OSHG Installation and Integration

Contract Documents and Technical Specifications

Humboldt Bay Municipal Water District

September 2024

GHD Project #: 12616149

Humboldt Bay Municipal Water District

OSHG Installation and Integration

Contract Documents and Technical Specifications

September 2024

Prepared for

Humboldt Bay Municipal Water District
828 7th Street
Eureka, California 95501

BOARD OF DIRECTORS

Michelle Fuller, President
David Lindberg, Vice President
J. Bruce Rupp, Secretary-Treasurer
Sheri Woo, Director
Tom Wheeler, Director

John Friedenbach, General Manager

Prepared by

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

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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 OSHG Installation and Integration.

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 1:30 p.m., October 15, 2024 at the project site at 7270 West End Road near Arcata, California. A site overview outside of this meeting time can be arranged by contacting Dale Davidsen at HBMWD by telephone at (707) 822-2918 or by email at supt@hbmwd.com.

The Humboldt Bay Municipal Water District (HBMWD, District, or Owner) is a wholesale water supplier that provides potable water to approximately 88,000 residents of Humboldt County. The District is planning to transition from chlorine gas to a dilute liquid sodium hypochlorite solution to provide disinfection, which will be accomplished by installing an onsite sodium hypochlorite generator (OSHG). HBMWD has procured the OSHG unit and some of the other equipment related to the system as further identified in the Drawings and Specifications. The Work consists of furnishing all labor, materials, equipment, and supervision for installing the OSHG unit and integrating it with the District's existing systems in place. This includes, but is not limited to, the following: demolishing and removing electrical, plumbing, and miscellaneous installations within the existing building; installing and anchoring the OSHG unit; installing a new concrete slab for the installation and anchoring of brine and hypochlorite storage tanks; installing new blowers; installing new water softeners; installing new electrical and controls; installing new ventilation piping; and installing new water piping connections.

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, November 5, 2024, and then at said office publicly opened and read aloud. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed to the Owner at Humboldt Bay Municipal Water District, PO Box 95, Eureka, CA 95502-0095 and must be delivered to the District office by the above referenced time and date, regardless of postmark.

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 HBMWD at office@hbmwd.com.

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

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).

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

The Contractor shall comply with and shall ensure all Subcontractors comply with all laws and regulations governing the Contractor's and Subcontractors' performance on this project including, but not limited to: anti-discrimination laws, workers' compensation laws, and prevailing wage laws as set forth in CA Labor Code, Sections 1720-1861 et seq. and licensing laws. The Contractor is required to include the prevailing wage language in all subcontracts pursuant to CA Labor Code 1775(E)(b)(1). The Contractor shall post, at appropriate conspicuous points on the site of the Project, a schedule showing all the determined general prevailing wage rates.

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

September 30, 2024
Date

PART 1
BID REQUIREMENTS

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INFORMATION FOR BIDDERS

Project: OSHG Installation and Integration

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: OSHG INSTALLATION AND INTEGRATION, 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. Bids will be rejected if filled out in pencil. 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 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. 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. Successful bidders will be required to furnish both a Payment Bond and Performance Bond in the full amount of the Contract Price with a corporate surety approved by the Owner. 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. 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.

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.

Any bid protest must be in writing and received via email by John Friedenbach (friedenbach@hbmwd.com) before 5:00 p.m. no later than two working days following bid opening (the "Bid Protest Deadline") and must comply with the following requirements.

Only a bidder who has submitted a responsive Bid Proposal is eligible to submit a bid protest against another bidder. Subcontractors are not eligible to submit bid protests. A bidder may not rely on the bid protest submitted by another bidder but must timely pursue its own protest. If required by Owner, the protesting bidder must submit a nonrefundable fee in the amount specified by Owner, based upon Owner's reasonable costs to administer the bid protest. Any such fee must be submitted to Owner no later than the Bid Protest Deadline, unless otherwise specified.

The bid protest must contain a complete statement of the basis for the protest and all supporting documentation. Material submitted after the Bid Protest Deadline will not be considered. The protest must refer to the specific portion or portions of the Contract Documents upon which the protest is based. The protest must include the name, address, email address, and telephone number of the person representing the protesting bidder.

A copy of the protest and all supporting documents must be concurrently transmitted by email, by or before the Bid Protest Deadline, to the protested bidder and any other bidder who has a reasonable prospect of receiving an award depending upon the outcome of the protest.

