Humboldt Bay Municipal Water District

TRF Generator Project

Contract Documents and Technical Specifications
February 2025

1/29/25

www.paceengineering.us

PACE Job No.: 3073.01

Humboldt Bay Municipal Water District

TRF Generator Project

February 2025

Prepared for

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

BOARD OF DIRECTORS

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David Lindberg, Vice-President
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Prepared by

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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 TRF Generator 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., February 5, 2025, at the Turbidity Reduction Facility (TRF) site at 440 Pipeline Road, Arcata, California. A site overview outside of this meeting time can be arranged by contacting Bryan Gentles at Pace Engineering, Inc. by telephone at (530) 244-0202 or by email at bgentles@paceengineering.us.

The Humboldt Bay Municipal Water District (HBMWD or District) is a wholesale water supplier in Humboldt County, California that treats its water at the Turbidity Reduction Facility. The work for this project consists of furnishing all labor, materials, and equipment; supervision required for the installation of a new 750kW diesel generator and associated automatic transfer switch (ATS) and replacement of an existing open-transition ATS with a new closed-transition ATS; and other related work. The existing 100kW generator, new 750kW generator, and ATSs shall be controlled by the site's existing supervisory control and data acquisition (SCADA) system. The work will generally consist of the following:

- New 750kW diesel generator, subbase fuel tank, stairs, platforms, and other appurtenances.
- New 1200A ATS.
- Replacement of existing 225A ATS.
- Modifications to existing electrical system to accommodate new equipment.
- Gradings and paving of area surrounding new 750kW generator and Tesla batteries.
- New security fencing.
- New conduit, conductors, and other ancillary electrical equipment as shown on Drawings.
- Modifications to SCADA to achieve generator control as described in the technical specifications.
- Other miscellaneous work as outlined in the Contract Documents.

Each contractor or subcontractor shall submit a Qualifications Statement as a part of their bid, which shall include the following:

- Copy of California Contractor's license
- Department of Industrial Relations registration number
- List of a minimum of three completed projects over the last ten years of similar size and complexity. Include the following for each project:
    a. Project name and location.
    b. Name of owner with contact number.
    c. Name of prime contractor with contact number.
    d. Name of engineer with contact number.
    e. Approximate size of generator(s) installed.
    f. Date of completion.

Bids will be received by the General Manager of the Humboldt Bay Municipal Water District at the District Office, 828 Seventh Street, Eureka, California, 95501 until 3:00 p.m. Pacific Time, March 5, 2025, 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, California 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 for free by emailing a request to Bryan Gentles (bgentles@paceengineering.us).

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 California 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 California 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 California 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 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.

John Friedenbach
General Manager
Humboldt Bay Municipal Water District

January 29, 2025
Date

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INFORMATION FOR BIDDERS

Project: HBMWD TRF Generator

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: TRF GENERATOR 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 three (3) 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.

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.

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 Bryan Gentles at PACE Engineering, Inc. by email at bgentles@paceengineering.us. Replies to such inquiries will be in the form of addenda or clarification that will be sent to all plan holders.

Contract Plans and Specifications may be obtained as specified in the Advertisement for Bids.

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 items in the Bid Proposal are 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.

Where items in the Bid Proposal are 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 items 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 therefor. 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 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 regarding 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 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: Michiko Mares PO Box 95 Eureka, CA 95502-0095
Business Phone:	(707) 443-5018
Email:	gm@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:

ITEM		PAGE	CHECKED
1.	Bid Proposal	1-7 through 1-9	_____
2.	List of Subcontractors (Subcontractor Details)	1-10	_____
3.	Bid Bond	1-11 through 1-12	_____
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 Subcontractors' 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 TRF Generator 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.

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 includes the tasks described in the Advertisement for Bids 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.

BID SCHEDULE

BID ITEMS					
Item No.	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
1.	Mobilization/Demobilization	1	LS	$_____	$_____
2.	Site Clearing and Demolition	1	LS	$_____	$_____
3.	Grading, Paving, Concrete Curb, and Fencing, complete	1	LS	$_____	$_____
4.	Replace and Reconnect ATS-2	1	LS	$_____	$_____
5.	Provide and Install New GEN-1, ATS-1, Conduit, Conductors, Pull Boxes, and Appurtenances	1	LS	$_____	$_____
6.	Modify Existing SCADA System to Control Generators and Transfer Switches	1	LS	$_____	$_____
7.	Functional Acceptance Testing	1	LS	$_____	$_____

TOTAL BID (Sum of Items 1-7) ($_____)

TOTAL BID IN WORDS: _____

The low bidder shall be determined based on the TOTAL BID.

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)

SUBCONTRACTOR DETAILS

The Bidder certifies that:

A. __ I do not intend to subcontract any Work on this project.

B. __ I do intend to subcontract portions of the Work on this project.

NOTE: The Bidder shall check box A or box B. If the Bidder does not check a box, it will be deemed that the Bidder has checked box A.

If awarded the Contract, the Bidder proposes to employ the following subcontractors who will perform Work or labor or render service to the Bidder in or about the Work in an amount in excess of one-half of one percent (0.5%) of the total amount of Bidder's proposal. If no subcontract Work is proposed, except within the one-half of one percent (0.5%) limit set forth, the Bidder shall so state.

NAME & ADDRESS OF SUBCONTRACTOR	DESCRIPTION OF WORK TO BE SUBCONTRACTED	SUBCONTRACTOR'S CALIF. LIC. NO. AND DIR NO.

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:

TRF Generator 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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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:
   TRF Generator 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.

_____	_____
Owner	Contractor
Title_____	Title_____
Date_____	Date_____

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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:

TRF Generator 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.

IN WITNESS WHEREOF, this instrument is executed this _____ day of _____, 20__.

ATTEST:

_____	_____
(Principal) Secretary	Principal
	By_____
	_____
	Address
_____	_____
Witness as to Principal	
_____	
Address	
	_____
	Surety
ATTEST:	
_____	By_____
Witness as to Surety	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:

TRF Generator 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.

IN WITNESS WHEREOF, this instrument is executed this _____ day of _____, 20__.

ATTEST:

_____ _____
(Principal) Secretary Principal

By_____

_____
Address

_____ _____
Witness as to Principal

_____
Address

_____
Surety

ATTEST:

_____ By_____
Witness as to Surety 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: TRF Generator 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: TRF Generator 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 the timeframe as noted in Section B-35 of the General Conditions.

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: _____

GENERAL CONDITIONS
TABLE OF CONTENTS

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
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
TRF	Turbidity Reduction Facility
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 PACE Engineering, Inc. The Engineer will have final authority as regards to contract administration, field inspection, and related items. Where applicable, “Engineer” shall be interpreted to mean “Engineer and its representatives”, which may include personnel from other firms contracted by the District to perform construction management and construction inspection.

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.

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 KC Engineering, Co. and is dated June 2023.

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, local weather patterns, 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 (15%). 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) The Engineer may delegate the above authorities to others who may be contracted by the District to perform construction management and construction inspection duties.

h) It is expressly agreed and understood that PACE Engineering, 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 PACE Engineering, 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 Contractor shall be responsible for procuring its own copies of the Contract Documents and full-size drawings. 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 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 Engineer 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 Engineer and 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 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 forty (340) calendar days thereafter. This is the maximum number of calendar days regardless of weather or other potential delays.

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 for the region, 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 $1,000 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.

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.

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.

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 acknowledgement 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 Longshoremen's 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.

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.

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.

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 TRF Generator 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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SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Formwork for cast-in-place concrete.
2. Shoring, bracing, and anchorage.
3. Wood form materials.
4. Prefabricated forms.
5. Formwork accessories.
6. Form stripping.

B. Related Requirements:

1. Section 032000 - Concrete Reinforcing: Reinforcing steel and required supports for cast-in-place concrete.
2. Section 033000 - Cast-in-Place Concrete: Cast-in-place or in-situ concrete for structural building frame, slabs-on-grade, and other concrete components associated with building.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 031000 - Concrete Forming and Accessories shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 REFERENCE STANDARDS

A. Refer to Engineer’s Supplementary Conditions – REFERENCE SPECIFICATIONS.

B. American Concrete Institute:

1. ACI 117 - Specification for Tolerances for Concrete Construction and Materials.
2. ACI 301 - Specifications for Structural Concrete.
3. ACI 318 - Building Code Requirements for Structural Concrete.
4. ACI 347 - Guide to Formwork for Concrete.

C. American Forest & Paper Association:

1. AF&PA - National Design Specification (NDS) for Wood Construction.

D. American Society of Mechanical Engineers:

1. ASME A17.1 - Safety Code for Elevators and Escalators.

E. APA - The Engineered Wood Association:

1. APA/EWA PS 1 - Voluntary Product Standard - Structural Plywood.

F. ASTM International:

1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
2. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

G. West Coast Lumber Inspection Bureau:

1. WCLIB - Standard No. 17 Grading Rules for West Coast Lumber.

1.4 COORDINATION

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Coordinate Work of this Section with other Sections of Work in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.

1.5 SUBMITTALS

A. Certifications as required to comply with American Iron and Steel (AIS) provisions.

B. Refer to the Standard General Conditions and Supplementary Conditions.

1.6 QUALITY ASSURANCE

A. Perform Work according to ACI 347.

B. For wood products furnished for Work of this Section, comply with AF&PA.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Store materials off ground in ventilated and protected manner to prevent deterioration from moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

A. Design, engineer, and construct formwork, shoring, and bracing according to ACI 318 to conform to design and applicable code requirements to achieve concrete shape, line, and dimension as indicated on Drawings.

2.2 WOOD FORM MATERIALS

A. Softwood Plywood: Comply with APA/EWA PS 1, exterior BB (Concrete form) Class 1 plywood.

B. Plywood Forms:

1. Application: Exposed finish concrete.
2. Description:

    a. Comply with APA/EWA PS 1.
    b. Panels: Full size, 4 by 8 feet.
    c. Label each panel with grade trademark of APA/EWA.

3. Plywood for Surfaces to Receive Membrane Waterproofing:

    a. Minimum Thickness: 5/8 inch.
    b. Grade: APA/EWA "B-B Plyform Structural I Exterior."

4. Plywood with "Smooth Finish" Indicated on Drawings:

    a. Minimum Thickness: 3/4 inch.
    b. Grade: APA/EWA "HD Overlay Plyform Structural I Exterior."

2.3 PREFABRICATED FORMS

A. Manufacturers:

1. EFCO.
2. Or equal: Refer to the Standard General Conditions and Supplementary Conditions.
3. Substitutions: Refer to the Standard General Conditions and Supplementary Conditions.

B. Preformed Steel Forms:

1. Description: Matched, tightly fitted, and stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
2. Minimum Thickness: 16 gage.

C. FRP Forms: Matched, tightly fitted, and stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

D. Steel Forms:

1. Description: Sheet steel, suitably reinforced.
2. Design: For particular use as indicated on Drawings.

E. Form Liners: Smooth, durable, grainless, and non-staining hardboard unless otherwise indicated on Drawings.

F. Framing, Studding, and Bracing: Stud.

2.4 FORMWORK ACCESSORIES

A. Form Ties:

1. Type: Snap off; cone.
2. Material: Galvanized.
3. Manufacturers:

a. Dayton Superior.
b. Or equal: Refer to the Standard General Conditions and Supplementary Conditions.
c. Substitutions: Refer to the Standard General Conditions and Supplementary Conditions.

B. Spreaders:

1. Description: Standard, non-corrosive metal-form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch of concrete face.
2. Wire ties, wood spreaders, or through bolts are not permitted.

C. Form Release Agent:

1. Description: Colorless mineral oil that will not stain concrete or absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.

D. Corners:

1. Type: Chamfer.
2. Lengths: Maximum possible.

E. Preformed Joint Filler Bituminous Joint Filler: Comply with ASTM D1751.

F. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength, and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify lines, levels, and centers before proceeding with formwork.

B. Verify that dimensions agree with Drawings.

C. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, request instructions from Engineer before proceeding.

3.2 INSTALLATION

A. Formwork:

1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
3. Camber forms where necessary to produce level finished soffits unless indicated otherwise on Drawings.
4. Positioning:

    a. Carefully verify horizontal and vertical positions of forms.
    b. Correct misaligned or misplaced forms before placing concrete.

5. Complete wedging and bracing before placing concrete.
6. Erect formwork, shoring, and bracing to achieve design requirements according to ACI 301.
7. Stripping:

    a. Arrange and assemble formwork to permit dismantling and stripping.
    b. Do not damage concrete during stripping.
    c. Permit removal of remaining principal shores.

8. Obtain approval of Engineer before framing openings in structural members not indicated on Drawings.
9. Install chamfer strips on all external corners.
10. Do not patch formwork.
11. Leave forms in place for minimum number of days according to ACI 347.

B. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

C. Form Removal:

1. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads, and removal has been approved by Engineer.
2. Loosen forms carefully; do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
3. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged.
4. Discard damaged forms.

5. Form Release Agent:

    a. Apply according to manufacturer instructions.
    b. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
    c. Do not apply form release agent if concrete surfaces are indicated to receive special finishes or applied coverings that may be affected by agent.
    d. Soak inside surfaces of untreated forms with clean water, and keep surfaces coated prior to placement of concrete.

6. Form Cleaning:

    a. Clean forms as erection proceeds to remove foreign matter within forms.
    b. Clean formed cavities of debris prior to placing concrete.
    c. Flush with water or use compressed air to remove remaining foreign matter.
    d. Ensure that water and debris drain to exterior through cleanout ports.
    e. Cold Weather:

        1) During cold weather, remove ice and snow from within forms.
        2) Do not use de-icing salts.
        3) Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure; use compressed air or other dry method to remove foreign matter.

7. Reuse and Coating of Forms:

    a. Thoroughly clean forms and reapply form coating before each reuse.
    b. For exposed Work, do not reuse forms with damaged faces or edges.
    c. Apply form coating to forms according to manufacturer instructions.
    d. Do not coat forms for concrete indicated to receive "scored finish."
    e. Apply form coatings before placing reinforcing steel.

D. Forms for Smooth Finish Concrete:

1. Use steel, plywood, or lined-board forms.
2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
3. Install form lining with close-fitting square joints between separate sheets without springing into place.
4. Use full-sized sheets of form liners and plywood wherever possible.
5. Tape joints to prevent protrusions in concrete.
6. Apply forming and strip wood forms in a manner to protect corners and edges.
7. Level and continue horizontal joints.
8. Keep wood forms wet until stripped.

E. Forms for Surfaces to Receive Membrane Waterproofing:

1. Use plywood or steel forms.
2. After erection of forms, tape form joints to prevent protrusions in concrete.

F. Framing, Studding, and Bracing:

1. Maximum Spacing of Studs:

a. Boards: Maximum 16 inches o.c.
b. Plywood: 12 inches o.c.

2. Size framing, bracing, centering, and supporting members for sufficient strength to maintain shape and position under imposed loads from construction operations.
3. Construct beam soffits of material minimum 2 inches thick.
4. Distribute bracing loads over base area on which bracing is erected.
5. When placed on ground, protect against undermining, settlement, and accidental impact.

G. Form Anchors and Hangers:

1. Do not use anchors and hangers leaving exposed metal at concrete surface.
2. Symmetrically arrange hangers supporting forms from structural-steel members to minimize twisting or rotation of member.
3. Penetration of structural-steel members is not permitted.

H. Inserts, Embedded Parts, and Openings:

1. Install formed openings for items to be embedded in or passing through concrete Work.
2. Locate and set in place items required to be cast directly into concrete.
3. Install accessories straight, level, and plumb, and ensure that items are not disturbed during concrete placement.
4. Openings:

a. Provide temporary ports or openings in formwork as required to facilitate cleaning and inspection.
b. Locate openings at bottom of forms to allow flushing water to drain.

5. Close temporary openings with tight-fitting panels, flush with inside face of forms, and neatly fitted such that joints will not be apparent in exposed concrete surfaces.

I. Form Ties:

1. Provide sufficient strength and quantity to prevent spreading of forms.
2. Place ties at least 1 inch away from finished surface of concrete.
3. Leave inner rods in concrete when forms are stripped.
4. Space form ties equidistant, symmetrical, and aligned vertically and horizontally unless indicated otherwise on Drawings.

J. Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

K. Construction Joints:

1. Install surfaced pouring strip where construction joints intersect on exposed surfaces to provide straight line at joints.

2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
3. Appearance:

    a. Show no overlapping of construction joints.
    b. Construct joints to present same appearance as butted plywood joints.

4. Arrange joints in continuous line straight, true, and sharp.

L. Embedded Items:

1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, water stops, and other features.
2. Do not embed wood or uncoated aluminum in concrete.
3. Obtain installation and setting information for embedded items furnished under other Sections.
4. Securely anchor embedded items in correct location and alignment prior to placing concrete.
5. Ensure that conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318 regarding size and location limitations.

M. Openings for Items Passing through Concrete:

1. Frame openings in concrete where indicated on Drawings.
2. Establish exact locations, sizes, and other conditions required for openings and attachment of Work specified under other Sections.
3. Coordinate Work to avoid cutting and patching of concrete after placement.
4. Perform cutting and repairing of concrete required as result of failure to provide required openings.

N. Screeds:

1. Set screeds and establish levels for tops of and finish on concrete slabs.
2. Slope slabs to drain where required or as indicated on Drawings.
3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms; remove freestanding water.

O. Screed Supports:

1. For concrete over waterproof membranes and vapor retarder membranes, use cradle-, pad-, or base-type screed supports that will not puncture membrane.
2. Staking through membrane is not permitted.

