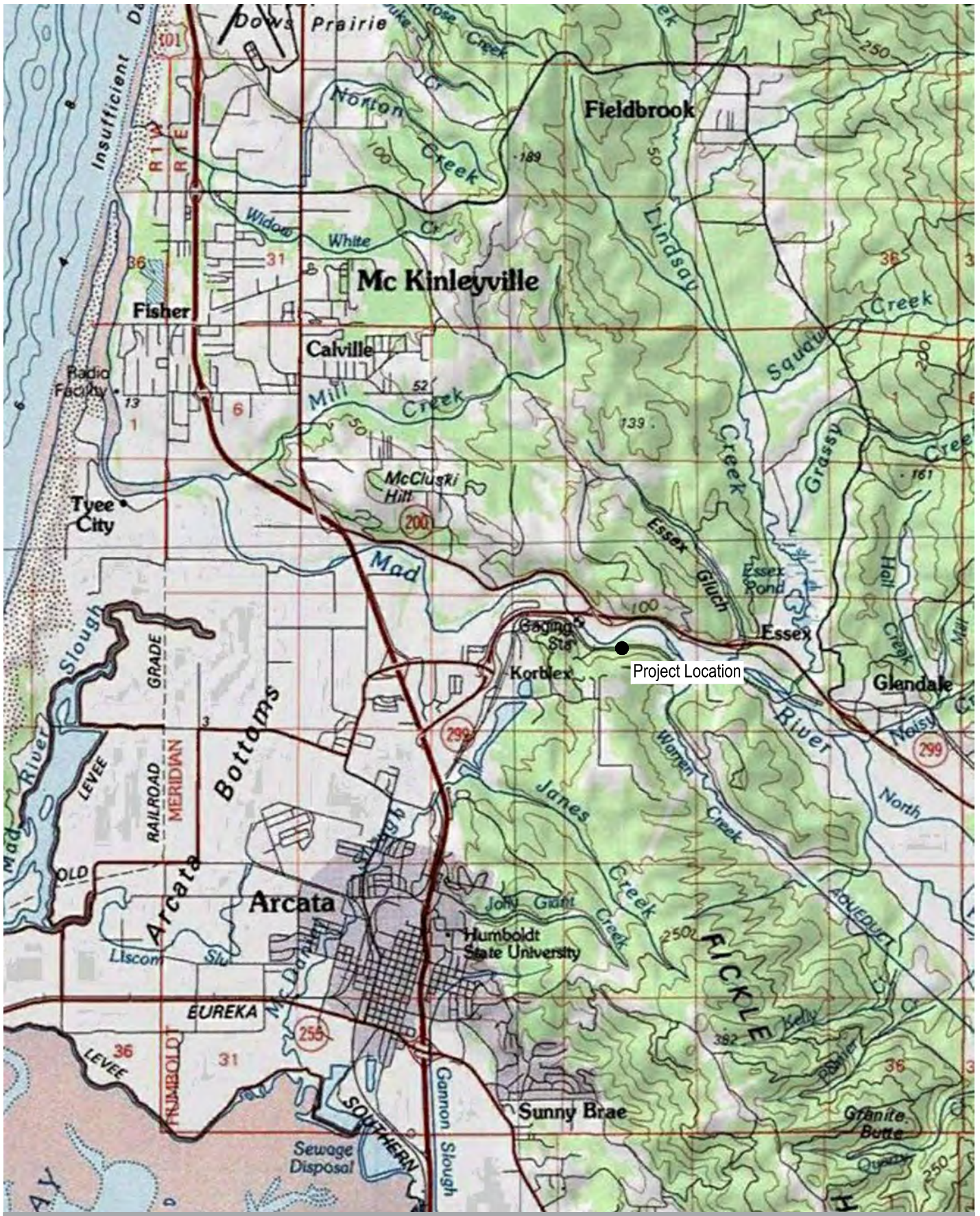
Subject to the paragraphs in this section of the Report, the interpretations of data, findings, conclusions, recommendations and professional opinions in this Report are based on the information reviewed, site conditions encountered, and samples collected during our field exploration and were developed in accordance with generally accepted geotechnical engineering principles and practices and as prescribed by the client. This Report is considered valid for the proposed project for a period of two years from the report date provided that the site conditions and development plans remain unchanged. With the passage of time, changes in the conditions of a property can occur due to natural processes or the works of man on this or adjacent properties. Legislation or the broadening of knowledge may result in changes in applicable standards. Depending on the magnitude of any changes, GHD may require that additional studies (at additional cost) be performed and that an updated report be issued. Additional studies may disclose



information which may significantly modify the findings of this report. GHD will retain untested samples collected during our field investigation for a period not to exceed 60 days unless other arrangements are made with the client. After a period of two years from the report date, GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with those opinions, conclusions and any recommendations.