The protested bidder may submit a written response to the protest, provided the response is received by Owner before 5:00 p.m., within three working days after the Bid Protest Deadline or after actual receipt of the bid protest, whichever is sooner (the "Response Deadline"). The response must include all supporting documentation. Material submitted after the Response Deadline will not be considered. The response must include the name, address, email address, and telephone number of the person representing the protested bidder.

A copy of the response and all supporting documents must be concurrently transmitted by email, by or before the Response Deadline, to the protesting bidder and any other bidder who has a reasonable prospect of receiving an award depending upon the outcome of the protest.

The procedure and time limits set forth in this section are mandatory and are the bidder's sole and exclusive remedy in the event of bid protest. A bidder's failure to comply with these procedures will constitute a waiver of any right to further pursue a bid protest, including filing a Government Code Claim or initiation of legal proceedings.

Owner reserves the right to award the Contract to the bidder it has determined to be the responsible bidder submitting the lowest responsive bid, and to issue a notice to proceed with the Work notwithstanding any pending or continuing challenge to its determination.

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 performance bond and the payment bond, 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, provided that the Contractor is responsive to the bid requirements and is deemed qualified to perform the work.

Award(s) will be made to the lowest, responsive, qualified 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, and/or fabricators (greater than 10% of total contract amount) 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 by email to Dale Davidsen at HBMWD at supt@hbmwd.com. Replies to such inquiries will be in the form of addenda or clarifications that will be sent to all plan holders. Requests for clarification regarding various portions may be made by phone to Dale Davidsen at HBMWD, (707) 822-2918.

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.

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

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

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

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

The Bidder shall sign the Bid Proposal in the blank space provided 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 in regard to the obligation of Bidders to verify for themselves and to their complete satisfaction all information concerning site and subsurface conditions, and Notice requirements.

The applicable California prevailing wage rates can be found at www.dir.ca.gov and are on file with the

Owner's principal office, which shall be available to any interested party upon request. The contractor is also required to have a copy of the applicable wage determination posted and/or available at each jobsite.

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.

California State prevailing wage rates will be required on this project. The Contractor will be required to comply with any changes in these wage rates as they are updated by the State at no cost to the Owner.

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

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

This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

Contractors shall be subject to withholding of progress or final payments if prevailing wage compliance is incomplete or has not been submitted by Contractor or any Subcontractor.

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, 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.	Acknowledgement of Addenda	1-9	_____
3.	List of Subcontractors (Subcontractor Details)	1-10	_____
4.	Bid Bond	1-11 through 1-12	_____
5.	Authority to Sign Bid Proposal (if applicable)	(Attached to Bid Bond)	_____
6.	Power of Attorney	(Attached to Bid Bond)	_____
7.	Prime's and Subcontractor's valid Department of Industrial Relations registration number(s)	(where Requested herein)	_____

BID PROPOSAL

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

doing business as _____*.(*Insert: "a corporation," “a limited liability corporation”, "a partnership," or "an individual" as applicable)

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 OSHG Installation and Integration Design 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.

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.

BASE BID SCHEDULE

Item No.	Unit	Description	Unit	Est. Qty.	Total Price
1	LS	Mobilization and Demobilization	LS	1	$_____
2	LS	Erosion and Sediment Control	LS	1	$_____
3	LS	Demolition, Removal, and Disposal of Existing Equipment	LS	1	$_____
4	LS	Installation of Onsite Sodium Hypochlorite Generator, Ancillary Equipment, and other Site Modifications	LS	1	$_____
5	LS	Concrete	LS	1	$_____
6	LS	Electrical and Controls System	LS	1	$_____

TOTAL OF BASE BID ($_____)

TOTAL OF BASE BID IN WORDS ($_____)

Award will be made to the lowest, responsive, responsible bidder. The low bidder shall be determined based on the Total of Base 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 Humboldt Bay Municipal Water District a certain bid, attached hereto and hereby made a part hereof to enter into a contract in writing, for the:

OSHG Installation and Integration

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.

PART 2
CONTRACT FORMS

This page left blank intentionally.

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 limited liability 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:
   OSHG Installation and Integration

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, LLC, 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:

OSHG Installation and Integration

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:	
Witness as to Surety	By_____ Attorney-in-Fact
Address	Address

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

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

PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS: that

_____
(Name of Contractor)

_____
(Address of Contractor)

a _____, hereinafter
(Corporation, LLC, 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:

OSHG Installation and Integration

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: OSHG Installation and Integration

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: OSHG Installation and Integration

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: _____

PART 3
GENERAL CONDITIONS

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GENERAL CONDITIONS
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SECTION B – GENERAL CONDITIONS

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
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
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" or “by the Owner.”