P. Cleanouts and Access Panels:

1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris, and waste material.
2. Clean forms and surfaces against which concrete is to be placed.
3. Remove chips, sawdust, and other debris.
4. Thoroughly blow out forms with compressed air just before concrete is placed.

3.3 TOLERANCES

A. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.

B. Construct formwork to maintain tolerances according to ACI 301.

3.4 FIELD QUALITY CONTROL

A. Inspection:

1. Inspect erected formwork, shoring, and bracing to ensure that Work complies with formwork design and that supports, fastenings, wedges, ties, and items are secure.
2. Notify Engineer after placement of reinforcing steel in forms but prior to placing concrete.
3. Schedule concrete placement to permit formwork inspection before placing concrete.

END OF SECTION 031000

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Reinforcing bars.
2. Reinforcement accessories.

B. Related Requirements:

1. Section 031000 - Concrete Forming and Accessories: Form materials, waterstops, and accessories required to form cast-in-place concrete.
2. Section 033000 - Cast-in-Place Concrete: Cast-in-place or in-situ concrete for structural building frame, slabs on grade, and other concrete components associated with building.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 032000 - Concrete Reinforcing shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 REFERENCE STANDARDS

A. Refer to Engineer’s Supplementary Conditions – REFERENCE SPECIFICATIONS.

B. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.
3. ACI 530/530.1 - Building Code Requirements and Specification for Masonry Structures.
4. ACI SP-66 - ACI Detailing Manual.

C. American Welding Society:

1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

D. ASTM International:

1. ASTM A184 - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.
2. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
3. ASTM A704 - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.

4. ASTM A706 - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
5. ASTM A767 - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
6. ASTM A775 - Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
7. ASTM A884 - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
8. ASTM A934 - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
9. ASTM A996 - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.
10. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

E. Concrete Reinforcing Steel Institute:

1. CRSI 10-MSP - Manual of Standard Practice.
2. CRSI 10-PLACE - Placing Reinforcing Bars.

1.4 COORDINATION

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Coordinate Work of this Section with placement of formwork, formed openings, and other Work.

1.5 PREINSTALLATION MEETINGS

A. Refer to Engineer’s Supplementary Conditions – SEQUENCE OF WORK AND INTERRUPTION OF EXISTING FACILITIES and Standard General Conditions – Preconstruction Conference.

B. Convene minimum one week prior to commencing Work of this Section.

1.6 SUBMITTALS

A. Certifications as required to comply with American Iron and Steel (AIS) provisions.

B. Refer to the Standard General Conditions and Supplementary Conditions.

C. Shop Drawings:

1. Indicate bar sizes, spacings, locations, splice locations, and quantities of reinforcing steel.
2. Indicate bending and cutting schedules.
3. Indicate supporting and spacing devices.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Submit certified copies of mill test report of reinforcement materials analysis.

1.7 QUALITY ASSURANCE

A. Perform Work according to ACI 301.

B. Prepare Shop Drawings according to ACI SP-66.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.9 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel:

1. Comply with ASTM A615.
2. Yield Strength: 60 ksi.
3. Billet Bars: Deformed.
4. Finish: Uncoated.

2.2 FABRICATION

A. Fabricate concrete reinforcement according to ACI 318.

B. Form standard hooks for 180-degree bends, 90-degree bends, stirrups and tie hooks, and seismic hooks as indicated on Drawings.

C. Form reinforcement bends with minimum diameters according to ACI 318.

D. Splicing:

1. If not indicated on Drawings, locate reinforcement splices at point of minimum stress.

2.3 ACCESSORY MATERIALS

A. Tie Wire:

1. Minimum 16 gage, annealed type.

B. Chairs, Bolsters, Bar Supports, and Spacers:

1. Size and Shape: To strengthen and support reinforcement during concrete placement conditions.

C. Special Chairs, Bolsters, Bar Supports, and Spacers Adjacent to Weather-Exposed Concrete Surfaces:

1. Material: Plastic-coated steel.
2. Size and Shape: To meet Project conditions.

D. Reinforcing Splicing Devices:

1. Type: Mechanical set screw; full tension and compression.
2. Size: To fit joined reinforcing.
3. Manufacturers:

a. Dayton Superior.
b. Or equal: Refer to the Standard General Conditions and Supplementary Conditions.
c. Substitutions: Refer to the Standard General Conditions and Supplementary Conditions.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Place, support, and secure reinforcement against displacement.

B. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

C. Do not deviate from required position beyond specified tolerance.

D. Do not weld crossing reinforcement bars for assembly except as permitted by Engineer.

E. Do not displace or damage vapor retarder.

F. Accommodate placement of formed openings.

G. Spacing:

1. Space reinforcement bars with minimum clear spacing according to ACI 318.
2. If bars are indicated in multiple layers, place upper bars directly above lower bars.

H. Maintain minimum concrete cover around reinforcement according to ACI 318 as follows:

1. Footings and Concrete Formed against Earth: 3 inches.
2. Concrete Exposed to Earth or Weather:

   a. No. 6 Bars and Larger: 2 inches.
   b. No. 5 Bars and Smaller: 1-1/2 inches.

3. Supported Slabs, Walls, and Joists:

   a. No. 14 Bars and Larger: 1-1/2 inches.
   b. No. 11 Bars and Smaller: 3/4 inch.

4. Beams and Columns: 1-1/2 inches.
5. Shell and Folded Plate Members:

   a. No. 6 Bars and Larger: 3/4 inch.
   b. No. 5 Bars and Smaller: 1/2 inch.

I. Bond and ground reinforcement as specified in Section 260526 - Grounding and Bonding for Electrical Systems.

3.2 TOLERANCES

A. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.

B. Install reinforcement within following tolerances for flexural members, walls, and compression members:

1. Reinforcement Depth Greater Than 8 Inches:

   a. Depth Tolerance: Plus or Minus 1/2 inch.
   b. Concrete Cover Tolerance: Minus 1/2 inch.

2. Reinforcement Depth Less Than or Equal to 8 Inches:

   a. Depth Tolerance: Plus or Minus 3/8 inch.
   b. Concrete Cover Tolerance: Minus 3/8 inch.

C. Foundation Walls: Install reinforcement within tolerances according to ACI 530/530.1.

3.3 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed by Owner's testing laboratory according to the California Building Code.

B. Provide unrestricted access to Work and cooperate with appointed inspection and testing firm.

C. Reinforcement Inspection:

1. Placement Acceptance: Inspect specified and ACI 318 material requirements and specified placement tolerances.
2. Welding: Inspect welds according to AWS D1.1.
3. Periodic Placement Inspection: Inspect for correct materials, fabrication, sizes, locations, spacing, concrete cover, and splicing.
4. Weldability Inspection: Inspect for reinforcement weldability if formed from steel other than ASTM A706.
5. Continuous Weld Inspection: Inspect reinforcement according to ACI 318.
6. Periodic Weld Inspection: Inspect other welded connections.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete for the following items:

1. Equipment pads.

B. Related Requirements:

1. Section 031000 - Concrete Forming and Accessories: Formwork and accessories.
2. Section 032000 - Concrete Reinforcing: Requirements for reinforcing steel and supports.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 033000 - Cast-In-Place Concrete shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 REFERENCE STANDARDS

A. Refer to Engineer’s Supplementary Conditions – REFERENCE SPECIFICATIONS.

B. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 305R - Guide to Hot Weather Concreting.
3. ACI 306.1 - Standard Specification for Cold Weather Concreting.
4. ACI 308.1 - Specification for Curing Concrete.
5. ACI 318 - Building Code Requirements for Structural Concrete.

C. ASTM International:

1. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
2. ASTM C33 - Standard Specification for Concrete Aggregates.
3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
5. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
6. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete.
7. ASTM C150 - Standard Specification for Portland Cement.
8. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
9. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

10. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
11. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
12. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
13. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
14. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
15. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
16. ASTM C685 - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.
17. ASTM C845 - Standard Specification for Expansive Hydraulic Cement.
18. ASTM C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars.
19. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
20. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
21. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
22. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete.
23. ASTM C1157 - Standard Performance Specification for Hydraulic Cement.
24. ASTM C1218 - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
25. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
26. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
27. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
28. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
29. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
30. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
31. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
32. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
33. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.4 COORDINATION

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

1.5 SUBMITTALS

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Reports and certifications on proposed materials and mixture proportions for each concrete mixture design shall be submitted prior to conducting the laboratory trial batches for proposed mix designs where applicable.

C. Aggregate Reports (ASTM C33): Fine aggregate (source and type, gradation, deleterious materials, specific gravity, sand equivalent); coarse aggregate (source and type, gradation, deleterious materials, abrasion loss, specific gravity); and combined aggregate gradation.

1. Aggregate reports shall be project specific and shall be no more than two years old at time of submittal.
2. Aggregates shall be sampled and tested in accordance with ASTM C33. In addition, the bulk specific gravity of each aggregate shall be determined in accordance with ASTM C127 and ASTM C128.
3. Alkali-aggregate reactivity potential shall be determined by one of the following procedures:

    a. Test fine and coarse aggregates in accordance with ASTM C1260. Aggregates which do not indicate a potential for alkali reactivity may be used without further testing. Aggregates which indicate a potential for alkali reactivity shall be further tested in accordance with ASTM C1105 or ASTM C1293 (as appropriate), using a cement containing less than 0.6 percent alkalis.
    b. Test a project-specific mixture, which includes all aggregates and cementitious materials selected for the project, in accordance with ASTM C1567. This test may only be used for mixtures that contain slag cement or fly ash, and those products shall not have an alkali content greater than 4.0 percent sodium oxide equivalent. Combinations of cementitious materials and aggregates which do not indicate a potential for alkali reactivity may be used without further testing. Mixture combinations which indicate a potential for alkali reactivity shall have the ingredients and/or proportions modified and then the test shall be repeated.

4. At the discretion of the Engineer, testing in addition to that indicated herein or in Appendix X1 of ASTM C33 may be required on potentially reactive aggregates. Nonreactive aggregates shall be imported if, in the opinion of the Engineer, local aggregates exhibit unacceptable potential reactivity.

D. Cement: Contractor shall submit certified copies of supplier's (source) test reports showing chemical composition and physical analysis for each shipment used and certifying that the cement complies with ASTM C150 and these Specifications. The certificate shall be signed by the cement manufacturer.

E. Cementitious Materials: Type, data sheet, and test report (fly ash, pozzolan, slag cement).

F. Admixtures: Data sheets and certifications for all admixtures required or proposed (e.g. water reducers, set retarders, plasticizers, activators, air entrainment agents, bond preventers, bonding compounds, etc.) with manufacturer's approval letters.

G. Mixture Proportions: Provide all proposed mix design(s) to be used for Project per ACI 318. Three-point curves are required; compressive strength at 7 and 28 days; mixture proportions report (slump; water content; air content; water-cementitious materials ratio; brand, type, composition, and quantity of cement; brand, type, composition, and quantity of fly ash; specific gravity of each aggregate; ratio of fine to total aggregates; temperature; unit weight; time of initial

set at 70°F and 90°F). Lab testing and reports must have been produced within the past two years; otherwise, trial batching and lab testing must be performed for proposed mix designs.

H. Water analysis test for mixing water and ice including total chlorides and sulfates (as SO4).

I. Submit data describing the equipment to be used for proportioning, mixing, and transporting concrete. In the case of ready-mixed concrete, certification that the ready-mix plant complies with the requirements of ASTM C94 will be acceptable. Identify plant location from which concrete will be supplied, plant capacity, and estimated travel time from plant(s) to work site.

J. For structures with multiple placements, submit placement sequence and construction joints. Joint locations are subject to approval of the Engineer.

K. Provide reinforcing steel fabrication and placement drawings and bar lists. The bar lists and drawings shall include a reference to the structure in which the reinforcement will be installed and to the Drawing showing the reinforcement. Shop drawings shall include bar lengths, diameters, and bend and splice locations/dimensions.

L. Submit the following as specified elsewhere in this section:

1. Certified test reports.
2. Mill certs for reinforcing steel.
3. Manufacturers' Certificates of Compliance, which includes copies of independent test results confirming compliance with specified requirements, shall be submitted for (when used): cement, admixtures, fly ash, slag cement, form coatings, form ties, mechanical connections, membrane curing compound, floor sealer and epoxy bonding agent.
4. Mixture designs and independent testing laboratory test results (minimum of 10 tests).
5. Batch tickets.
6. Field quality control reports.

M. Submit Product Data and manufacturer's installation instructions for curing materials, joint materials, bonding materials, repair materials, admixtures, steel fibers, sealers and hardeners.

N. Submit procedures for hot and cold weather concreting when such conditions are anticipated.

O. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

P. Project Record Documents: Record actual locations of embedded utilities and components concealed from view in finished construction.

1.6 STORAGE AND HANDLING

A. Cement, slag cement, and fly ash shall be stored in suitable moisture-proof enclosures. Cement, slag cement, and fly ash, which have become caked or lumpy, shall not be used.

B. Aggregates shall be stored so that segregation and the inclusion of foreign materials are prevented. The bottom 6 inches of aggregate piles in contact with the ground shall not be used.

C. Reinforcing steel shall be carefully handled and shall be stored on supports that prevent the steel from touching the ground until inclusion in the Work.

1.7 QUALITY ASSURANCE

A. Perform Work according to ACI 318.

B. Comply with ACI 305R when pouring concrete during hot weather.

C. Comply with ACI 306.1 when pouring concrete during cold weather.

D. Acquire cement and aggregate from one source for Work.

E. Perform Work according to California Building Code standards.

F. Concrete materials shall be selected, and concrete shall be proportioned, batched, mixed, and delivered in a manner that will minimize shrinkage and cracking as specified herein and in accordance with Chapters 3 and 8 of ACI 224R. Concrete temperatures shall be controlled before and until delivery at the end of the delivery truck chute to minimize cracking. Any rise in concrete temperature caused by environmental conditions that will be conducive to excessive shrinkage shall be controlled.

1.8 AMBIENT CONDITIONS

A. Maintain concrete temperature after installation at minimum 50 degrees F for minimum seven days.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete:

1. Cement:

a. Comply with ASTM C150, Type II - Moderate Sulfate Resistant.
b. Type: Portland.

2. Normal Weight Aggregates:

a. Comply with ASTM C33.
b. Coarse Aggregate Maximum Size: 1½ inches.

3. Water:

a. Comply with ACI 318.
b. Potable, without deleterious amounts of chloride ions.

B. Admixtures:

1. Manufacturers:

a. BASF Corporation.

b. Euclid Chemical Company.
c. GCP Applied Technology.
d. Or equal: Refer to the Standard General Conditions and Supplementary Conditions.
e. Substitutions: Refer to the Standard General Conditions and Supplementary Conditions.

2. Air Entrainment: Comply with ASTM C260.
3. Chemical:

a. Comply with ASTM C494.
b. Type A - Water Reducing.
c. Type B - Retarding.
d. Type C - Accelerating.
e. Type D - Water Reducing and Retarding.
f. Type E - Water Reducing and Accelerating.
g. Type F - Water Reducing, High Range.
h. Type G - Water Reducing, High Range, and Retarding.

4. Fly Ash: Comply with ASTM C618, Class F.
5. Plasticizing:

a. Comply with ASTM C1017.
b. Type I, plasticizing and Type II, plasticizing and retarding.

C. Joint Devices and Filler:

1. Joint Filler, Type A:

a. Description: Asphalt-impregnated fiberboard or felt.
b. Comply with ASTM D1751 and ASTM D994.
c. Thickness: ½ inch.
d. Profile: Tongue-and-groove.

2. Removable Cap:

a. Description: Removable cap for creating the void for joint sealant.
b. Manufacturers:

1) Sealtight Snap Cap, Greenstreak #942 supplied by JP Specialties, Joint Cap supplied by A-Y Supply.
2) Or equal: Refer to the Standard General Conditions and Supplementary Conditions.
3) Substitutions: Refer to the Standard General Conditions and Supplementary Conditions.

3. Sealant:

a. Comply with ASTM D6690.
b. Type: I.

c. Manufacturers:

1) Vulkem, as manufactured by Tremco.
2) Sikaflex1a, as manufactured by Sika.
3) Or equal: Refer to the Standard General Conditions and Supplementary Conditions.
4) Substitutions: Refer to the Standard General Conditions and Supplementary Conditions.

2.2 CONCRETE MIX

A. Select proportions for concrete according to ACI 318 trial mixtures or field test data.

B. Performance and Design Criteria:

1. See Section 3.5A herein for Table of Concrete Proportions.
2. Cement Type: ASTM C150.
3. Aggregate Type: Normal weight.
4. Aggregate Size:

a. Maximum: 1½ inch.

5. Maximum Fly Ash Content: 25 percent of cementitious materials by weight.
6. Concrete mix designs with required compressive strength of 3,000 psi or greater shall be stamped and signed by a Civil Engineer licensed in the State of California. Mix designs shall be approved at least 3 days prior to concrete placement.

C. Admixtures:

1. Include admixture types and quantities indicated in concrete mix designs only if approved by Engineer.
2. Cold Weather:

a. Use accelerating admixtures in cold weather.
b. Use of admixtures will not relax cold-weather placement requirements.

3. Hot Weather: Use set-retarding admixtures.

D. Average Compressive Strength Reduction: Not permitted.

E. Ready-Mixed Concrete: Mix and deliver concrete according to ASTM C94 and ASTM C685.

2.3 ACCESSORIES

A. Non-shrink Grout:

1. Manufacturers:

a. Euclid Chemical Company.
b. Sika Corporation.

c. Or equal: Refer to the Standard General Conditions and Supplementary Conditions.
d. Substitutions: Refer to the Standard General Conditions and Supplementary Conditions.