Appendix A Figures



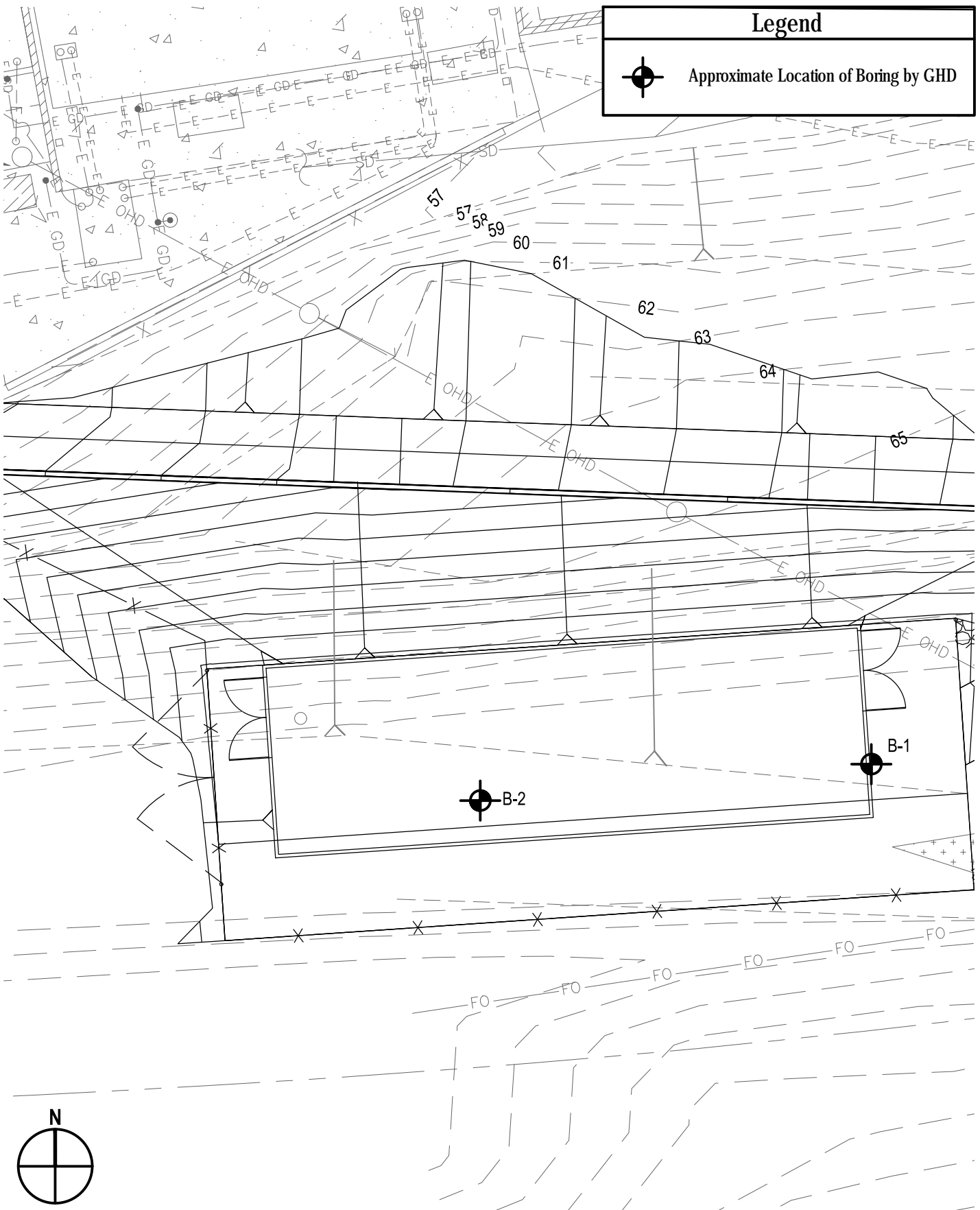
Humboldt Bay Municipal Water District
 12kV Switchgear Relocation
 Humboldt County, California