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) Board of Directors or Board – The Board of Directors of the Humboldt Bay Municipal Water District

h) 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.

i) 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.

j) 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.

k) Contract Documents - The Contract Documents are any or all of the documents listed in Article I of these General Conditions.

l) Contract Price - Total monies payable to the Contractor under the terms and conditions of the Contract Documents.

m) Contract Time - The numbers of days stated in the Contract Documents for the completion of the Work.

n) 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.

o) 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.

p) County - County of Humboldt, California.

q) Date of Execution of the Contract - The date on which the Contract is signed by the District's authorized representative.

r) Datum - The figures given in the Specifications or upon the Drawings after the word "Elevation" or an abbreviation of it shall be per datum noted on the Drawings.

s) Days - Unless otherwise designated, days as used in the Contract Documents shall mean calendar days.

t) District - The Humboldt Bay Municipal Water District, may also be referred to as the District, HBMWD, or Owner.

u) Engineer - Wherever in these documents the word "Engineer" appears, it shall be understood to mean GHD Inc. The Engineer will have final authority as regards to contract administration, field inspection, and related items.

v) Field Order or Field Work Directive - A written order effecting a change in the Work not necessarily involving an adjustment in the Contract Price or an extension of Contract Time, issued by the Engineer to the Contractor during construction.

w) His - "His" shall include "her" and "its".

x) Install - "Install" wherever and in whatever manner used shall mean the installation, complete in place of an item.

y) Notice of Award - The written notice of the acceptance of the Bid from the District to the successful Bidder.

z) 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.

aa) 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.

bb) District Project Representative – The authorized representative of the District who is assigned to the project site or any part of thereof.

cc) 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.

dd) Project - The undertaking performed as provided by the Contract Documents.

ee) Provide - "Provide" wherever and in whatever manner used shall be understood to mean furnish and install.

ff) Project Geotechnical Engineer – none for this project.

gg) Resident Project Representative - Authorized representative of the Engineer who is assigned to the Project or any part thereof.

hh) 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, 828 Seventh Street, Eureka, CA 95501 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.

ii) 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.

jj) 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.

kk) 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.

ll) 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.

mm) Specified - “Specified,” “described,” or “noted,” wherever and in whatever manner used, means as specified, described or noted in the Contract Documents.

nn) 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, which would be considered a supplier only.

oo) 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.

pp) 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.

qq) 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.”

rr) 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.

ss) Time Limits - All time limits stated in the Contract Documents are of the essence of the Contract.

tt) 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.

uu) 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.

vv) 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

a) 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.

b) 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.

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

d) 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 conflicts 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 scaled 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

a) It is understood and agreed that the Contractor has, by careful examination, satisfied itself as to

the nature and location of the Work, the conformation of the ground, the character, quality, and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the Work, the general and local conditions and weather, 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.

b) 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, the District may take one or more of the actions outlined in 44 CFR Section 13.43 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

a) 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.

b) 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.

c) To comply with the California Environmental Quality Act (CEQA) and permitting processes, material additions or amendments to this scope of work (SOW) may have to be reviewed by all agencies participating in the CEQA and permitting processes. The Contractor shall obtain approval in writing from the District prior to proceeding with any changes of work.

d) 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.

e) 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) 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 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.)

b) 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.

c) If the change in or addition to the Work will result in an increase in the contract sum, 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:

(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. Markup by Subcontractors on their work shall not exceed fifteen percent (15%) in totality. Contractor's markup on Subcontractor's work shall not exceed five percent (5%).

(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. 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. Markup by Subcontractors on their work shall not exceed fifteen percent (15%) in totality. Contractor's markup on Subcontractor's work shall not exceed five percent (5%).

d) 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.

e) 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.)

f) 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 Documents, 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.

g) 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.

h) 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.

i) 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.

j) 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.

k) 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.

l) 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.

m) 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.

n) 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 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 (except where noted otherwise), procedures, or construction safety.

g) It is expressly agreed and understood that GHD Inc. will have no liability whatsoever resulting from the obligations entered into under the Contract except as provided in any scope of work agreement between GHD Inc. and the District; that the District must look solely to the Contractor for the furnishing of the Work; that the Contractor must look solely to the District for payment; and that the District and the Contractor must look solely to each other for the enforcement of any claims or liabilities arising under or by reason of the Contract.