2. Description: Premixed compound consisting of non-metallic aggregate, cement, and water-reducing and plasticizing agents.
3. Comply with ASTM C1107.
4. Minimum Compressive Strength: 2,400 psi in 48 hours and 7,000 psi in 28 days.

B. Epoxy Adhesive Anchors and Dowels:

1. Manufacturers:

a. Simpson Set 3-G (ICC ESR-4057) supplied by Simpson Strong-Tie.
b. Hilti HY-200 (ICC ESR-3187) supplied by Hilti.
c. Or equal: Refer to the Standard General Conditions and Supplementary Conditions.
d. Substitutions: Refer to the Standard General Conditions and Supplementary Conditions.

2. Threaded Rod:

a. ASTM F1554; Grade 36.
b. Furnish with nut and washer.
c. Finish: Hot-dip galvanized.

3. Dowels: As specified in Section 032000 - Concrete Reinforcing.

C. Bonding Agent:

1. Description: High-modulus, high-strength, epoxy bonding/grouting adhesive.
2. Manufacturers:

a. Sikadur-32 Hi-Mod supplied by Sika.
b. Or equal: Refer to the Standard General Conditions and Supplementary Conditions.
c. Substitutions: Refer to the Standard General Conditions and Supplementary Conditions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify requirements for concrete cover over reinforcement.

B. Verify that anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PREPARATION

A. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

B. Previously Placed Concrete:

1. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.
2. Remove laitance, coatings, and unsound materials.

C. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels, and pack solid with non-shrink grout.

D. Remove debris and ice from formwork, reinforcement, and concrete substrates.

E. Remove water from areas receiving concrete before concrete is placed.

3.3 INSTALLATION

A. Placing Concrete:

1. Place concrete according to ACI 301.
2. Notify testing laboratory and Engineer minimum 48 hours prior to commencement of operations.
3. Ensure that reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.
4. Deposit concrete at final position, preventing segregation of mix.
5. Place concrete in continuous operation for each panel or section as determined by predetermined joints.
6. Consolidate concrete.
7. Maintain records of concrete placement, including date, location, quantity, air temperature, and test samples taken.
8. Place concrete continuously between predetermined expansion, control, and construction joints.
9. Do not interrupt successive placement and do not permit cold joints to occur.
10. Screeding:

    a. Screed floors and slabs on grade level.
    b. Surface Flatness: FF 20 maximum 1/4 inch in 10 feet.

B. Concrete Finishing:

1. Provide formed concrete finishes as described herein in 3.5.C Schedule - Concrete Finishes.

C. Curing and Protection:

1. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

2. Protect concrete footings from freezing for minimum of five days.
3. Maintain concrete with minimal moisture loss at relatively constant temperature for period as necessary for hydration of cement and hardening of concrete.
4. Cure concrete slabs according to ACI 308.1 using burlene blankets. Concrete walls shall be cured by leaving the forms in place and applying a soaker hose to keep all surfaces wet.
5. Curing concrete shall maintain wetness for seven days.

3.4 FIELD QUALITY CONTROL

A. Inspection and Testing: Furnished and paid for by Owner according to ACI 318 and California Building Code.

B. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.

C. Concrete Inspections:

1. Continuous Placement Inspection: Inspect for proper installation procedures.
2. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.

D. Strength Test Samples:

1. Sampling Procedures: Comply with ASTM C172.
2. Cylinder Molding and Curing Procedures:

    a. Comply with ASTM C31.
    b. Cylinder Specimens: Standard cured.

3. Sample concrete and make one set of three 6x12 or four 4x8 cylinders for every 150 cu. yd. or less of each class of concrete placed each day, and for every 5,000 sq. ft. of surface area for slabs and walls.
4. If volume of concrete for a class of concrete would provide less than five sets of cylinders, take samples from five randomly selected batches, or from every batch if less than five batches are used.
5. Make one additional cylinder during cold weather concreting and field cure.

E. Field Testing:

1. Slump Test Method: Comply with ASTM C143.
2. Air Content Test Method: Comply with ASTM C173 or ASTM C231.
3. Temperature Test Method: Comply with ASTM C1064.
4. Compressive Strength Concrete:

    a. Measure slump and temperature for each sample.
    b. Measure air content in air-entrained concrete for each sample.

F. Cylinder Compressive Strength Testing:

1. Test Method: Comply with ASTM C39.
2. Test Acceptance: According to ACI 318.

3. Test one cylinder at seven days.
4. Test two 6x12 or three 4x8 cylinders at 28 days.
5. Retain one cylinder for testing when requested by Engineer.
6. Dispose of remaining cylinders if testing is not required.

G. Patching:

1. Allow Engineer to inspect concrete surfaces immediately upon removal of forms.
2. Honeycombing or Embedded Debris in Concrete:

   a. Not acceptable.
   b. Notify Engineer upon discovery.

3. Patch imperfections as directed by Engineer and according to ACI 301 and ACI 318.

H. Defective Concrete:

1. Description: Concrete not conforming to required lines, details, dimensions, tolerances, or specified requirements.
2. Repair or replacement of defective concrete will be determined by Engineer.
3. Do not patch, fill, touch up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

3.5 ATTACHMENTS

A. Table of Concrete Proportions.

End use of Concrete	Tests(5)	Min Sacks of Cement per C.Y.(1)	Min 28-day Compression Strength PSI	Max W/C Ratio by Weight(2)	Total Air Content(3)	Slump	WRDA	Super Plasticizer
Lean concrete fill	---	2.5	---	---	---	4-6	---	---
Equipment pads and other	A, C	7.5	4,500	.50	4%-6%	3-5	Yes	---

Notes:

1. A sack of cement weighs 94 pounds. The cementitious materials shall be composed of one of the following by weight:
   a. 25 percent natural pozzolan or fly ash with a CaO content of up to 10 percent and 75 percent Portland cement.
   b. 50 percent ground granulated blast-furnace slag (slag-cement) and 50 percent Portland cement.
2. The W/C ratio is the weight of water divided by the weight of cement plus pozzolan. At the job site when the slump is less than required for proper placement, water may be added to the mix. The measurement of the slump and determination for the need of additional water shall be made as soon as possible after the truck arrival. Add water shall not exceed 2 gallons per cubic yard of concrete. Insufficient slump after the maximum addition of add water shall be cause for rejection. At any time, if the slump is excessive the concrete is subject to rejection by the Engineer.
3. The total air content is measured in the concrete as deposited in the forms. The air content shall be achieved solely by the addition of an air entraining admixture (AEA).
4. Testing:
   a. is three 6x12 or four 4x8 test cylinders for each 150 yards or less of concrete per day.

b. is three 6x12 or four 4x8 cylinders for each 100 yards or less of concrete per day.
c. is slump, temperature, and air content of the first truck; from all trucks in which the concrete seems to vary from the acceptable mix; and from the trucks from which the test cylinders are taken.

B. Grading of Combined Fine and Coarse Aggregates:

1. Grading of combined fine and coarse aggregates shall fall within the following limits:

Sieve Number or Size (inches)	Percentage Passing by Weight	
	1½-inch maximum	1-inch maximum
Passing a 2-inch	---	---
Passing a 1½-inch	90 - 100	---
Passing a 1-inch	50 - 86	90 - 100
Passing a ¾-inch	45 - 75	55 - 100
Passing a ⅜-inch	38 - 55	45 - 75
Passing a No. 4	30 - 45	35 - 60
Passing a No. 8	23 - 38	27 - 45
Passing a No. 16	1 - 33	20 - 35
Passing a No. 30	10 - 22	12 - 25
Passing a No. 50	4 - 10	5 - 15
Passing a No. 100	1 - 6	1 - 8
Passing a No. 200	0 - 3	0 - 4

C. Schedule - Concrete Finishes:

1. Formed concrete finishes:

a. All formed concrete surfaces shall be finished with the applicable finish system described below. The Class C Finish applies to all buried surfaces that are designated to receive a waterproofing or damp-proofing system. The Class B Finish applied to all formed surfaces not receiving a Rough Finish or a Class C Finish.

1) Rough Finish:

a) Is applicable to all non-waterproofed/damp-proofed buried surfaces. The finish system shall consist of plugging all tie-bolt holes, snap-tie cone depressions, and other surface defects deeper than 2 inches. Mortar fins protruding more than ¼ inch shall be removed. Plugging shall be performed with Cement Mortar on thoroughly saturated concrete or with a proprietary product intended for that purpose that is reviewed and approved by the Engineer.

2) Class C Finish:

a) Shall consist of patching all tie-bolt holes, snap-tie cone depressions, and other surface defects deeper than 1/8-inch with Cement Mortar. Mortar fins protruding more than 1/16-inch shall be removed except that all mortar fins shall be ground flush with the surrounding surface when it is designed to receive a Waterproof Membrane.

3) Class B Finish:

a) Shall consist of patching all tie-bolt holes, snap-tie cone depressions, and other surface defects deeper than 1/16-inch or having a dimension larger than 1-inch with Cement Mortar. Mortar fins and other protrusions shall be removed flush with the surface and ground smooth. In addition, the surface shall have a uniform pattern, color and texture. If necessary, the surface shall be Sack Rubbed. The need for and extent of the Sack Rubbed Finish shall be determined by the Engineer upon removal of the forms. The Sack Rubbed Finish shall provide a uniform appearance over the entire surface.

4) Cement Mortar:

a) For plugging holes and other depressions shall be composed of one-part mortar sand to one-part Type I or Type II Portland Cement and sufficient water to produce a damp cohesive formable mixture. The surface receiving the Cement Mortar shall be thoroughly saturated, damp, and precoated with a wet cement slurry just prior to applying the Cement Mortar. In layers not exceeding 1-inch in thickness, the Cement Mortar shall be densely packed into the depression using a smooth faced hammer. Wet curing for three days of the Cement Mortar with burlene or burlap shall proceed the installation unless the plugged area will immediately receive a Sack Rubbed Finish.

5) Sack Rubbed Finish:

a) Shall be performed as soon as the forms are stripped while the concrete is clean and thoroughly saturated. If performed at a later time the concrete shall be scrubbed and pressure washed clean and soaked with water for three days until the surface is thoroughly saturated prior to sack rubbing.
b) Shall consist of applying a two-part cement to one-part fine mortar sand paste to the designated surface and scrubbing the paste into the wall with a burlap sack, rubber float or other device that will produce a uniform texture with the thin layer of paste.
c) Shall be wet cured with burlene for three days immediately after it has been applied.

END OF SECTION 033000

SECTION 033900 - CONCRETE CURING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Initial and final curing of horizontal and vertical concrete surfaces.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 033900 - Concrete Curing shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 SUBMITTALS

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Product Data: Manufacturer's information on curing compounds, mats, paper, and film, including compatibilities and limitations.

C. Manufacturer's Certificate: Products meet or exceed specified requirements.

D. Manufacturer Instructions: Installation requirements, including storage and handling procedures.

E. Qualifications Statement:

1. Qualifications for manufacturer.

1.4 QUALITY ASSURANCE

A. Perform Work according to ACI 301, 302.1, 308.1, and 318.

B. Manufacturer: Company specializing in manufacturing products specified in this Section with three years' experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Store materials according to manufacturer instructions.

C. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.

2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Absorptive Mats, Burlene:

1. Description:

a. Material: Burlap-polyethylene (PE).
b. Minimum Weight: 10 oz./sq. yd.
c. Bonded to prevent separation during handling and placing.

2. Comply with ASTM C171.
3. Manufacturers:

a. Max Katz Bag Co.
b. Midwest Canvas.
c. Or equal: Refer to the Standard General Conditions and Supplementary Conditions.
d. Substitutions: Refer to the Standard General Conditions and Supplementary Conditions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to be cured.

3.2 APPLICATION

A. Horizontal Surfaces:

1. Comply with ACI 308.1, using sheet material method.
2. Absorptive Mat:

a. Saturate burlap-PE and place burlap-side down over floor slab areas.
b. Lap ends and sides.
c. Maintain in place for 7 days.

B. Vertical Surfaces:

1. Comply with ACI 308.1, using soaker hose method; leave forms in place and keep all surfaces wet.
2. Spraying: Spray water over surfaces and maintain wet for 7 days.

3.3 PROTECTION

A. Do not permit traffic over unprotected floor surfaces.

END OF SECTION 033900

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural shapes.
2. Channels and angles.
3. Hollow structural sections.
4. Structural pipe.
5. Structural plates and bars.
6. Bolts, connectors, and anchors.
7. Grout.

B. Related Requirements:

1. Section 036000 - Grouting: Grout for setting base plates.
2. Section 055200 - Metal Railing: Railing fabrications affecting structural steel work.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 051200 - Structural Steel Framing shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 REFERENCE STANDARDS

A. Refer to Engineer’s Supplementary Conditions – REFERENCE SPECIFICATIONS.

B. American Institute of Steel Construction:

1. AISC 303 - Code of Standard Practice for Structural Steel Buildings and Bridges.
2. AISC 341 - Seismic Provisions for Structural Steel Buildings.
3. AISC 360 - Specification for Structural Steel Buildings.

C. American Society of Civil Engineers:

1. ASCE 19 - Structural Applications of Steel Cables for Buildings.

D. American Welding Society:

1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.

E. ASTM International:

1. ASTM A36 - Standard Specification for Carbon Structural Steel.
2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
4. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
5. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
6. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
7. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
8. ASTM A354 - Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.
9. ASTM A449 - Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.
10. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
11. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
12. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
13. ASTM A514 - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding.
14. ASTM A529 - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
15. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
16. ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
17. ASTM A588 - Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi (345 MPa) Minimum Yield Point, with Atmospheric Corrosion Resistance.
18. ASTM A618 - Standard Specification for Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing.
19. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
20. ASTM A786 - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
21. ASTM A847 - Standard Specification for Cold-Formed Welded and Seamless High-Strength, Low Alloy Structural Tubing with Improved Atmospheric Corrosion Resistance.
22. ASTM A913 - Standard Specification for High-Strength Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process.
23. ASTM A992 - Standard Specification for Structural Steel Shapes.
24. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
25. ASTM E94 - Standard Guide for Radiographic Examination.
26. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments.
27. ASTM E165 - Standard Practice for Liquid Penetrant Examination for General Industry.
28. ASTM E709 - Standard Guide for Magnetic Particle Testing.

29. ASTM F436 - Standard Specification for Hardened Steel Washers.
30. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
31. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
32. ASTM F1852 - Standard Specification for "Twist Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
33. ASTM F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.

F. Research Council on Structural Connections:

1. RCSC - Specification for Structural Joints Using ASTM A325 or A490 Bolts.

G. SSPC: The Society for Protective Coatings:

1. SSPC - Steel Structures Painting Manual.
2. SSPC Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
3. SSPC Paint 20 - Zinc-Rich Coating (Type I - Inorganic and Type II - Organic).
4. SSPC SP 3 - Power Tool Cleaning.
5. SSPC SP 6 - Commercial Blast Cleaning.
6. SSPC SP 10 - Near-White Blast Cleaning.

1.4 COORDINATION

A. Refer to the Standard General Conditions and Supplementary Conditions.

1.5 SUBMITTALS

A. Certifications as required to comply with American Iron and Steel (AIS) provisions.

B. Refer to the Standard General Conditions and Supplementary Conditions.

C. Shop Drawings:

1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and bolts.
2. Connections.
3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

F. Mill Test Reports: Submit indicating structural strength, and destructive and non-destructive test analysis.

G. Qualifications Statements:

1. Submit qualifications for fabricator, erector, shop painter, and welders.

1.6 QUALITY ASSURANCE

A. Perform Work according to following:

1. Structural Steel: AISC 303, ASIC 341, and AISC 360.
2. Architecturally Exposed Structural Steel: AISC 303, Section 10.
3. High-Strength Bolted Connections: RCSC - Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts.
4. Steel Cable Structures: ASCE 19.

B. Perform Work according to California Building Code standards.

1.7 QUALIFICATIONS

A. Welders and Welding Procedures: AWS D1.1 qualified within previous 12 months.

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL

A. Structural W-Shapes: ASTM A992.

B. Channels and Angles: ASTM A36.

C. Rectangular, Hollow Structural Sections: ASTM A500, Grade C.

D. Structural Pipe: ASTM A53, Grade B.

E. Structural Plates and Bars: ASTM A36.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. Bolts: Hex, structural type.

1. ASTM F593F, Type 316 stainless steel.

B. Nuts: Hex type.

1. ASTM F594F, Type 316 stainless steel.
2. ASTM A194 Grade 8M, Type 316 stainless steel.
3. Location: As indicated on Drawings.

C. Washers:

1. Type 316 stainless steel.
2. Circular or as indicated on Drawings.
3. Furnish clipped washers where space limitations require.

D. Threaded Rods:

1. ASTM A193 Grade B8M Class 1, Type 316 stainless steel.
2. ASTM A193 Grade B8M Class 2, Type 316 stainless steel.
3. Location: As indicated on Drawings.

2.3 WELDING MATERIALS

A. Welding Materials:

1. AWS D1.1.
2. Type required for materials being welded.

2.4 FABRICATION

A. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

B. Fabricate connections for bolt, nut, and washer connectors.

C. Develop required camber for members.

2.5 FINISHES

A. Galvanizing: ASTM A123; hot-dip galvanize after fabrication.

B. Galvanizing for Bolts, Connectors, and Anchors:

1. Hot-Dip Galvanizing:

a. Bolts, Nuts, and Washers: ASTM F2329.
b. Connectors and Anchors: ASTM A153.

2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

2.6 ACCESSORIES

A. Grout:

1. Non-shrink type; premixed compound consisting of nonmetallic aggregate, cement, water-reducing, and plasticizing additives.
2. Capable of developing minimum compressive strength of 7,000 psi at 28 days.