Project No. 11186675
 Report No. _____
 Date 08/23/2019

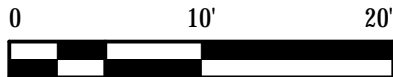
Map Projection: Universal Transverse Mercator
 Horizontal Datum: NAD 1983 2011
 Grid: NAD 1983 2011 State Plane California I

Vicinity Map

Figure A-1



Legend	
	Approximate Location of Boring by GHD



Humboldt Bay Municipal Water District
 12kV Switchgear Relocation
 Humboldt County, California

Project No. 11186675
 Report No. _____
 Date 08/19/2019

Exploration Map

Figure A-2



Appendix B

Logs of Borings

EMPIRICAL CORRELATIONS WITH STANDARD PENETRATION RESISTANCE N VALUES*

	N_{60}^* (Blows/ft)	Consistency	Unconfined Compressive Strength (tons/sq ft)		N_{60}^* (Blows/ft)	Relative Density
FINE GRAINED SOIL	0 - 2	Very Soft	<0.25	COARSE GRAINED SOIL	0 - 4	Very Loose
	3 - 4	Soft	0.25 - 0.50		5 - 10	Loose
	5 - 8	Medium Stiff	0.50 - 1.00		11 - 30	Medium Dense
	9 - 15	Stiff	1.00 - 2.00		31 - 50	Dense
	16 - 30	Very Stiff	2.00 - 4.00		>50	Very Dense
	>30	Hard	>4.00			

*ASTM D 1586; number of blows of 140 pound hammer falling 30 inches to drive a 2-inch-O.D., 1.4-inch-I.D. sampler one foot.

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

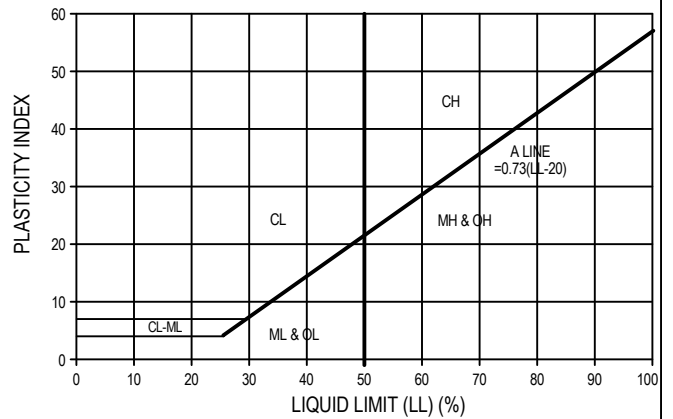
MAJOR DIVISIONS		SYMBOLS	DESCRIPTIONS	
COARSE- GRAINED SOIL	GRAVELS	CLEAN GRAVELS	GW Well-graded Gravels, Gravel - Sand Mixtures, Little Or No Fines	
		<5% Fines	GP Poorly-Graded Gravels, Gravel - Sand Mixtures, Little Or No Fines	
	More Than 50% Of Coarse Fraction Retained On No. 4 Sieve	GRAVELS WITH FINES	>12% Fines	GM Silty Gravels, Gravel - Sand - Silt Mixtures
			>12% Fines	GC Clayey Gravels, Gravel - Sand - Clay Mixtures
		SANDS	CLEAN SANDS	SW Well-Graded Sands, Gravelly Sands, Little Or No Fines
			<5% Fines	SP Poorly-Graded Sands, Gravelly Sand, Little Or No Fines
	More Than 50% Of Material Is Retained On No. 200 Sieve	SANDS WITH FINES	>12% Fines	SM Silty Sands, Sand - Silt Mixtures
			>12% Fines	SC Clayey Sands, Sand - Clay Mixtures
FINE- GRAINED SOIL	SILTS AND CLAYS	LL < 50	ML Inorganic Silts And Very Fine Sands, Rock Flour, Silty Or Clayey Fine Sands Or Clayey Silts With Slight Plasticity	
			CL Inorganic Clays Of Low To Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays	
			OL Organic Silts And Organic Silty Clays Of Low Plasticity	
		LL > 50	MH Inorganic Silts, Micaceous Or Diatomaceous Fine Sand Or Silty Soils	
			CH Inorganic Clays Of High Plasticity	
			OH Organic Clays Of Medium To High Plasticity, Organic Silts	
			PT Peat, Humus, Swamp Soils With High Organic Contents	
HIGHLY ORGANIC SOIL				