B. Touchup Primer for Galvanized Surfaces:

1. SSPC Paint 20, Type I - Inorganic.
2. Comply with ASTM A780.

2.7 SOURCE QUALITY CONTROL

A. Testing: Test bolted and welded connections as specified in PART 3 for field quality control tests.

B. Certificate of Compliance: When fabricator is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.

1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that bearing surfaces are at correct elevation.

B. Verify that anchor rods are set in correct locations and arrangements, with correct exposure for steel attachment.

3.2 PREPARATION

A. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

B. Furnish templates for installation of anchor rods and embedments in concrete and masonry work.

3.3 ERECTION

A. Allow for erection loads and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.

B. Field-weld components and shear connectors as indicated on Drawings or Shop Drawings.

C. Field-connect members with threaded fasteners; torque to required resistance and snug-tighten for bearing-type connections.

D. Do not field-cut or alter structural members without approval of Architect/Engineer.

E. After erection, touch up welds and abrasions to match shop finishes.

3.4 GROUT INSTALLATION

A. Shim bearing plates and equipment supports to proper elevation, and snug-tighten anchor bolts.

B. Fill void under bearing surface with grout; install and pack grout to remove air pockets.

C. Moist-cure grout.

D. Remove forms after grout is set; trim grout edges to form smooth surface, splayed 45 degrees.

E. Tighten anchor bolts after grout has cured for a minimum of three days.

3.5 TOLERANCES

A. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.

B. Maximum Variation from Plumb: 1/4 inch per story, noncumulative.

C. Maximum Offset from Alignment: 1/4 inch.

3.6 FIELD QUALITY CONTROL

A. Bolted Connections: Inspect according to AISC 303.

1. Visually inspect all bolted connections.
2. Direct Tension Indicators: Comply with requirements of ASTM F959, and verify that gaps are less than gaps specified in Table 2.

B. Welding: Inspect welds according to AWS D1.1.

1. Use certified welders, and conduct inspections and tests as required. Record types and locations of defects found in Work. Record work required and performed to correct deficiencies.
2. Visually inspect all welds.
3. Ultrasonic Inspection: ASTM E164; perform on each full-penetration weld.
4. Liquid Penetrant Inspection: ASTM E165.

C. Correct defective bolted connections and welds.

END OF SECTION 051200

SECTION 055200 - METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel pipe railings, balusters, and fittings.
2. Handrails.

B. Related Requirements:

1. Section 033000 - Cast-In-Place Concrete: Execution requirements for placement of anchors, as specified in this Section, in concrete.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 055200 - Metal Railings shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 REFERENCE STANDARDS

A. Refer to Engineer’s Supplementary Conditions – REFERENCE SPECIFICATIONS.

B. ASTM International:

1. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
4. ASTM A312 - Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
5. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
6. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
7. ASTM A513 - Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
8. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing.
9. ASTM A743 - Standard Specification for Castings, Iron Chromium, Iron Chromium Nickel, Corrosion Resistant, for General Application.
10. ASTM B177 - Standard Guide for Engineering Chromium Electroplating.

11. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.
12. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
13. ASTM B241 - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
14. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.

C. California Department of Health Services:

1. CA/DHS/EHLB/R-174 - Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.

D. Green Seal:

1. GC-03 - Anti-Corrosive Paints.

E. National Association of Architectural Metal Manufacturers:

1. NAAMM Metal Finishes Manual.

F. National Ornamental & Miscellaneous Metals Association:

1. NOMMA Guideline 1 - Joint Finishes.

G. SSPC: The Society for Protective Coatings:

1. SSPC - Steel Structures Painting Manual.
2. SSPC Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
3. SSPC Paint 20 - Zinc-Rich Coating, Type I - Inorganic and Type II - Organic.

1.4 SUBMITTALS

A. Certifications as required to comply with American Iron and Steel (AIS) provisions.

B. Refer to the Standard General Conditions and Supplementary Conditions.

C. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

F. Qualifications Statements:

1. Submit qualifications for fabricator and erector.
2. Submit manufacturer's approval of fabricator and erector.

1.5 QUALITY ASSURANCE

A. Perform Work of this Section according to ASTM E985.

B. Finish joints according to NOMMA Guideline 1.

1.6 QUALIFICATIONS

A. Fabricator: Company specializing in fabricating products specified in this Section with minimum three years' documented experience and approved by manufacturer.

B. Erector: Company specializing in performing Work of this Section with minimum three years' documented experience and approved by manufacturer.

1.7 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 HANDRAILS AND RAILINGS

A. Manufacturers:

1. Furnish materials according to the Specifications and Drawings.

2.2 MATERIALS

A. Steel Railing System:

1. Pipe: ASTM A53, Grade B, Schedule 40.
2. Rails and Posts: Steel pipe as indicated on the Drawings.
3. Posts: Pipe as indicated on the Drawings.
4. Fittings: As indicated on the Drawings.
5. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
6. Splice Connectors: Steel type as indicated on the Drawings.
7. Galvanizing: According to ASTM A123; hot-dip galvanized after fabrication.

2.3 FABRICATION

A. Fit and shop-assemble components in largest practical sizes for delivery to Site.

B. Fabricate components with joints tightly fitted and secured. Furnish spigots and sleeves to accommodate Site assembly and installation.

C. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.

D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

F. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations not encouraging water intrusion.

G. Interior Components: Continuously seal joined pieces by continuous welds.

H. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

I. Accurately form components to suit stairs and landings, to each other and to building structure.

J. Accommodate expansion and contraction of members and building movement without damage to connections or members.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive Work.

B. Verify that concealed blocking and reinforcement are installed and correctly located to receive wall-mounted handrails.

3.2 PREPARATION

A. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

B. Clean and strip primed steel items to bare metal where Site welding is required.

C. Supply items required to be cast into concrete and embedded in masonry with setting templates to appropriate Sections.

3.3 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Anchor railings to structure with anchors in accordance with the Drawings.

C. Field-weld anchors as indicated on Drawings. Touch up welds with primer. Grind welds smooth.

D. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

E. Assemble with spigots and sleeves to accommodate tight joints and secure installation.

F. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction

3.4 TOLERANCES

A. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.

B. Maximum Variation from Plumb: 1/4 inch per story, noncumulative.

C. Maximum Offset from Alignment: 1/4 inch.

D. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 055200

SECTION 259000 - ORT AND FAT REQUIREMENTS

PART 1 - GENERAL

1.1 SYSTEM OPERATION

A. See Supplement No. 2 – Functional Descriptions for a description of the system operation. The system shall operate as described, and any changes to the system operation shall be approved by the EEOR.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 TESTING

A. Operational Readiness Test (ORT):

1. The entire installed I&C system shall be certified (inspected, tested, and documented) that it is ready for operation. The objective of this test is to demonstrate that the I&C system is ready for functional acceptance testing. The ORT shall be completed, documented, and submitted to the engineer prior to commencing with the functional acceptance test. See Supplement No. 1 – Example ORT Form for an example of an acceptable set of ORT forms.
2. Point-to-Point Wire Check: After installation, termination, and identification of conductors, perform a point-to-point wire check to verify that all wiring has been properly installed and identified and that there are no shorts between wires, shields, and ground. Lift conductors from terminals as required to perform this test.

    a. Sequence Test: The sequence test is a step-by-step check of a control circuit to verify that the circuit does function as shown on the elementary diagrams and schematic diagrams.

        1) The test is performed with control busses energized. Load elements (relay coils, indicating lights, solenoid valves, etc.) are energized and de-energized by opening and closing contacts in the circuit leading to each load element. Each contact is checked individually, either by actual operation of the contact, or if that is not practical, by simulated operation of the contact, or, if that is not practical, by simulated operation of the contact (removing a wire or shorting the contact).
        2) The sequence test is performed by going through the elementary diagrams on a line-by-line basis. As each circuit is checked, the Drawing is marked with a colored pen. The objective is to confirm that the control circuitry agrees with the elementary diagrams. Corrections shall be made as required to the circuitry and to the Drawings. The end item is the set of marked-up elementary diagrams.
        3) Simulate operation of remote devices by opening or jumpering control circuits.

B. Functional Acceptance Testing (FAT):

1. Testing:

a. Testing shall be scheduled and performed in accordance with the requirements detailed in the Engineer's Supplementary Conditions.
b. After the Contractor has completed all required ORT documentation, manufacturer startups, and equipment calibrations, the Engineer shall be notified for approval of ORT and startup documentation.
c. The Contractor shall be responsible for developing all FAT procedures and documentation. The FAT documents shall be submitted to PACE as a formal submittal for approval. No final testing or scheduling of final testing shall occur until the Engineer has given formal approval of all testing procedures within the FAT.
d. When integration and ORT testing is complete, Contractor shall provide written notice to the Engineer that the system is installed and ready for complete operation. The Engineer shall be informed at least two weeks prior to requested start of the FAT. Updated versions of the system documentation including O&M manuals and interconnection drawings shall be available at the job site both before and during the FAT.
e. The Integrator shall perform the FAT in the presence of the Engineer and the Owner's representative. The Contractor shall build one week into their schedule of work that includes FAT efforts. This additional time shall fall within the contract time schedule.
f. The FAT shall test all modes of operation as described in the Functional Descriptions. During this testing, it is required that all project equipment, including but not limited to pumps, motors, valves, instrumentation, and panels be operated to verify conformance to the Contract Documents. Perform test on all equipment and operate the equipment in every mode of operation. Verify all communications, controls, and alarms operate as intended. If any equipment or system fails the FAT, correct the problem and repeat the test until it is successful.
g. The Contractor shall remain responsible for all supplied equipment during the FAT. PACE shall not be liable for any actual or perceived damage that occurs during integration or functional testing.

C. Any changes to wiring or product changes shall be documented in the respective documents such as O&M manuals, ORT forms, etc.

3.2 SUPPLEMENTS

A. Supplements listed below are part of this Specification.

1. SUPPLEMENT NO. 1 – Example ORT Form.
2. SUPPLEMENT NO. 2 – Functional Descriptions.

END OF SECTION 259000

SUPPLEMENT NO. 1
EXAMPLE
ORT FORM

PACE ENGINEERING OPERATIONAL READINESS TEST (ORT) - INSTRUMENT CALIBRATION

COMPONENT	MANUFACTURER	PROJECT
Name:	Name:	Name:
	Model:	Number:
	Serial No.:	

FUNCTIONS

	Range	Units	Control? Y/N
Indicate? Y/N			Action? Direct/Reverse
Record? Y/N			Switch? Y/N Unit Range: Differential: Reset? Automatic/Manual
Transmit? Y/N			

ANALOG CALIBRATIONS							DISCRETE CALIBRATIONS			
REQUIRED			AS CALIBRATED				REQUIRED		As Calibrated	
			Increasing Input		Decreasing Input		Trip Point	Reset Point	Trip Point	Reset Point
Input	Indicated	Output	Indicated	Output	Indicated	Output	(Note rising or falling)		(Note rising or falling)	

NOTES:	Component Calibrated and Ready for Start-up
	By:
	Date:

SUPPLEMENT NO. 2
FUNCTIONAL DESCRIPTIONS

HUMBOLDT BAY MUNICIPAL WATER DISTRICT
TRF GENERATOR PROJECT
FUNCTIONAL DESCRIPTIONS

The following functional descriptions describes the control scheme for the emergency backup generators and automatic transfer switches at the Turbidity Reduction Facility (TRF):

Turbidity Reduction Facility

General:

The TRF consists of a Tesla battery energy storage system (BESS), two emergency backup generators, and an automatic transfer switch (ATS) for each generator. GEN-1 is a new 750kW generator, sized and connected to support the entire TRF site during a utility power outage. Its associated automatic transfer switch (ATS-1) is a 1,200A, 3-pole, open-transition switch. GEN-2 is an existing 100kW generator, sized and connected to support only select loads including supervisory control and data acquisition (SCADA) equipment, dosing pumps, sample pumps, analyzers, and wash water return pumps during a utility power outage. Its associated automatic transfer switch (ATS-2) is a 225A, 3-pole, closed-transition switch.

Generator Operation:

When the site initially loses utility power the BESS shall provide electrical power to the entire site and no generators shall be called to run.

After the batteries are fully discharged, GEN-2 shall be called to run. After ATS-2 senses quality emergency power, it shall transition to the generator position and provide power to distribution panel A (Dist Pnl A). GEN-2 shall continue to run while GEN-1 remains off until a backwash sequence is initiated. Once a backwash is initiated in SCADA, GEN-1 shall be called to run. After ATS-1 senses quality emergency power, it shall transition to the generator position and provide power to the entire facility excluding Dist Pnl A. When ATS-2 senses quality power from GEN-1 on the normal power side it shall call the generators to synchronize voltage, frequency, and phase. Once synchronization is achieved, ATS-2 shall transition from emergency power to normal power, ensuring a seamless transfer for Dist Pnl A to be powered from GEN-2 to GEN-1. Once ATS-2 completes its transition to GEN-1 power, GEN-2 shall be called to stop.

When the backwash cycle is completed, GEN-2 shall be called to run and synchronize with GEN-1. After synchronization is achieved, ATS-2 shall transition from GEN-1 power to GEN-2 power. After ATS-2 completes the transfer, GEN-1 shall be called to stop. The transition between GEN-2 and GEN-1 for backwash operations can occur multiple

times before utility power is restored. When utility power is restored, both ATS-1 and ATS-2 sense quality utility power, they shall transition to the normal position and both GEN-1 and GEN-2 shall be called to stop. ATS-2 shall always perform closed transitions except for when transitioning back to utility power, which shall be an open transition so as not to back feed generator power to the utility grid.

To accomplish these operations, generator and ATS controllers shall be capable of synchronizing and communicating the necessary information to accomplish this. GEN-2 shall be the main source of power for the facility during a power outage with GEN-1 only running when a backwash is required.

SCADA Visualization:

The following values/statuses shall be displayed in SCADA:

- Generator ON Status (GEN-1 and GEN-2)
- Generator Fault Status (GEN-1 and GEN-2)
- Generator Runtime Hours (GEN-1 and GEN-2)
- Transfer switch position (normal vs. emergency) (ATS-1 and ATS-2)

Trending:

The following values shall be monitored in SCADA for historical trending:

- Generator ON Status (GEN-1 and GEN-2)
- Generator Runtime Hours (GEN-1 and GEN-2)

Generator Alarms:

Each of the following alarms shall be indicated in SCADA. Alarms shall be dialed out as indicated. All dial-out alarms shall have the ability to be ENABLED/DISABLED at SCADA. The following alarms shall be generated:

1. **Communication FAIL:** When communication fails between SCADA and a generator for an operator-adjustable time delay, a COMM FAIL alarm shall be generated. Upon COMM FAIL, the generator shall be prevented from operating based on SCADA. The alarm shall be reset when communication is re-established. This alarm shall be communicated to the auto dialer for dial out.

2. **Generator ON:** Generator running status shall be monitored, and a generator ON alarm activated at SCADA when generator ON status is received from the generator control panel. The alarm shall be reset when the generator is no longer running. This alarm shall be communicated to the auto dialer for dial out.

3. **Generator FAULT:** Generator fault status shall be monitored, and a generator FAULT alarm activated at SCADA when generator FAULT status is received from the generator control panel. The alarm shall be reset locally at the generator control panel. This alarm shall be communicated to the auto dialer for dial out.

4. **Generator LOW Fuel:** Generator fuel status shall be monitored, and a generator LOW fuel alarm activated at SCADA when generator LOW fuel status is received from the generator control panel. The alarm shall be reset when the generator fuel level is above the LOW fuel setpoint. This alarm shall be communicated to the auto dialer for dial out.

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Aluminum building wire rated 600 V or less.
3. Connectors, splices, and terminations rated 600 V and less.
4. Power distribution blocks.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 260519 - Low-Voltage Electrical Power Conductors and Cables shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 DEFINITIONS

A. MOCP: Maximum overcurrent protection.

B. MCA: Minimum circuit ampacity.

C. Exposed: On or attached to the surface or behind panels designed to allow access. Raceways and cables in unfinished basements in accessible underfloor areas or attics; or behind, above, or below panels designed to allow access; and that may be removed without damage to the building structure or finish are considered exposed.

D. Concealed: Rendered inaccessible by the structure of finish of the building. Raceways and cables supported or located within hollow frames or permanently enclosed by the finish of buildings are considered concealed.

1.4 COORDINATION

A. Refer to the Standard General Conditions and Supplementary Conditions.

1.5 SUBMITTALS

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

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

1. Southwire Company.
2. Okonite.
3. Or equal: Refer to the Standard General Conditions and Supplementary Conditions.
4. Substitutions: Refer to the Standard General Conditions and Supplementary Conditions.

C. Standards:

1. Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and use.
2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 or ASTM B496 for stranded conductors.

E. Conductor Insulation:

1. Type THHN and Type THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

2.2 ALUMINUM BUILDING WIRE

A. Description: Flexible, insulated, and uninsulated, drawn aluminum current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Standards:

1. Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Conductors: Aluminum, complying with ASTM B800 and ASTM B801.

D. Conductor Insulation:

1. Type THHN and Type THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

2.3 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and use.

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

1. 3M Electrical Products.
2. Greaves.
3. Hubbell Power Systems, Inc.
4. Ideal Industries, Inc.
5. ILSCO.
6. NSi Industries LLC.
7. Thomas & Betts Corporation; A Member of the ABB Group.
8. Or equal: Refer to the Standard General Conditions and Supplementary Conditions.
9. Substitutions: Refer to the Standard General Conditions and Supplementary Conditions.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: One or two-hole with standard or long barrels.
3. Termination: Compression.

E. Splices shall be in accordance with the CEC and UL Listing.

F. Above Ground Splices for No. 10 AWG and Smaller:

1. Solderless, screw-on, reusable pressure cable type, with integral insulation, approved for copper and aluminum conductors.
2. The integral insulator shall have a skirt to completely cover the stripped conductors.
3. The number, size, and combination of conductors used with the connector, as listed on the manufacturer's packaging, shall be strictly followed.

G. Above Ground Splices for No. 8 AWG to No. 4/0 AWG:

1. Compression, hex screw, or bolt clamp-type of high conductivity and corrosion-resistant material, listed for use with copper and aluminum conductors.
2. Insulate with materials approved for the particular use, location, voltage, and temperature. Insulation level shall be not less than the insulation level of the conductors being joined.
3. Splice and insulation shall be product of the same manufacturer.

H. Above Ground Splices for 250 kcmil and Larger:

1. Long barrel “butt-splice” or “sleeve” type compression connectors, with minimum of two compression indents per wire, listed for use with copper and aluminum conductors.

2. Insulate with materials approved for the particular use, location, voltage, and temperature. Insulation level shall be not less than the insulation level of the conductors being joined.
3. Splice and insulation shall be product of the same manufacturer.

I. Underground Splices for No. 10 AWG and Smaller:

1. Solderless, screw-on, reusable pressure cable type, with integral insulation. Listed for wet locations and approved for copper and aluminum conductors.
2. The integral insulator shall have a skirt to completely cover the stripped conductors.
3. The number, size, and combination of conductors used with the connector, as listed on the manufacturer's packaging, shall be strictly followed.
4. Submersible-type.
5. Standards: ANSI C119.1 and C119.4 for Class A underground.
6. Multicable pedestals allowed.

J. Underground Splices for No. 8 AWG and Larger:

1. Mechanical type, of high conductivity and corrosion-resistant material. Listed for wet locations and approved for copper and aluminum conductors.
2. Insulate with materials approved for the particular use, location, voltage, and temperature. Insulation level shall be not less than the insulation level of the conductors being joined.
3. Splice and insulation shall be product of the same manufacturer.
4. Plastic electrical insulating tape: Per ASTM D2304, flame-retardant, cold, and weather resistant.
5. Submersible-type.
6. Standards: ANSI C119.1 and C119.4 for Class A underground.
7. Multicable pedestals allowed.

K. Power Distribution Blocks:

1. Description: Power distribution blocks accepting either aluminum or copper stranded cable.
2. Blocks for Splices No. 6 AWG to 500 MCM:

    a. AL/CU mechanical splices with 75/90F rated terminals.
    b. Poles as required for each circuit (3 and 4 pole configurations accepted).
    c. Ports as required to splice cables together. Field verify conditions. Some splices may differ in applications where new and existing conductors are being spliced together. E.g., existing conductors may be parallel runs where new may be single runs of cable. Each power block shall accommodate field conditions.
    d. Voltage rating: 600V.
    e. Maximum ampere rating shall be equal or greater to that of the maximum overcurrent protection device.
    f. Barriers shall separate line, neutral and ground cables.
    g. Standards:

        1) UL 1059.
        2) CSA Class 6228-1.

PART 3 - EXECUTION

3.1 PREPARATION

A. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

3.2 INSTALLATION

A. Comply with:

1. CEC Chapter 2 for Wiring and Protection.
2. CEC Chapter 3 for Wiring Methods and Materials.
3. NECA 1: Standard Practices for Good Workmanship in Electrical Construction.
4. NECA 101 Standard for Installing Steel Conduits (RMC, IMC, EMT).

B. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

C. The contractor shall verify MOCP and MCA requirements with the listing and labeling of each piece of equipment or device delivered to the field and determine if the feeder or branch circuit is compliant with the listing and labeling. Comply with CEC 110.3 and 422.60. The contractor shall inform the Engineer of any discrepancies.

D. It is assumed that all terminations in the field shall have minimum rated 75°C rated terminals. The contractor shall field verify all terminals for connection in compliance with CEC 110.14. The contractor shall inform the Engineer of any terminals deviating from 75°C. All conductors are rated for 75°C on plans unless otherwise noted.

3.3 CONDUCTOR MATERIAL APPLICATIONS

A. Branch Circuits and Feeders: THHN/THWN-2 Copper; solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

3.4 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Feeders: Concealed or exposed: Type THHN/THWN-2, single conductors in raceway.

B. Branch Circuits:

1. General:

a. Branch circuits shall be routed as single conductors in raceway from the panelboard until reaching the room, space, device, or equipment served.
b. The use of flexible raceway to equipment, appliances, surface and lay-in luminaires and devices shall be limited to 6’-0”.

c. The use of metal-clad cable to equipment and appliances is prohibited.
d. Metal-clad cable may be used to serve surface and lay-in luminaires and devices.

2. Exposed Branch Circuits not readily visible (typ. above ceiling or other similar spaces) without removal of an access panel: Type THHN/THWN-2 or XHHW-2, single conductors in raceway.
3. Exposed Branch Circuits readily visible: Type THHN/THWN-2 or XHHW-2, single conductors in raceway.
4. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2 or XHHW-2, single conductors in raceway.
5. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2 or XHHW-2, single conductors in raceway.

3.5 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

F. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer with a minimum separation of 0’-6”. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with fire-alarm system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

G. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes; cabinets; or equipment enclosures where circuit connections are made.

H. Color-Coding: Color-code Division 27 and Division 28 conductors differently from normal building power wiring.

3.6 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

1. Comply with CEC 110.14.
2. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.7 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 - Identification for Electrical Systems.

3.8 FIELD QUALITY CONTROL

A. Perform Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
2. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and all conductors #6 AWG and larger.

a. The cabling system shall be certified (inspected, tested, and documented) that it is ready for operation.

1) Insulation Resistance Test:

a) Perform insulation resistance test on each conductor #6 AWG and larger with respect to ground. Applied potential to be 1,000 VDC for one minute.
b) Record test values and submit to the Engineer. Insulation resistance to be 50 megohm, minimum.
c) Measure insulation resistance of complete circuits with the breakers open.

b. Forms: An example ORT form is provided in the supplement at the end of this section.

END OF SECTION 260519

SUPPLEMENT NO. 1
EXAMPLE
ORT FORM

INSULATION RESISTANCE TEST REPORT

Project:	Location:	Date:
		Tested By:
PNL Identification:	Test Equipment Used:	

T E S T D A T A

	INSULATION RESISTANCE IN MEGOHMS							
CIRCUIT DESIGNATION	A-GND	B-GND	C-GND	A-B	A-C	B-C	TEST VOLTAGE	DURATION

Notes:

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DEFINITIONS

A. Structure: That which is built or constructed, other than equipment (CEC Article 100).

B. EGC: Equipment ground conductor.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 260526 - Grounding and Bonding for Electrical Systems shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 COORDINATION

A. Refer to the Standard General Conditions and Supplementary Conditions.

1.4 SUBMITTALS

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B3.
2. Stranded Conductors: ASTM B8.
3. Bonding Conductor: #4 or #6 AWG, stranded conductor.
4. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Conduit Grounding Hubs: Mechanical type, terminal with threaded hub.

E. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex-head bolt.

F. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 COMPLY WITH CEC ARTICLE 250.

3.2 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors.
3. Connections to Structural Steel: Bolted Connectors.

C. Grounding Conductors: Green insulation.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Underground Equipment Grounding Conductors:

1. Bury at least 30 inches below grade.

2. Bare tinned copper conductor sized according to the largest feeder routed with the underground duct per CEC Table 250.66 for pullboxes.
3. Conductor shall run the length of underground trench duct and be exothermically bonded to steel pullbox covers and mechanically bonded to steel, enclosures poles, (etc.) using listed and labeled materials for the use.
4. Pullboxes are considered structures. For any structure containing more than one circuit (which may be 1Ø or 3Ø in accordance with CEC 250.32), provide and install one ground rod at each structure in addition to the underground EGC.

    a. Provide ground rod within the pullbox. Exothermically weld the EGC to the ground rod.
    b. A ground rod shall not be required for structures having only one circuit as defined by CEC 250.32 (A), Exception 1. The EGC shall still be required to bond metal parts in pullboxes. For pullboxes, the underground EGC shall be used to bond the lid.

5. Equipment grounding conductors at pullboxes and vaults that are exothermically welded at the lid shall allow contain 5’-0” of slack so that the lid may be laid adjacent to the pullbox on the ground for service or maintenance within the pullbox.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. Use exothermic welds for all below-grade connections.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations.

E. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1,000 kVA: 5 ohms.
3. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
4. Substations and Pad-Mounted Equipment: 5 ohms.

E. Prepare test and inspection reports.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

G. See attached Supplement No. 1 for an example ORT form.

END OF SECTION 260526

SUPPLEMENT NO. 1
EXAMPLE
ORT FORM

PACE ENGINEERING OPERATION READINESS TEST (ORT) - GROUND RESISTANCE TEST

GROUND RESISTANCE TEST REPORT

Project:		Location:	Date: Tested By:
Test Method:	☐ Two Point ☐ Fall of Potential	Test Equipment Used:	

GROUND DESIGNATION	OHMS	GROUND DESIGNATION	OHMS	GROUND DESIGNATION	OHMS	GROUND DESIGNATION	OHMS

NOTES:

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 260529 - Hangers and Supports for Electrical Systems shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 COORDINATION

A. Refer to the Standard General Conditions and Supplementary Conditions.

1.4 SUBMITTALS

A. Refer to the Standard General Conditions and Supplementary Conditions.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches on center in at least one surface.

1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2. Material for Channel, Fittings, and Accessories: Stainless steel, Type 304 Stainless steel.
3. Channel Width: Selected for applicable load criteria.
4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
7. Comply with 2019 CBC Chapter 16A and ASCE 7-16 Mechanical Equipment Anchorage Requirements.

B. Conduit and Cable Support Devices: Galvanized steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened Portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.
5. Hanger Rods: Threaded galvanized steel.
6. Raceway spring steel clamps listed and suitable for the use.

PART 3 - EXECUTION

3.1 PREPARATION

A. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

3.2 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1 (Good Workmanship Standards).
2. NECA 101 (Metallic Raceway Standards).
3. NECA 111 (Nonmetallic Raceway Standards).
4. California Electric Code 300.19 and Table 300.19 (A) for vertical cable supports.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, and RMC as required by CEC. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.3 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

C. Raceway Support Methods: In addition to methods described in NECA 1, EMT IMC and RMC may be supported by openings through structure members, according to CEC.

D. Strength of Support Assemblies: Where indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

E. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To New Concrete: Bolt to concrete inserts.
2. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
3. To Existing Concrete: Expansion anchor fasteners.

F. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.4 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

3.5 CONCRETE

A. Construct concrete pads, foundations and bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 4,000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements shall be per Structural and Architectural contract documents.

C. Anchor Equipment to Concrete Base as Follows:

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.6 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Conduit and fittings.
2. Boxes, enclosures, and cabinets.
3. Pullboxes and handholes.
4. Duct spacers.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 260533 - Raceways and Boxes for Electrical Systems shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 REFERENCES

A. See Section 260544 - Sleeves and Sleeve Seals for Electrical Raceways and Cabling.

B. See Section 260519 - Low Voltage Electrical Power Conductors and Cables. Section 260519 may supersede Section 260533, Part 3, Section 3.1.

1.4 DEFINITIONS

A. RMC: Rigid Metallic Conduit.

B. PVC: Rigid Polyvinyl Chloride Conduit.

C. FMC: Flexible Metal Conduit.

D. LFMC: Liquid-tight Flexible Metal Conduit.

E. Concealed: Rendered inaccessible by the structure or finish of the building. Raceways and cables supported or located within hollow frames or permanently enclosed by the finish of buildings are considered concealed.

F. Exposed: On or attached to the surface or behind panels designed to allow access. Raceways and cables in unfinished basements in accessible underfloor areas or attics; or behind, above, or below.

G. Pullbox: Underground box to which raceways terminate and wire space is given to redirect or splice conductors.

1.5 COORDINATION

A. Refer to the Standard General Conditions and Supplementary Conditions.

1.6 SUBMITTALS

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Product Data: For all products.

C. The Contractor shall document (by photography) the installation of duct spacers while trenching is open and send to the Electrical Engineer of Record.

PART 2 - PRODUCTS

2.1 CONDUITS AND FITTINGS

A. General:

1. Listing and Labeling: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application. Comply with NEMA FB 1 and UL 514B.
2. Fittings shall be listed and labeled for type of conduit, location, and use.
3. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and CEC.
4. Nonmetallic conduit shall be listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.

B. RMC:

1. Rigid galvanized threaded.
2. Comply with ANSI C80.1 and UL 6.
3. Joint Compound for RMC: Approved, as defined in CEC, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

C. FMC:

1. Thread-in fittings.
2. Comply with UL 1; zinc-coated steel.

D. LFMC:

1. Liquid tight steel or iron.
2. Flexible steel conduit with PVC jacket and complying with UL 360.

E. PVC:

1. Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
2. Fittings to match conduit type.

3. Solvents and adhesive shall be as recommended by conduit manufacturer.
4. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions. Steel expansion fittings shall be outfitted by a braided bonding jumper listed for the use.

2.2 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets:

1. Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

D. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

E. Device Box Dimensions:

1. General: 4 inches square by 2-1/8 inches deep.
2. For Cat6A cable installation: 5-Square box.

2.3 PULLBOXES AND HANDHOLES

A. General Requirements for Underground Pullboxes and Handholes:

1. Pullboxes for use in underground systems shall be designed and identified as defined in CEC, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.

B. Underground Polymer-Concrete Pullboxes:

1. Polymer-Concrete Cover: Used in non-rated traffic areas: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
2. Steel Cover: Used in traffic-rated areas: H20 AASHTO M309, skid resistant and marked. Frame to be reinforced concrete with steel frame.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC", or “FIRE ALARM” or “COMMUNICATION” as shown on Drawings.
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

8. Precast concrete structures shall be designed and constructed in accordance with ASTM C857 and ASTM C858. Concrete compressive strength at 28 days shall not be less than 3,000 PSI.
9. Extension rings: As required.
10. Pullboxes providing entry for line and low-voltage systems shall incorporate a pullbox divider separation.

C. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

2.4 DUCT SPACERS

A. Description and use: Duct spacers are designed to temporarily support an array of ducts within a trench until it can be filled with grout or similar suitable fill material. They also maintain accurate duct separation and alignment, which promotes reduced pulling tension. The spacer provides for independent support and separation of each duct. Optional foot pads assure specified vertical separation between the trench floor and the bottom of the first duct tier. Duct spacers produced may be used in combination with vertical reinforcing rods and metal collars, provide an effective means for splaying from duct bank to vault or manhole.

B. Material: Spacers shall be made from high density polyethylene.

C. Spacers shall consist of interlocking modules. Base pads shall be used to assure specified dimensions between trench floor and bottom of first tier of ducts. The interlocking modules shall include an internal vertical channel on both side edges of the spacer. The interlocking module spacers shall provide independent support for each duct.

PART 3 - EXECUTION

3.1 PREPARATION

A. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

3.2 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit not Subject to damage: RMC.
2. Exposed Conduit Subject to damage: RMC.
3. Concealed Conduit, Aboveground: RMC.
4. Underground Conduit: PVC Type 40.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes, Wireways and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit not Subject to damage: RMC.

2. Exposed Conduit Subject to damage: RMC.
3. Concealed in Ceilings and Interior Walls and Partitions: RMC.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
5. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Steel Conduit: Comply with NEMA FB 2.10.
2. Flexible Conduit: Comply with NEMA FB 2.20.

3.3 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with CEC limitations for types of raceways allowed in specific occupancies and number of floors.

B. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

C. Raceways shall be installed in compliance with the manufacturer installation instructions, this Section and relevant CEC Articles listed below:

1. RMC: CEC Article 344.
2. FMC: CEC Article 348.
3. LFMC: CEC Article 350.
4. PVC: CEC Article 352.

D. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

E. Complete raceway installation before starting conductor installation.

F. Arrange stub-ups so curved portions of bends are not visible above finished slab.

G. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

H. Make bends in raceway using large-radius preformed ells. Field bending shall be according to CEC minimum radii requirements. Use only equipment specifically designed for material and size involved.

I. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

J. Support conduit within 36 inches of boxes, cabinets, and enclosures to which attached.

K. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Engineer for each specific location.

L. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than #4 AWG.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

T. Fasten junction and pullboxes to or support from building structure. Do not support boxes by conduits.

U. Duct spacers shall be installed at 20’-0” intervals (minimum).

V. Duct spacers shall be installed wherever underground ducts are 3 or more in number.

3.4 INSTALLATION OF UNDERGROUND CONDUIT

A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

B. Direct-Buried Conduit:

1. All work performed in the field shall comply with CEC Article 300.5(A) through 300.5(F).
2. Comply with minimum coverage in accordance with CEC Table 300.5.
3. Compacted trench backfill shall be 95% relative compaction per ASTM D1557 Maximum Dry Density.
4. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in contract documents.
5. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
6. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

3.5 INSTALLATION OF UNDERGROUND PULLBOXES

A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

B. Install pullboxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

C. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

D. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

E. 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.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

END OF SECTION 260533

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal fittings.
3. Conduit sealing bushing.
4. Grout.
5. Silicone sealants.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 260544 - Sleeves and Sleeve Seals for Electrical Raceways and Cabling shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 COORDINATION

A. Refer to the Standard General Conditions and Supplementary Conditions.

1.4 SUBMITTALS

A. Refer to the Standard General Conditions and Supplementary Conditions.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.2 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.3 CONDUIT SEALING BUSHING

A. Description: Interior conduit sealing bushing to seal against fluid or gases, providing some support for the cables when the fitting is used in a vertical position.