Note: Dual Symbols Are Used To Indicate Borderline Soil Classifications

PARTICLE SIZE IDENTIFICATION

U.S. Standard Sieve	200	40	10	4	3/4"	3"	12"
Sils and Clays	Sand			Gravel		Cobbles	Boulders
	fine	medium	coarse	fine	coarse		
Grain Size (mm)	0.074	0.420	2.00	4.76	19.1	76.2	305

PLASTICITY CHART



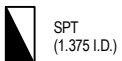
MOISTURE DESCRIPTION

↑
Saturated
Wet
Moist
Damp
Dry

SOIL DESCRIPTION FORMAT

Color, Secondary Component, PRIMARY COMPONENT (USCS), gradation plasticity, with component, trace component, consistency/relative density, moisture, source.

SAMPLE SYMBOLS



SPT
(1.375 I.D.)



California
(2.0-inch I.D.)



Modified California
(2.5-inch I.D.)



Direct Push



Shelby Tube



Rock Core

WELL SYMBOLS



Cement Grout



Bentonite



Filter Sand



Screen in filter sand



Slough

WATER LEVEL SYMBOLS



Water level at time of drilling.



Water level measured at a specified time after drilling and sampling or well completion.

GENERAL NOTES

- Soil classifications are based on the Unified Soil Classification System. Soil descriptions and stratum lines are interpretive, and actual changes may be gradual. Field descriptions may have been modified to reflect results of laboratory tests.
- Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations.

ABBREVIATIONS

CD = TX-CD	NR = No Recovery
CN = Consolidation	PR = Permeability
CR = Corrosivity	RV = R-Value
CU = TX-CU	TC = Cyclic Triaxial
DS = Direct Shear	UC = Unconfined Compression
EI = Expansion Index	UU = TX-UU (quick)
MDD = Maximum Density	ATD = At Time of Drilling



**Humboldt Bay Municipal Water District
12 kV Swithgear Relocation
Humboldt County, CA**


Project No. 11186675
Revision No.
Date 8/23/2019

Soil Boring Key

Start Date: 7/26/19		Total Depth Drilled (ft bgs): 15.0	
Drilling Method: 4-inch Flight Auger	Drilling Contractor: Taber Drilling	Arbitrary Ground Surface Elevation (ft MSL): 72	
Drill Rig: CME-45	Hammer Type/ Efficiency: Automatic Trip/ 60%	Hammer Weight / Drop: 140# / 30"	
Logged By: JCB	Reviewed By: E. Smith	Borehole Backfill: grout	Groundwater Depth (ft): Not Encountered ATD

Remarks:

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N ₆₀	Recovery (in)	Water Content (%)	Dry Density (pcf)
-71	1	Gray brown, poorly graded Silty SAND with Gravel (SM), fine -to-coarse grained, low plasticity, medium dense, damp			1-1	12	20	13		
-70	2					18				
-69	3					18				
-68	4									
-67	5	Light brown gravelly lean CLAY (CL), low plasticity, stiff, damp			1-2	15	17	13		
-66	6					15				
-65	7					15				
-64	8	Brown Lean CLAY (CL), with trace organics, low plasticity, stiff, damp			1-3	11	10	13	11	113
-63	9					10				
-62	10	Light brown Sandy Lean CLAY (CL), low plasticity, fine -to-medium grained sand, stiff, damp			1-4	8	13	16	14	107
-61	11					11				
-60	12					11				
-59	13	Boring Termination @ 15 ft.				10				
-58	14									
-57	15									
-56	16									
-55	17									
-54	18									
-53	19									

	Humboldt Bay Municipal Water District 12 kV Swithgear Relocation Humboldt County, CA	Project No. 11186675 Revision No. Date 8/23/2019
	Log of Boring	B-1

Start Date: 7/26/19		Total Depth Drilled (ft bgs): 16.5	
Drilling Method: 4-inch Flight Auger	Drilling Contractor: Taber Drilling	Arbitrary Ground Surface Elevation (ft MSL): 72	
Drill Rig: CME-45	Hammer Type/ Efficiency: Automatic Trip/ 60%	Hammer Weight / Drop: 140# / 30"	
Logged By: JCB	Reviewed By: E. Smith	Borehole Backfill: grout	Groundwater Depth (ft): Not Encountered ATD

Remarks:

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N ₆₀	Recovery (in)	Water Content (%)	Dry Density (pcf)	% Passing No. 4 Sieve	% Passing No. 200 Sieve
71	1	Brown, poorly graded Silty SAND with Gravel (SM), 1/4 to 1/2 angular gravel, fine -to-coarse grained, low plasticity, medium dense, damp										
70	2	Dark brown, well graded GRAVEL with Silt and Sand (GW), fine -to-coarse grained, low plasticity, medium dense, damp										
69	3				2-1	17 15 16	18	18			48	9
68	4											
67	5	Gray Sandy GRAVEL (GP), course, medium dense, damp										
66	6				2-2	11 15 20	20	14				
65	7											
64	8	Brown Sandy Lean CLAY (CL), fine -to-medium grained sand, low plasticity, hard, damp										
63	9											
62	10											
61	11				2-3	20 28 37	39	18	10	124		
60	12											
59	13											
58	14											
57	15											
56	16				2-4	14 16 19	22	12	16	115		
55	17	Boring Termination @ 16.5 ft.										
54	18											
53	19											



Humboldt Bay Municipal Water District
12 kV Swithgear Relocation
Humboldt County, CA

Project No. 11186675
Revision No.
Date 8/23/2019

Log of Boring



Appendix C

Geotechnical Laboratory Test Results

Boring ID	Depth (ft)	Description	Water Content (%)	Dry Density (pcf)	Maximum Size (mm)	%<#200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index	Other Tests
B-1	9.5	CL, Light brown gravelly lean clay with sand	10.9	113.1						
B-1	14.5	SC, Brown clayey sand with gravel	13.8	107.4						
B-2	3.0	GW, Dark brown well-graded gravel with silt and sand			50	9				
B-2	11.0	CL, Yellow-brown gravelly lean clay with sand	10.2	123.6						
B-2	16.0	SC, Yellow-brown clayey sand with gravel	15.5	114.6						



Humboldt Bay Municipal Water District
12 kV Swithgear Relocation
Humboldt County, CA



Project No. 11186675
Revision No.
Date 8/23/2019

Summary of Laboratory Results

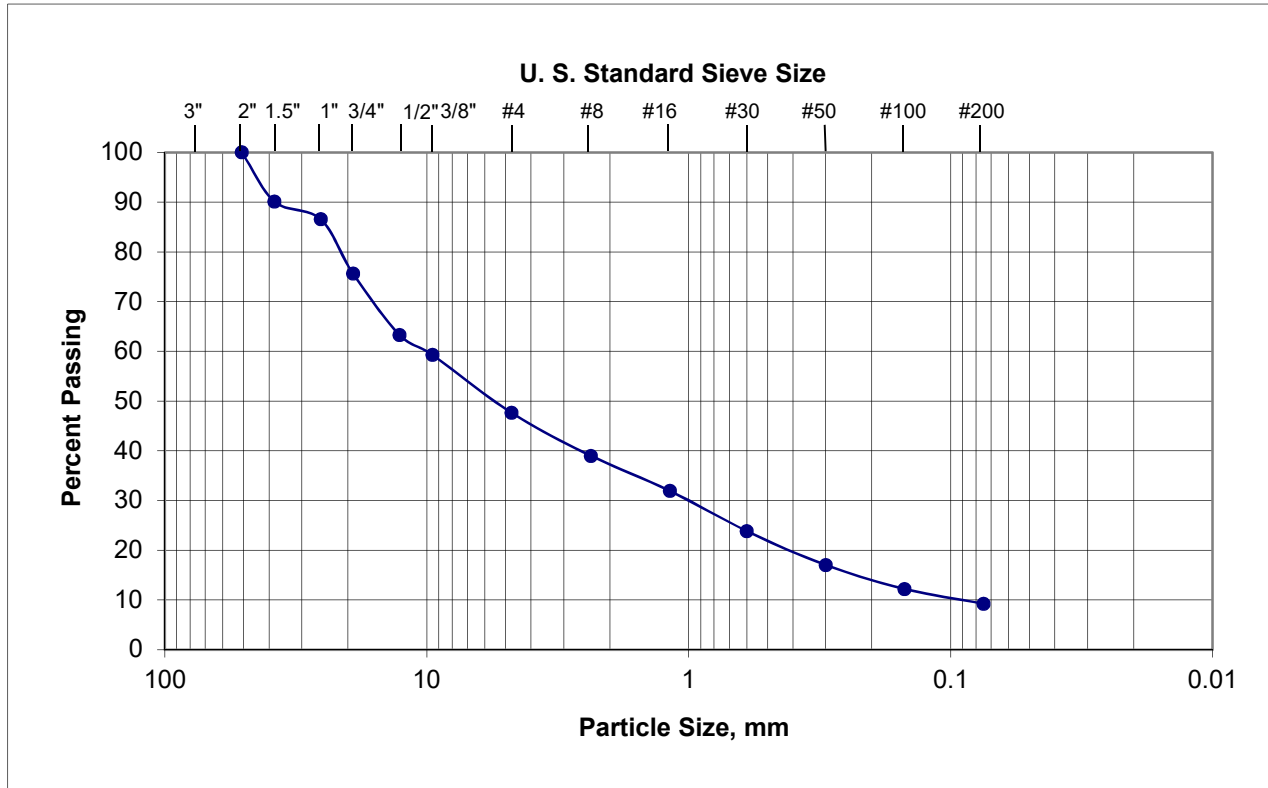
MOISTURE CONTENT & UNIT WEIGHT TEST RESULTS