1. Type CSBI for sealing gas or fluid pressures of 50 psig.
2. Type CSBE for sealing gas or fluid pressures of 50 psig., lending some vertical support.
3. Type CSBG for applications where internal pressure will be high, or if the fitting is used in an inverted position.
4. Slotted PVC coated steel discs.
5. Neoprene sealing ring.
6. Stainless steel socket head cap screws and washers.
7. Hot dipped galvanized malleable or ductile iron locking collars on Type CSBG.
8. Aluminum or brass/bronze pressure discus (metal plates) on Type CSBI and CSBE bushings.
9. Blank fittings for sealing empty conduit.
10. One or multiple holes per the application.
11. Operating temperature -40 deg F to 200 deg F.

2.4 GROUT

A. Description: Non-shrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5,000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 PREPARATION

A. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

3.2 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

D. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

E. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

B. Install sleeve-seal fittings in new walls and slabs as they are constructed.

C. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

D. Secure nailing flanges to concrete forms.

E. Using grout, seal the space around outside of sleeve-seal fittings.

3.4 CONDUIT SEALING BUSHING

A. Install at switchgear slabs outside of the building.

B. Install within pullboxes where a change in grade is present.

C. Install blank fittings at empty raceway.

3.5 CORING THROUGH EXISTING CONCRETE OR CONSTRUCTED MASONRY UNITS

A. Identify spot for drilling.

B. Use Sub-Scanner to detect any danger in the hole location. Do not core drill through structural reinforcements. Ensure no foreign materials to the concrete exist in the core location.

C. If core is near other services (electrical, gas, plumbing, etc.), drill a pilot hole before coring to ensure core does not interfere with other services.

END OF SECTION 260544

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Labels.
2. Underground tape.
3. Cable ties.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 260553 - Identification for Electrical Systems shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 COORDINATION

A. Refer to the Standard General Conditions and Supplementary Conditions.

1.4 SUBMITTALS

A. Refer to the Standard General Conditions and Supplementary Conditions.

PART 2 - PRODUCTS

2.1 COLOR AND LEGEND REQUIREMENTS

A. Color-Coding for Phase-Identification, 600V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.

1. Color shall be factory applied or field applied for sizes larger than #8 AWG if authorities having jurisdiction permit.
2. Colors for 240VAC or 208VAC, 3Ø Systems:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.
    d. Neutral: White.
    e. Ground: Green.

3. Colors for 480VAC Systems:

    a. Phase A: Brown.

b. Phase B: Orange.
c. Phase C: Yellow.
d. Neutral: Gray.
e. Ground: Green.

2.2 LABELS

A. Single-Sided Plastic Equipment Label:

1. Thickness: 1/16-inch or greater.
2. Font: Times New Roman, 3/16-inch H.
3. Mounting: Permanent double sided outdoor mounting tape covering the entire back of label.
4. Placement: Centered at top of equipment.
5. White letters on a black field.
6. Size as required, but minimum shall be 1-inch H x 3-inch W.

B. Single-Sided Tape Labels:

1. Size: ½-inch W.
2. Font: Times New Roman Size 14.
3. Mounting: permanent adhesive.
4. Background color: translucent/clear.
5. Legend Color: Black.

2.3 UNDERGROUND TAPE

A. Underground-Line Warning Tape:

1. Tape:

a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
b. Printing on tape shall be permanent and shall not be damaged by burial operations.
c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2.4 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F according to ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F according to ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

PART 3 - EXECUTION

3.1 PREPARATION

A. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

B. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 PANELBOARD AND SWITCHBOARD CIRCUIT DIRECTORIES

A. Circuit directories shall be typed or computer-generated using Times New Roman font.

B. Circuit directories shall meet minimum CEC 408.4 requirements. The contractor shall identify each circuit with room number, room name and equipment served. Standard abbreviations from the CEC and Webster’s dictionary are allowed. (E.g., “207 Janitor WH” or “102,103 RR RCPT”).

3.3 INSTALLATION

A. Coordinate identification with Project Drawings.

B. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

C. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

D. Service equipment at other than dwelling units shall be legibly marked in the field with the maximum available fault current. The field marking(s) shall include the date of the fault-current calculation was performed and be of sufficient durability to withstand the environment involved. The calculation shall be documented and made available to those authorized to design, install, inspect, maintain, or operate the system (CEC 110.24[A]).

E. Electrical equipment, such as switchboards, switchgear, panelboards, industrial control panels, meter socket enclosures, and motor control centers, that is in other than dwelling units, and is likely to require examination, adjustment, servicing, or maintenance while energized, shall be field or factory marked to warn qualified persons of electric arc flash hazards. The marking shall

meet the requirements in CEC 110.21(B) and shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment (CEC 110.16 [A]).

F. Each service disconnect shall be permanently marked to identify it as a service disconnect (CEC 230.70[B]).

G. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
2. Install underground-line warning tape for direct-buried cables and cables in raceways.

H. Where grounded conductors of different systems are installed in the same raceway, cable, box, auxiliary gutter, or other type of enclosure, each grounded conductor shall be identified by system. Comply with CEC 200.6(D) where these occur on drawings. Signage applications suiting 200.6(D)(3) shall be executed with single-sided equipment labels in accordance with CEC Exhibit 200.3.

I. Provide and install signage on inside of the main switchboard indicating where standby generation is installed CEC 702.7. The label shall be provided and installed in compliance with CEC 110.21(B).

J. Single-Sided Equipment Labels:

1. Adhere labels to equipment using an optically clear two-part epoxy mix. Do not screw or use rivets fasten labels to equipment.
2. The following units shall be labeled:

    a. Switchgear.
    b. Panelboards.
    c. Transformers.
    d. Disconnects.
    e. Mechanical at the point of connection to the unit. These labels will only be provided in the cases where mechanical units have no obvious disconnect adjacent to the unit. This is typical when an array of mechanical units is powered from a panelboard.

3. For equipment labels, follow the convention examples below:

PANEL A
FED FROM MSB
400A, 277/480, 3Ø, 22kAIC

HEAT PUMP M-1
FED FROM PANEL M

XFMR A
FED FROM PANEL A
480:120/208V, 3Ø, 75kVA

MOTOR CONTACT ENCLOSURE
FED FROM PANEL A

END OF SECTION 260553

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Disconnecting and overcurrent protection devices.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 262416 - Panelboards shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 DEFINITIONS

A. ATS: Acceptance testing specification.

B. GFCI: Ground-fault circuit interrupter.

C. MCCB: Molded-case circuit breaker.

1.4 COORDINATION

A. Refer to the Standard General Conditions and Supplementary Conditions.

1.5 SUBMITTALS

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Product Data: For each type of disconnecting and overcurrent protection device.

1. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, and ratings.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.7 FIELD 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 two business days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Owner's written permission.

PART 2 - PRODUCTS

2.1 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.
b. Instantaneous magnetic trip element for short circuits.
c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.
3. Circuit breaker lockouts allowing for lock-out-tag-out.
4. Top or Sub-Feed Circuit Breakers: Vertically mounted.
5. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Breaker handle indicates tripped status.
c. UL listed for reverse connection without restrictive line or load ratings.
d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering overcurrent protection devices to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in CEC.

B. Examine panelboards before installation. Reject overcurrent protection devices that are damaged, rusted, or have been subjected to water saturation.

C. Examine elements and surfaces to receive overcurrent protection devices for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. When manufacturer’s installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

3.3 INSTALLATION

A. Coordinate layout and installation of panelboard 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.

B. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

C. Comply with NECA 1.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

E. The center of the operating handle of switches or circuit breakers used as switches shall not be mounted higher than 79 inches above the floor or working platform per CEC 404.8.

F. Install overcurrent protective devices and controllers not already factory installed.

1. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

G. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

H. Examine the area where panelboard(s) and/or loadcenter(s) shall be installed. Ensure compliance with CEC 110.26 for “Spaces About Electrical Equipment”.

I. Comply with CEC 110.25. Circuit breaker lockouts allowing for lock-out-tag-out shall be provided for all:

1. Transformers.

3.4 IDENTIFICATION

A. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Handwritten directories are not acceptable. Install directory inside panelboard door. All directories shall be typed or computer printed.

3.5 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

END OF SECTION 262416

SECTION 263213.14 - DIESEL ENGINE GENERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes packaged engine generators used to supply non-emergency power, with the following features:

1. Diesel engine.
2. Diesel fuel system.
3. Control and monitoring.
4. Generator overcurrent and fault protection.
5. Generator, exciter, and voltage regulator.
6. Outdoor engine generator enclosure.
7. Vibration isolation devices.
8. Accessories.
9. Finishes.

B. Related Requirements:

1. Section 263600 - Transfer Switches for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine generators.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 263213.14 - Diesel Engine Generators shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.4 SUBMITTALS

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Include fuel consumption in gallons per hour at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
3. Include generator efficiency at the rated power factor at 0.5, 0.75, and 1.0 times generator capacity.

4. Include airflow requirements for cooling and combustion air in cubic feet per minute at the rated power factor, with air-supply temperature of 95, 80, 70, and 50 deg F. Provide Drawings indicating requirements and limitations for location of air intake and exhausts.
5. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.

C. Shop Drawings:

1. Include plans and elevations for engine generator and other components specified. Indicate access requirements affected by height of subbase fuel tank.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
5. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for engine generators and functional relationship between all electrical components.

D. Seismic Qualification Data: Certificates, for engine generator, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: With engine and generator mounted on rails, identify center of gravity and total weight, including full fuel tank, supplied enclosure, and each piece of equipment not integral to the engine generator, and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Certified summary of prototype-unit test report.
5. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
6. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
7. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
8. Report of sound generation.
9. Report of exhaust emissions showing compliance with applicable regulations.

E. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals.

1.5 WARRANTY

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Warranty Coverage: Comprehensive.

C. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Cummins.

B. Kohler.

C. Blue Star.

D. Generac.

E. Or equal: Refer to the Standard General Conditions and Supplementary Conditions.

F. Substitutions: Refer to the Standard General Conditions and Supplementary Conditions.

G. Source Limitations: Obtain packaged engine generators and auxiliary components from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Engine generator housing, subbase fuel tank, engine generator, batteries, battery racks, silencers, sound attenuating equipment, accessories, and components shall withstand the effects of earthquake motions determined according to the 2022 California Building Code and ASCE 7-16.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Shake-table testing shall comply with ICC-ES AC156. Testing shall be performed with all fluids at worst-case normal levels.
3. Component Importance Factor: Ip 1.5.
4. Seismic Design Category D.
5. Minimum Design Spectral Response Accelerations: S_{DS}=1.742 S_{DI}=1.822.
6. Special seismic certification is required.

B. NFPA Compliance: Comply with NFPA 37.

C. UL Compliance:

1. Comply with UL 2200.
2. UL 142.
3. UL 2085.

D. Engine Exhaust Emissions: Tier 2; comply with State and Local air quality control requirements.

E. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at 23 feet due to sound emitted by engine generator including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

1. Sound level measured at the location mentioned shall not exceed: 75 Db.

F. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: 5 deg to 104 deg F.
2. Altitude: Sea level to 1,000 feet.

2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and use.

C. Power Rating: Standby.

D. Service Load: 750 kW.

E. Power Factor: 0.8, lagging.

F. Frequency: 60 Hz.

G. Voltage: 277/480VAC.

H. Phase: Three-phase, four wire, wye.

I. Governor: Adjustable isochronous, with speed sensing.

J. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and engine generator center of gravity.

K. Capacities and Characteristics:

1. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.

L. Engine Generator Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.

2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than ten seconds and then clear the fault automatically, without damage to generator system components.
8. Start Time: Ten seconds.

2.4 DIESEL ENGINE

A. Fuel: ASTM D975, diesel fuel, Grade 2-D S15.

B. Diesel tank shall be filled with fuel one week prior to the start of generator testing. The tank will not be required to be refueled after testing if the tank remains above 75 percent after testing acceptance.

C. Rated Engine Speed: 1,800 rpm.

D. Lubrication System: Engine-mounted.

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.

E. Jacket Coolant Heater: 208VAC, single-phase factory installed in coolant system. Comply with UL 499.

F. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator set mounting frame and integral engine-driven coolant pump.

1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
2. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

G. Muffler/Silencer: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

H. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

I. Starting System:

1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: 60 seconds.
4. Battery: Lead acid, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least twice without recharging.
5. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 50 deg F regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
6. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
8. Battery Charger: Current-limiting, automatic-equalizing, and float-charging type designed for lead-acid batteries. Unit shall comply with UL 1236 and include the following features:

a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
b. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
c. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
d. Enclosure and Mounting: Integral to enclosure.

2.5 DIESEL FUEL SYSTEM

A. Comply with NFPA 30.

B. Subbase-Mounted, Double-Wall, Fuel Tank: State compliant, Factory installed and piped, complying with UL 142 fuel tank. Features include the following:

1. Tank level indicator.
2. Fuel-Tank Capacity: Tank shall be large enough to run the generator at 100 percent load for 72 hours, minimum 3,000 gallons of fuel storage.
3. Leak detection in interstitial space.

4. Vandal-resistant fill cap.
5. Containment Provisions: Comply with requirements of authorities having jurisdiction.

2.6 CONTROL AND MONITORING

A. Comply with UL 508A.

B. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from engine generator vibration. Panel shall be powered from the engine generator battery.

C. Control and Monitoring Panel:

1. Digital engine generator controller with integrated LCD display, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
2. Instruments: Located on the control and monitoring panel and viewable during operation.

    a. Engine lubricating-oil pressure gage.
    b. Engine-coolant temperature gage.
    c. DC voltmeter (alternator battery charging).
    d. Running-time meter.
    e. AC voltmeter, for each phase.
    f. AC ammeter, for each phase.
    g. AC frequency meter.
    h. Generator-voltage adjusting rheostat.

3. Controls and Protective Devices: Controls, shutdown devices, and common alarm indication, including the following:

    a. Cranking control equipment.
    b. Run-Off-Auto switch.
    c. Control switch not in automatic position alarm.
    d. Overcrank alarm.
    e. Overcrank shutdown device.
    f. Low-water temperature alarm.
    g. High engine temperature pre-alarm.
    h. High engine temperature.
    i. High engine temperature shutdown device.
    j. Overspeed alarm.
    k. Overspeed shutdown device.
    l. Low fuel main tank.

        1) Low-fuel-level alarm shall be initiated when the level falls below that required for operation for duration required in "Fuel Tank Capacity" Subparagraph in "Diesel Fuel System" Article.

    m. Coolant low-level alarm.
    n. Coolant low-level shutdown device.

o. Coolant high-temperature prealarm.
p. Coolant high-temperature alarm.
q. Coolant low-temperature alarm.
r. Coolant high-temperature shutdown device.
s. Battery high-voltage alarm.
t. Low cranking voltage alarm.
u. Battery-charger malfunction alarm.
v. Battery low-voltage alarm.
w. Lamp test.
x. Contacts for local and remote common alarm.
y. Remote manual stop shutdown device.
z. Generator overcurrent-protective-device not-closed alarm.
aa. Hours of operation.
bb. Engine generator metering, including voltage, current, hertz, kilowatt, kilovolt ampere, and power factor.

D. Connection to Datalink:

1. Provide a separate terminal block, factory wired to Form C dry contacts, for a common alarm.
2. Provide connections for datalink transmission of indications to remote data terminals via ModBus.

E. Common Remote Panel with Common Audible Alarm: Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine generator battery.

F. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator unless otherwise indicated.

G. Remote Emergency-Stop Switch: Flush; mounted on exterior of generator enclosure; and labeled. Push button shall be protected from accidental operation.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.

B. Generator Circuit Breaker: Molded-case, electronic-trip type; 100 percent rated; complying with UL 489.

1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous with ground fault protection.
2. Trip Settings: Selected to coordinate with generator thermal damage curve.
3. Mounting: Adjacent to, or integrated with, control and monitoring panel.

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class F.

D. Enclosure: Dripproof.

E. Instrument Transformers: Mounted within generator enclosure.

F. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.

1. Maintain voltage within 20 percent on one step, full load.
2. Provide anti-hunt provision to stabilize voltage.
3. Maintain frequency within 10 percent and stabilize at rated frequency within 5 seconds.

G. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

H. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

I. Subtransient Reactance: 12 percent, maximum.

2.9 OUTDOOR ENGINE GENERATOR ENCLOSURE

A. Description: Vandal-resistant, sound-attenuating, weatherproof aluminum housing; wind resistant up to 105 mph (ultimate 3-second gust). Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Instruments and control shall be mounted within enclosure.

B. Structural Design and Anchorage: Comply with ASCE 7-16 for wind loads up to 105 mph (ultimate mph three-second gust).

C. Hinged Doors: With padlocking provisions.

D. Space Heater: 120VAC thermostatically controlled and sized to prevent condensation.

E. Lighting: Provide weather-resistant LED lighting.

F. Muffler Location: Within enclosure.

1. Louvers: Fixed-engine, cooling-air inlet and discharge. Stormproof and drainable louvers prevent entry of rain and snow.
2. Ventilation: Provide external exhaust piping so that it discharges downward at a 45 deg angle.

G. Interior Lights with Switch: Factory-wired, vaporproof luminaires within housing; arranged to illuminate controls and accessible interior. Arrange for external electrical connection.

1. AC lighting system powered via load center.

H. Convenience Outlets: Factory-wired, GFCI. Arrange for external electrical connection.

I. Factory Mounted Load Center and Transformer: Transformer sized to support 100A, 120/208 VAC, three-phase load center.

1. All generator loads requiring an external power source shall be connected to the generator load center.
2. Generator enclosure shall come with all necessary components, including transformers and disconnects to accommodate customer-supplied power voltage and phase. See Drawings.

J. Provide factory installed rodent guards where applicable.

K. Provide platform and stairs at both sides of enclosure to match height of enclosure doors on top of fuel tank.

2.10 VIBRATION ISOLATION DEVICES

A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

1. Material: Standard neoprene separated by steel shims.
2. Shore A Scale Durometer Rating: 60.
3. Number of Layers: One.
4. Minimum Deflection: 1/2 inch.

2.11 GENERATOR ACCESSORIES

A. Generator Platform, Stairs, Guardrail, and Handrail:

1. Comply with requirements listed by OSHA Standard Subpart D - Walking-Working Surfaces and Cal/OSHA Title 8, Chapter 4, Subchapter 7, Group 1, Article 2, unless supplemented or modified in this Section.
2. Stairs:

a. Riser Height: 9.5 inches maximum.
b. Tread Depth: 9.5 inches minimum.
c. Stair Width: 22 inches minimum between vertical barriers.

3. Guardrail:

a. Height: 42 inches minimum above walking-working surface.

4. Handrail:

    a. Location: At stairs.
    b. Height: 36 inches above walking-working surface.
    c. Handrails shall extend 12 inches minimum beyond the top and bottom stair trend.

2.12 FINISHES

A. Indoor and Outdoor Enclosures and Components: Carboline, Carboxane 2000 Series paint color code 2731 (olive brown) and compatible primer.

2.13 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with IEEE 115.
2. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
3. Report factory test results within 14 days of completion of test.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.

B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

B. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Owner no fewer than two weeks in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.

3.3 INSTALLATION

A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

B. Comply with NECA 1 and NECA 404.

C. Comply with packaged engine generator manufacturers' written installation and alignment instructions.

D. Equipment Mounting:

1. Install packaged engine generators on cast-in-place concrete equipment bases.
2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

E. Fuel Piping:

1. Copper and galvanized steel shall not be used in the fuel piping system.

F. Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.4 CONNECTIONS

A. Ground equipment according to Section 260526 Grounding and Bonding for Electrical Systems.

B. Connect wiring according to Section 260519 Low-Voltage Electrical Power Conductors and Cables. Provide a minimum of one 90-deg bend in flexible conduit routed to the engine generator from a stationary element.

C. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.5 IDENTIFICATION

A. Identify system components according to Section 260553 Identification for Electrical Systems.

B. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections with the assistance of a factory-authorized service representative.

C. Contractor shall be responsible for fuel used during startup and testing. After testing is complete, Contractor shall fill fuel tank to 80 percent capacity minimum.

D. Tests and Inspections:

1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in first two subparagraphs below. Certify compliance with test parameters.

a. Visual and Mechanical Inspection:

1) Compare equipment nameplate data with Drawings and the Specifications.
2) Inspect physical and mechanical condition.
3) Inspect anchorage, alignment, and grounding.
4) Verify that the unit is clean.

b. Electrical and Mechanical Tests:

1) Perform insulation-resistance tests according to IEEE 43.

a) Machines Larger Than 200 hp: Test duration shall be 10 minutes.
b) Machines 200 hp or Less: Test duration shall be one minute.

2) Verify phase rotation, phasing, and synchronized operation as required by the application.
3) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
4) Provide testing according to NFPA 110 for 2 hours with portable load bank, capable of applying 100 percent of rated load capacity. Document the current, voltage, frequency, oil pressure, and coolant temperature every 15 minutes.

2. Exhaust Emissions Test: Comply with applicable government test criteria.
3. Noise Level Tests: Measure A-weighted level of noise emanating from engine generator installation, including engine exhaust and cooling-air intake and discharge, at four locations 23 feet from edge of the generator enclosure, and compare measured levels with required values.

E. Coordinate tests with tests for transfer switches and run them concurrently.

F. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.

G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

H. Remove and replace malfunctioning units and retest as specified above.

I. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.

3.7 PERMITTING

A. Contractor is responsible for all permitting related to the generator. Coordinate with Owner and generator manufacturer as required.

3.8 MAINTENANCE SERVICE

A. Generator supplier to provide a one-year maintenance contract, two times per year with load bank testing. On the sixth month following start-up, a visual inspection will be conducted along with topping off fluids (coolant and oil), Diesel fuel not included. On the twelfth month following start-up, a visual inspection will be conducted along with an oil and filter change with a 2-hour load bank test. Load bank test report will be provided to the end user.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION 263213.14

SECTION 263600 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes automatic transfer switches rated 600 V and less.

1.3 MEASUREMENT AND PAYMENT

A. Payment for Section 263600 - Transfer Switches shall be included in the most applicable lump-sum bid item in the Proposal.

1.4 SUBMITTALS

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for transfer switches.
2. Include rated capacities, operating characteristics, electrical characteristics, and accessories.

C. Shop Drawings:

1. Include plans, elevations, sections, details showing minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
2. Include material lists for each switch specified.
3. Single-Line Diagram: Show connections between transfer switch, power sources, and load.
4. Riser Diagram: Show interconnection wiring between transfer switches, bypass/isolation switches, annunciators, and control panels.

D. Qualification Data: For manufacturer-authorized service representative.

E. Seismic Qualification Data: Certificates, for transfer switches, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

F. Field quality-control reports.

G. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1. Include the following:

a. Features and operating sequences, both automatic and manual.
b. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.5 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Notify Owner no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.

1.6 WARRANTY

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Contractor shall be responsible for verifying the transfer switch is compatible with the generator. Contractor shall provide written verification to the EEOR if transfer switch and generator manufacturers differ.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined the NFPA, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA ICS 1.

D. Comply with NFPA 99.

E. Comply with NFPA 110.

F. Comply with UL 1008 unless requirements of these Specifications are stricter.

G. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

H. Tested Fault-Current Closing and Short-Circuit Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.
2. Short-time withstand capability for three cycles.

I. Repetitive Accuracy of Solid-State Controls: All settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 deg to plus 70 deg C.

J. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.62. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

K. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism. Switches for emergency or standby purposes shall be mechanically and electrically interlocked in both directions to prevent simultaneous connection to both power sources unless closed transition.

L. Neutral Terminal: Solid and fully rated unless otherwise indicated.

M. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater.

N. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

O. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, by color-code or by numbered or lettered wire and cable with printed tape markers at terminations. Color-coding and wire and cable markers are specified in Section 260553 - Identification for Electrical Systems.

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
4. Accessible via front access.

P. Enclosures: General-purpose NEMA 250, Type 1 and Type 3R, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.2 CONTACTOR-TYPE AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are unacceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Contactor-style automatic transfer-switch units, rated 600 A and higher, shall have separate arcing contacts.
4. Conductor Connectors: Suitable for use with conductor material and sizes.
5. Material: Tin-plated aluminum.
6. Main and Neutral Lugs: Compression type.
7. Ground Lugs and Bus-Configured Terminators: Compression type.
8. Ground bar.
9. Connectors shall be marked for conductor size and type according to UL 1008.

C. Automatic Open-Transition Transfer Switches (ATS-1): Interlocked to prevent the load from being closed on both sources at the same time.

1. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.

D. Automatic Closed-Transition Transfer Switches (ATS-2): Connect both sources to load momentarily. Transition is controlled by programming in the automatic transfer-switch controller.

1. Fully automatic make-before-break operation when transferring between two available power sources.
2. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 ms.
3. Initiation of No-Interruption Transfer: Controlled by in-phase monitor and sensors confirming both sources are present and acceptable.

    a. Initiation occurs without active control of generator.
    b. Automatic transfer-switch controller takes active control of generator to match frequency, phase angle, and voltage.
    c. Controls ensure that closed-transition load transfer closure occurs only when the two sources are within plus or minus 5 electrical degrees maximum, and plus or minus 5 percent maximum voltage difference.

4. Failure of power source serving load initiates automatic break-before-make transfer.

E. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

F. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

G. Electric Nonautomatic Switch Operation: Electrically actuated by push buttons designated "Normal Source" and "Alternative Source." Switch shall be capable of transferring load in either direction with either or both sources energized.

H. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval shall be adjustable from 1 to 30 seconds.

I. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

J. Automatic Transfer-Switch Controller Features:

1. Controller operates through a period of loss of control power.
2. Undervoltage Sensing for Each Phase of Normal and Alternate Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from zero to 30 minutes, and factory set for 10 minutes. Override shall automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
12. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
13. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and

shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods shall be adjustable from 10 to 30 minutes. Factory settings shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
b. Push-button programming control with digital display of settings.
c. Integral battery operation of time switch when normal control power is unavailable.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect components, assembled switches, and associated equipment according to UL 1008. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

B. Prepare test and inspection reports.

1. For each of the tests required by UL 1008, performed on representative devices, for emergency systems. Include results of test for the following conditions:

a. Overvoltage.
b. Undervoltage.
c. Loss of supply voltage.
d. Reduction of supply voltage.
e. Alternative supply voltage or frequency is at minimum acceptable values.
f. Temperature rise.
g. Dielectric voltage-withstand; before and after short-circuit test.
h. Overload.
i. Contact opening.
j. Endurance.
k. Short circuit.
l. Short-time current capability.
m. Receptacle withstand capability.
n. Insulating base and supports damage.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

B. Floor-Mounting Switch: Anchor to floor by bolting.

1. Install transfer switches on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 - Cast-in-Place Concrete.
2. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.
3. Provide workspace and clearances required by CEC.

C. Annunciator and Control Panel Mounting: Flush in wall unless otherwise indicated.

D. Identify components according to Section 260553 - Identification for Electrical Systems.

E. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

F. Comply with NECA 1.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to generator sets, control, and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Wiring Method: Install cables in raceways and cable trays except within electrical enclosures. Conceal raceway and cables except in unfinished spaces.

1. Comply with requirements for raceways and boxes specified in Section 260533 - Raceways and Boxes for Electrical Systems.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

D. Ground equipment according to Section 260526 - Grounding and Bonding for Electrical Systems.

E. Connect wiring according to Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

F. Route and brace conductors according to manufacturer's written instructions and Section 260529 - Hangers and Supports for Electrical Systems. Do not obscure manufacturer's markings and labels.

G. Final connections to equipment shall be made with liquidtight, flexible metallic conduit no more than 18 inches in length.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. After installing equipment, test for compliance with requirements according to NETA ATS.
2. Visual and Mechanical Inspection:

    a. Compare equipment nameplate data with Drawings and Specifications.
    b. Inspect physical and mechanical condition.
    c. Inspect anchorage, alignment, grounding, and required clearances.
    d. Verify that the unit is clean.
    e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
    f. Verify that manual transfer warnings are attached and visible.
    g. Verify tightness of all control connections.
    h. Inspect bolted electrical connections for high resistance using one of the following methods, or both:

        1) Use of low-resistance ohmmeter.
        2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.

    i. Perform manual transfer operation.
    j. Verify positive mechanical interlocking between normal and alternate sources.
    k. Perform visual and mechanical inspection of surge arresters.
    l. 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 or circuit-breaker ratings match Drawings.
        3) Verify correct functioning of drawout disconnecting contacts, grounding contacts, and interlocks.

3. Electrical Tests:

    a. Perform insulation-resistance tests on all control wiring with respect to ground.
    b. Perform a contact/pole-resistance test. Compare measured values with manufacturer's acceptable values.
    c. Verify settings and operation of control devices.
    d. Calibrate and set all relays and timers.
    e. Verify phase rotation, phasing, and synchronized operation.
    f. Perform automatic transfer tests.
    g. Verify correct operation and timing of the following functions:

        1) Normal source voltage-sensing and frequency-sensing relays.
        2) Engine start sequence.
        3) Time delay on transfer.
        4) Alternative source voltage-sensing and frequency-sensing relays.
        5) Automatic transfer operation.
        6) Interlocks and limit switch function.

7) Time delay and retransfer on normal power restoration.
8) Engine cool-down and shutdown feature.

4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

   a. Check for electrical continuity of circuits and for short circuits.
   b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
   c. Verify that manual transfer warnings are properly placed.
   d. Perform manual transfer operation.

5. After energizing circuits, perform each electrical test for transfer switches stated in NETA ATS and demonstrate interlocking sequence and operational function for each switch at least three times.

   a. Simulate power failures of normal source to automatic transfer switches and retransfer from emergency source with normal source available.
   b. Simulate loss of phase-to-ground voltage for each phase of normal source.
   c. Verify time-delay settings.
   d. Verify pickup and dropout voltages by data readout or inspection of control settings.
   e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
   f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for one pole deviating by more than 50 percent from other poles.
   g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

6. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

   a. Verify grounding connections and locations and ratings of sensors.

C. Coordinate tests with tests of generator and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

E. Transfer switches will be considered defective if they do not pass tests and inspections.

F. Remove and replace malfunctioning units and retest as specified above.

G. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment.

B. Training shall include testing ground-fault protective devices and instructions to determine when the ground-fault system shall be retested. Include instructions on where ground-fault sensors are located and how to avoid negating the ground-fault protection scheme during testing and circuit modifications.

C. Coordinate this training with that for generator equipment.

END OF SECTION 263600

SECTION 271513 - COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Category 6 twisted pair cable.
2. Twisted pair cable hardware, including plugs and jacks.
3. Cabling identification products.
4. Grounding provisions for twisted pair cable.
5. Source quality control requirements for twisted pair cable.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 271513 - Communications Copper Horizontal Cabling shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 DEFINITIONS

A. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

B. EMI: Electromagnetic interference.

C. FTP: Shielded twisted pair.

D. F/FTP: Overall foil screened cable with foil screened twisted pair.

E. F/UTP: Overall foil screened cable with unscreened twisted pair.

F. IDC: Insulation displacement connector.

G. LAN: Local area network.

H. Jack: Also commonly called an "outlet," it is the fixed, female connector.

I. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.

J. RCDD: Registered Communications Distribution Designer.

K. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

L. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

M. S/FTP: Overall braid screened cable with foil screened twisted pair.

N. S/UTP: Overall braid screened cable with unscreened twisted pairs.

O. UTP: Unscreened (unshielded) twisted pair.

1.4 SUBMITTALS

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Product Data: For each type of product.

C. Installation shall comply with TIA/EIA-569-A standards.

1.5 QUALITY ASSURANCE

A. Installation shall comply with TIA/EIA-569-A standards.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 COORDINATION

A. Refer to the Standard General Conditions and Supplementary Conditions.

B. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

1.8 WARRANTY

A. Refer to the Standard General Conditions and Supplementary Conditions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and CEC for the following types:

1. Communications, Plenum Rated: Type CMP complying with UL 1685.
2. Communications, Non-plenum: Type CMR complying with UL 1666.

B. RoHS compliant.

2.3 CATEGORY 6 TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.

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

1. Belden Inc.
2. Berk-Tek Leviton; a Nexans/Leviton alliance.
3. General Cable; General Cable Corporation.
4. Or equal: Refer to the Standard General Conditions and Supplementary Conditions.
5. Substitutions: Refer to the Standard General Conditions and Supplementary Conditions.

C. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.

D. Conductors: 100-ohm, 23 AWG solid copper.

E. Shielding/Screening: Unshielded twisted pairs (UTP).

F. Cable Rating:

1. Indoor: Riser.
2. Outdoor/Underground: Outside plant (OSP) unshielded.

G. Jacket: Blue thermoplastic.

2.4 TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

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

1. Belden Inc.
2. Berk-Tek Leviton; a Nexans/Leviton alliance.
3. General Cable; General Cable Corporation.
4. Or equal: Refer to the Standard General Conditions and Supplementary Conditions.
5. Substitutions: Refer to the Standard General Conditions and Supplementary Conditions.

C. General Requirements for Twisted Pair Cable Hardware:

1. Comply with the performance requirements of specified cabling.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.

D. Source Limitations: Obtain twisted pair cable hardware from same manufacturer as twisted pair cable, from single source.

E. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standard: Comply with TIA-568-C.2.
4. Marked to indicate transmission performance.

F. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.6 GROUNDING

A. Comply with TIA-607-B.

2.7 SOURCE QUALITY CONTROL

A. Factory test cables on reels according to TIA-568-C.1.

B. Factory test twisted pair cables according to TIA-568-C.2.

C. Cable will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports and submit a digital copy in PDF format to the engineer of record upon completion.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters. Conceal raceway and cables, except in unfinished spaces. Where plans differ in direction, the plans shall take precedence.

1. Install plenum cable in environmental air spaces, including plenum ceilings.

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Comb, bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.

3.2 INSTALLATION OF PATHWAYS

A. Drawings indicate general arrangement of pathways and fittings.

B. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

3.3 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

C. General Requirements for Cabling:

1. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
2. Comply with BICSI's "Information Transport Systems Installation Methods Manual (ITSIMM), Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

7. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI Information Transport Systems Installation Methods Manual , Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation, and replace it with new cable.
10. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
11. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
12. Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

D. Group connecting hardware for cables into separate logical fields.

E. Separation from EMI Sources:

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4 GROUNDING

A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."

B. Comply with TIA-607-B and NECA/BICSI-607.

3.5 IDENTIFICATION

A. Paint and label colors for equipment identification shall comply with TIA-606-B.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.

D. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 271513

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Clearing.
2. Stripping.