Sample <u>Identification</u>	<u>Depth, ft.</u>	Wet Unit <u>Weight, lb/ft.³</u>	Dry Unit <u>Weight, lb/ft.³</u>	Moisture <u>Content, %</u>
1-3	9.5	125.5	113.1	10.9
1-4	14.5	122.2	107.4	13.8
2-3	11	136.2	123.6	10.2
2-4	16	132.4	114.6	15.5

Test Method: ASTM D2216, ASTM D2937

PROJECT NUMBER:	11186675	August 13, 2019	
LAB MANAGER:			12kV Switchgear Replacement
 GHD Inc 4080 Plaza Goldorado Circle Suite B Cameron Park CA 95682 T 530 677 5515 Geotechnical Field Office: 3883 Ponderosa Road, Shingle Springs			

SIEVE ANALYSIS TEST REPORT



<u>U.S. STANDARD SIEVE SIZE</u>	<u>SIEVE SIZE, mm</u>	<u>PERCENT PASSING</u>
3 INCH	76.2	
2 INCH	50.8	100
1 1/2 INCH	38.1	90
1 INCH	25.4	87
3/4 INCH	19.1	76
1/2 INCH	12.7	63
3/8 INCH	9.5	59
NO. 4	4.75	48
NO. 8	2.36	39
NO. 16	1.18	32
NO. 30	0.6	24
NO. 50	0.3	17
NO.100	0.15	12
NO 200	0.075	9

Test Method: ASTM C136

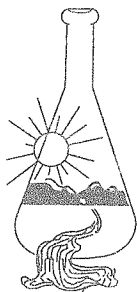
SAMPLE IDENTIFICATION: 2-1	SAMPLE DEPTH, ft. : 3'	Lab Number: 8171
SAMPLE DESCRIPTION: Dark brown well-graded gravel with silt and sand		Group Symbol: GW
REMARKS:		

PROJECT NUMBER:	11186675	August 13, 2019
------------------------	----------	-----------------

LAB MANAGER:	
---------------------	--

	<p>GHD Inc 4080 Plaza Goldorado Circle Suite B Cameron Park CA 95682 T 530 677 5515 Geotechnical Field Office: 3883 Ponderosa Road, Shingle Springs</p>
--	---

12kV SG Replacement



Sunland Analytical

11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 08/07/2019
Date Submitted 08/02/2019

To: Eric Smith
GHD
4080 Plaza Goldorado Cir. B
Cameron Park, CA 95682

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager RA

The reported analysis was requested for the following location:
Location : 11186675 12KV SWITCH Site ID : 1-1.
Thank you for your business.

* For future reference to this analysis please use SUN # 80268-167739.

EVALUATION FOR SOIL CORROSION

Soil pH	5.81		
Moisture	4.7	%	
Minimum Resistivity	5.09	ohm-cm (x1000)	
Chloride	1.2	ppm	00.00012 %
Sulfate	4.1	ppm	00.00041 %
Redox Potential	(+) 194	mv	
Sulfides	Presence - NEGATIVE		

METHODS

pH and Min. Resistivity CA DOT Test #643 Mod. (Sm. Cell)
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m
Redox Potential ASTM G-200m, Sulfides AWWA C105/A25.5



about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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PART 6
DRAWINGS