B. Related Sections:

1. Section 312316 - Excavation.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 311000 - Site Clearing shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 REFERENCE STANDARDS

A. The “Greenbook” Standard Specifications for Public Works Construction (SS), 2021 Edition.

1. SS 3-12.12 Air Pollution Control.
2. SS 300-1 Clearing and Grubbing.

1.4 SUBMITTALS

A. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection.

B. Submit private property release forms any time access will be needed on private property.

1.5 QUALITY ASSURANCE

A. Conform to applicable code and authorities having jurisdiction for environmental requirements and disposal of debris.

B. Perform Work in accordance with the “Greenbook” Standard Specifications for Public Works Construction (SS), 2021 Edition.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

A. Identify utilities and appurtenances to remain.

B. Verify existing plant life designated to remain is tagged or identified.

3.2 PREPARATION

A. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

B. Call Local Utility Line Information service at 811 not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 PROTECTION

A. Locate, identify, and protect utilities indicated to remain from damage.

B. Protect benchmarks, survey control points, and existing structures from damage or displacement.

3.4 CLEARING

A. Clearing and Grubbing:

1. Clearing shall consist of removal and disposal of all vegetation, brush, and refuse within the limits of the ponds.
2. Grubbing of designated fill areas shall consist of the removal of all stumps and roots 1-inch or more in diameter to a depth of 3 feet below natural ground surface.
3. Material shall be disposed of in such a manner as to meet all requirements of State, County, and local regulations regarding health, safety, and public welfare.
4. All waste material shall be disposed of off the construction site in an approved location at the Contractor's expense.
5. In no case shall any material be left on the project, shoved onto abutting private properties, or be buried in embankments or trenches on the project.

END OF SECTION 311000

SECTION 312316 - EXCAVATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Earthwork Quantities.
2. General.
3. Archeological.
4. Dust Control.
5. Blasting.
6. Excavation.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 312316 - Excavation shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 REFERENCE STANDARDS

A. Local utility standards when working within 24 inches of utility lines.

B. Geotechnical Report prepared by KC Engineering dated June 26, 2023 (Project No. RD5586).

C. The “Greenbook” Standard Specifications for Public Works Construction (SS), 2021 Edition.

1. SS 3-12.2 Air Pollution Control.
2. SS 7-4 Payment for Extra Work.

1.4 SUBMITTALS

A. Erosion Control Plan.

B. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.5 QUALITY ASSURANCE

A. Perform Work according to the “Greenbook” Standard Specifications for Public Works Construction (SS), 2021 Edition.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 PREPARATION

A. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

B. Utility Service Locator:

1. Call local utility service-line information at 811 not less than three working days before performing Work.
2. Request that underground utilities be located and marked within and immediately surrounding Site.
3. Identify required lines, levels, contours, and data.

C. Existing Utilities:

1. Protect from damage utilities indicated to remain.

D. Protect benchmarks, survey control points, existing structures, fences, and existing features from excavating equipment and vehicular traffic.

E. Do not close or obstruct roadways.

F. Erect and maintain temporary barriers and security devices, including warning signs, warning lights, and similar measures, for protection of public, Owner, and existing improvements indicated to remain.

3.2 EXCAVATION

A. Earthwork Quantities:

1. The Contractor is solely responsible for making his own determination of quantities based on his own calculations, interpretations of the Drawings, and field observations.
2. No extra payment for earthwork will be made to the Contractor for any actual quantity difference from these estimates, unless the scope of the work shown on the Drawings and in these Specifications is changed.

B. General:

1. Excavation is unclassified. Bedrock and weathered bedrock are anticipated throughout the pond bottoms and side slopes. All material encountered shall be excavated as required to facilitate construction at no additional cost to the Owner.
2. The Contractor shall excavate whatever material is encountered to the lines and grades shown on the Drawings.

3. Existing side slopes are not uniform due to soil erosion and deposition.

    a. Areas of erosion shall be filled with aggregate base compacted to a minimum relative compaction of 90 percent.
    b. Areas of deposition shall be removed.

C. Archeological:

1. If artifacts, exotic rock, or unusual amounts of shell or bone are uncovered during construction, work should stop in that area immediately and a qualified cultural resources specialist will be contacted by the Owner in order to evaluate the deposit.
2. If the bone found may be human, state law requires the immediate cessation of construction activities as well as immediate contact with the County Coroner and Native American Heritage Commission, Sacramento.
3. Such work stoppage will be considered Extra Work.

D. Dust Control:

1. Dust control shall be in accordance with SS 3-12.2.
2. Add the following after the first paragraph:

    a. Where dust is created, either by vehicles of the Contractor or of others through work being done by the Contractor, such dust shall be controlled by the Contractor through watering or by cleaning up the material causing the dust. Dust control shall be continued as necessary until the work is accepted by the Owner.

3. No separate payment will be made for any work performed or material used to control dust resulting from the Contractor's performance of the work.
4. Full compensation for such dust control will be considered as included in the prices paid for the various items of work involved.

E. Blasting:

1. Blasting is not allowed.

F. Excavation:

1. Excavations shall be taken to the depths shown on the Drawings.
2. If soft or otherwise unsuitable material is encountered at or below Plan grade, the unsuitable material shall be removed to a depth recommended by the Engineer and replaced with structure backfill.
3. The excavation and replacement of unsuitable material ordered by the Engineer will be paid for as specified under payment for extra work.
4. Overexcavation below the slab grades shown on the Drawings caused by an act or failure to act on the part of the Contractor shall be replaced with compacted structure backfill.
5. Cuts below grade shall be corrected by similarly cutting adjoining areas and creating a smooth transition.
6. The Contractor shall bear all costs for correcting overexcavated areas.
7. Rough grading shall be completed prior to excavation for footings, utilities, or other structures.

8. Where pipelines enter and leave a structure, the requirement for trench excavation and backfill shall be complied with up to the excavation line of the structure, unless specified or directed otherwise.
9. Excavation shall extend a sufficient distance from walls and footings to allow for placement and removal of forms, installation of services, and for inspection, except where concrete is authorized by the Engineer to be deposited directly against the excavated surface.
10. Keep excavations free of all water that would be detrimental to any phase of construction and dewater and dispose of the water so as not to cause injury to public or private property or to cause a nuisance or a menace to the public.

G. Underpin adjacent structures which may be damaged by excavation Work.

H. Excavate subsoil to accommodate slabs on grade, Site structures, and construction operations.

I. Compact disturbed load-bearing soil in direct contact with foundations to original bearing capacity, as specified in Geotechnical Report.

J. Trim excavation and remove loose matter.

K. Removal of Deleterious Materials:

1. Remove lumped subsoil, boulders, and rock protruding 2 inches above subgrade.
2. Remove excess and unsuitable material from Site.

L. Notify Engineer of unexpected subsurface conditions.

M. Correct over-excavated areas with Caltrans Class 2 aggregate base as specified in Geotechnical Report.

N. Remove excavated material from Site.

O. Repair or replace items indicated to remain that have been damaged by excavation.

3.3 PROTECTION

A. Prevent displacement or loose soil from falling into excavation and maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

C. Protect structures, utilities, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that may be created by earth operations.

END OF SECTION 312316

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Asphalt materials.
2. Aggregate materials.
3. Aggregate subbase.
4. Asphalt paving.

B. Related Requirement:

1. Compacted subbase for paving – per Project Geotechnical Report.

1.2 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:

1. AASHTO M17 - Standard Specification for Mineral Filler for Bituminous Paving Mixtures.
2. AASHTO M29 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
3. AASHTO M140 - Standard Specification for Emulsified Asphalt.
4. AASHTO M208 - Standard Specification for Cationic Emulsified Asphalt.
5. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.
6. AASHTO M320 - Standard Specification for Performance-Graded Asphalt Binder.
7. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
8. AASHTO MP1a - Standard Specification for Performance-Graded Asphalt Binder.

B. Asphalt Institute:

1. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot- Mix Types.
2. AI MS-19 - Basic Asphalt Emulsion Manual.
3. AI SP-2 - Superpave Mix Design.

C. ASTM International:

1. ASTM C1371-2004a - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
2. ASTM C1549-2004 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
3. ASTM D242 - Standard Specification for Mineral Filler for Bituminous Paving Mixtures.

4. ASTM D692 - Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.
5. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
6. ASTM D977 - Standard Specification for Emulsified Asphalt.
7. ASTM D1073 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
8. ASTM D1188 - Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
9. ASTM D2027 - Standard Specification for Cutback Asphalt (Medium-Curing Type).
10. ASTM D2397 - Standard Specification for Cationic Emulsified Asphalt.
11. ASTM D2726 - Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
12. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
13. ASTM D3381 - Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
14. ASTM D3515 - Standard Specification for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
15. ASTM D3549 - Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
16. ASTM D3910 - Standard Practices for Design, Testing, and Construction of Slurry Seal.
17. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
18. ASTM E408-1971(1996)e1 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
19. ASTM E903-1996 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
20. ASTM E1918-1997 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
21. ASTM E1980-2001 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

1.3 SUBMITTALS

A. Product Data:

1. Submit product information for asphalt and aggregate materials.
2. Submit mix design with laboratory test results supporting design.

B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Mixing Plant: Certified by State.

B. Obtain materials from same source throughout.

C. Perform Work in accordance with State of California Department of Transportation (Caltrans) Standard Specifications 2023 and City of Arcata construction standards.

D. Maintain copies of each document on site.

1.5 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with minimum three years' experience.

1.6 AMBIENT CONDITIONS

A. Do not place asphalt mixture between November 1 and March 1.

B. Do not place asphalt mixture when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 - PRODUCTS

2.1 ASPHALT PAVING

A. Asphalt Materials:

1. Asphalt Aggregate: In accordance with State of California Department of Transportation (Caltrans) Standard Specifications 2023 for Type A, 1/2-inch maximum size aggregate.
2. Asphalt Binder: PG 64-16 in accordance with State of California Department of Transportation (Caltrans) Standard Specifications 2023.
3. Tack Coat: ASTM D977; SS-1h emulsified asphalt.
4. Tack Coat: In accordance with State of California Department of Transportation (Caltrans) Standard Specifications 2023.
5. Reclaimed Asphalt Pavement (RAP): Processed material obtained by milling or full depth removal of existing asphalt paving.

B. Aggregate Materials:

1. Coarse Aggregate: ASTM D692; crushed stone, gravel, or blast furnace slag.
2. Fine Aggregate: ASTM D1073; natural sand or sand manufactured from stone, gravel, or blast furnace slag.

C. Aggregate Subbase: Class 2 aggregate base. In accordance with State of California Department of Transportation (Caltrans) Standard Specifications 2023.

2.2 MIXES

A. Use dry material to avoid foaming. Mix uniformly.

B. Asphalt Paving Mixtures: Designed in accordance with State of California Department of Transportation (Caltrans) Standard Specifications 2023. Type A asphalt concrete; 1/2-inch with maximum 25 percent by weight reclaimed asphalt pavement.

2.3 SOURCE QUALITY CONTROL

A. Mix design forms shall be submitted on a Job Mix Formula (JMF) form in accordance with State of California Department of Transportation (Caltrans) Standard Specifications 2023, Section 39.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.

B. Verify compacted subgrade is dry and ready to support paving and imposed loads.

1. Proof roll subbase with a minimum of two perpendicular passes to identify soft spots.
2. Remove soft subbase and replace with compacted fill as specified per the Project Geotechnical Report.

C. Verify gradients and elevations of base are correct.

D. Verify gutter drainage grilles and frames and are installed in correct position and elevation.

3.2 PREPARATION

A. Prepare subbase in accordance with State of California Department of Transportation (Caltrans) Standard Specifications 2023.

3.3 DEMOLITION

A. Saw cut and notch existing paving as indicated on Drawings.

B. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.

C. Repair surface defects in existing paving to provide uniform surface to receive new paving.

3.4 INSTALLATION

A. Subbase:

1. Place base course to a depth as indicated on Drawings.

2. Aggregate Subbase: Install as specified in Project Geotechnical Report.

B. Tack Coat:

1. Apply tack coat on asphalt and concrete surfaces over subgrade surface at uniform rate.
2. Apply tack coat to contact surfaces of curbs, gutters, and edge of pavement.
3. Coat surfaces of area drain frames with oil to prevent bond with asphalt paving. Do not tack coat these surfaces.

C. Single Course Asphalt Paving:

1. Install Work in accordance with State of California Department of Transportation (Caltrans) Standard Specifications 2023.
2. Place asphalt within 8 hours of applying primer or tack coat.
3. Place asphalt to 3-inch compacted thickness as indicated on Drawings.
4. Compact paving by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
5. Perform rolling with consecutive passes to achieve an even and smooth finish without roller marks.
6. Spread mix at minimum temperature of 250 degrees F.

3.5 TOLERANCES

A. Flatness: Maximum variation of 1/8 inch measured with 10-foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation from Indicated Elevation: Within 1/2 inch.

3.6 FIELD QUALITY CONTROL

A. Asphalt Paving Mix Temperature: Measure temperature at time of placement.

B. Asphalt Paving Thickness: Measured and observed by the Construction Observer during installation.

C. Asphalt Paving Density: ASTM D2950 nuclear method; test one location for every 1,000 square yards compacted paving.

3.7 PROTECTION

A. Immediately after placement, protect paving from mechanical injury until surface temperature is less than 140 degrees F.

END OF SECTION 321216

SECTION 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. General:

1. Some products specified herein may not be required based on the Contractor's means and methods and ability to salvage existing materials without damage. Refer to the Drawings.

B. Section Includes:

1. Fence framework, fabric, and accessories.
2. Excavation for post footings.
3. Concrete foundation for posts.
4. Manual gates and related hardware.
5. Privacy slats.

1.2 MEASUREMENT AND PAYMENT

A. Payment for Section 323113 - Chain Link Fences and Gates shall be included in the most applicable lump-sum bid item in the Proposal.

1.3 REFERENCE STANDARDS

A. ASTM International:

1. ASTM A121 - Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.
2. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A153 - 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 Marcelled Tension Wire.
7. A1011 - 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 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
9. ASTM C94 - 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.
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.

B. Chain Link Fence Manufacturers Institute:

1. CLFMI - Product Manual.

C. The “Greenbook” Standard Specifications for Public Works Construction (SS), 2021 Edition.

1. Standard specifications for Public Works SS 206-6.
2. Standard specifications for Public Works SS 304-3.

1.4 SYSTEM DESCRIPTION

A. Total Fence Height: 7-feet (84-inches).

1. 6-feet (72-inches) fencing fabric.
2. 1-foot (12-inches) of three (3) strands of barbed wire.

B. Line Post Spacing: At intervals not exceeding 10 feet.

1.5 SUBMITTALS

A. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

B. Product Data: Submit data on fabric, posts, accessories, fittings and hardware.

1.6 QUALITY ASSURANCE

A. Supply material according to CLFMI - Product Manual.

B. Perform installation according to ASTM F567.

C. Perform Work according to “Greenbook” standards.

1.7 QUALIFICATIONS

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

B. Installer: Company specializing in performing work of this section with minimum three years documented experience**.**

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.

B. Identify each package with the manufacturer's name.

C. Store fence fabric and accessories in secure and dry place.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. Chain Link Fence:

1. Chain link fence materials shall conform to SS. 206-6 and SS 304-3.
2. Fabric shall be 6 feet high and have twist finish on the bottom and top selvage and be galvanized after fabrication per ASTM A392 Class 1.
3. Fabric shall be 6 gauge with 2-inch mesh.
4. Three strands of barbed wire mounted on extension arms shall be included on all fencing and gates and facing outwards.
5. Top and bottom tension wire shall be provided on all fencing.
6. Provide stops and latches on all gates.
7. Drop rods shall be supplied on all double swing gates; steel pipe center gate stops encased in a 12-inch by 12-inch concrete footing shall be provided for all drop rod latches.
8. All gates shall be provided with industrial grade, hot dipped galvanized malleable iron, 180-degree hinges without the use of 180-degree adapters.
9. Posts shall be Class 1 galvanized steel pipe as defined in SS 206-6.1 with the following nominal pipe sizes (NPS):

Line Posts:	2 NPS (2.375 OD)
End and Corner Posts:	2-1/2 NPS (2.875 OD)
Gate Post for Gate:	3-1/2 NPS (4.0 OD)
Top Rails and Braces:	1-1/4 NPS (1.660 OD)
Gate Frames:	1-1/2 NPS (1.9 OD)
Gate Stiffeners:	1-1/4 NPS (1.660 OD)

2.2 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners, and fittings; galvanized steel.

C. Extension Arms: Galvanized pressed steel, to accommodate 3 strands of barbed wire, single arm, sloped to 45 degrees.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install framework, fabric, and accessories according to ASTM F567 and SS 304-3.

B. Set all fence and gate posts plumb, in concrete footings with top of footing 1 inch above finish grade. Slope top of concrete for water runoff.

C. Line Post Footing Depth Below Finish Grade: 36 inches.

D. Corner, Gate, and Terminal Post Footing Depth Below Finish Grade: 36 inches.

E. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.

F. Place fabric on outside of posts and rails.

G. Do not stretch fabric until concrete foundation has cured 28 days.

H. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

I. Position bottom of fabric 2 inches above finished grade.

J. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

K. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

L. Install top and bottom tension wire stretched taut between terminal posts.

M. Install support arms sloped outward and attach barbed wire; tension and secure.

N. Support gates from gate posts. Do not attach hinged side of gate from building wall.

O. Install posts with 6 inches maximum clear opening from end posts to buildings, fences, and other structures.

3.2 ERECTION TOLERANCES

A. Maximum Variation from Plumb: 1/4 inch.

B. Maximum Offset from Indicated Position: 1 inch.

C. Minimum distance from property line: 6 inches.

END OF SECTION 323113