B-11 Drawings

a) Drawings furnished herewith are for bidding purposes. No hard copies of the Drawings will be provided to the Contractor. However, the Contractor shall print for themselves and keep one copy of the 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 accepted 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, field verification of dimensions, 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 and submittals 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 or submittals 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 and submittals shall bear the Contractor's certification that they have reviewed, checked and approved the Shop Drawings and submittals 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 its 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 the Contractor's own full responsibility, the plan or method of work proposed, or furnishing the materials and equipment proposed.

B-12 Construction Staking and Surveys

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

B-13 Permits and Regulations

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

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

B-14 Conformity with Contract Documents and Allowable Deviations

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

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

B-15 Coordination and Interpretation of Contract Documents

a) The Contract Documents are complementary and a requirement occurring in one is as binding as though occurring in all.

b) In the event of conflict between the Plans and the Technical Specifications, the Technical Specifications shall govern, except that, where items are shown on the Plans and are not specifically included in the Technical Specifications, the Plans shall govern.

c) Should it appear that the work to be done or any of the matters relative thereto are not sufficiently detailed or explained in the Specifications or Plans, the Contractor shall apply to the Engineer for

such further explanations as may be necessary and shall conform to them as part of the Contract. In the event of any doubt or question arising respecting the true meaning of the Specifications and Plans, reference shall be made to the Engineer, whose decision thereon shall be final and conclusive.

d) In the event of any discrepancy between any plans and the figures written thereon, the figures shall be taken as correct. Detailed drawings shall prevail over general drawings.

e) Any reference made in these Specifications or on the plans to any Specification, standard, method, or publication of any scientific or technical society or other organization shall, in the absence of a specific designation to the contrary, be understood to refer to the Specification, standard, method, or publication in effect as of the date that the Work is advertised for Bids.

B-16 Subcontracts

a) 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.

b) 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.

c) 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.

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 inspections and tests. Contractor shall be charged with any additional cost of inspection when material and workmanship are not ready at the time specified by the Contractor for its inspection.

h) Where any part of the Work is being done under an encroachment permit or building permit, or is subject to Federal, State, County or City codes, laws, ordinances, rules or regulations, representatives of the government agency shall have full access to the Work and shall be allowed to make any inspection or tests in accordance with such permits, codes, laws, ordinances, rules, or regulations. If advance notice of the readiness of the Work for inspection by the governing agency is required, the Contractor shall furnish such notice to the appropriate agency.

i) The Engineer may inspect production of the material, or the manufacture of products at the source of supply. Plant inspection, however, will not be undertaken until the Engineer is assured of the cooperation and assistance of both the Contractor and the material producer. The Engineer or its authorized representative shall have free entry at all times to such parts of the plant as concerns the manufacture or production of the materials. Adequate facilities shall be furnished free of charge to make the necessary inspection. The District assumes no obligation to inspect materials at the source of supply.

j) Forty-eight (48) hours prior to work being accomplished, the Contractor will notify the Engineer of the proposed working hours to accomplish the work for that day. Overtime and shift work may be established as a regular procedure by the Contract and with the written permission of the Engineer. Such permission may be revoked at any time. No work other than overtime and shift work established as a regular procedure shall be done between the hours of 7 p.m. and 7 a.m., nor on Sundays or legal holidays, except for such work as is necessary for the proper care and protection of the work already performed, or in case of an emergency.

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

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

the overtime work. All such charges shall be deducted by the District from payment due the Contractor.

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

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

B-20 Tests

The District shall 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 by an independent testing service, 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 ensure 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.

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) If applicable, the Contractor shall facilitate the completion of an audit in accordance with 2 CFR Section 200 Subpart F 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(b)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 and 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 monthly 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 **one hundred twenty (120)** calendar days.

B-36 Suspension of Work

a) The Engineer may at any time, by notice in writing to the Contractor, suspend any part of the Work for such period of time as may be necessary to prevent improper execution of the Work on the project by the Contractor, its Subcontractors or agents, and the Contractor shall have no claim for damages or additional compensation on account of any such suspension.

b) The District may at any time suspend any part or all of the Work upon ten (10) calendar days' written notice to the Contractor, who shall thereupon discontinue all Work suspended except for all operations to prevent loss or damage to Work already executed as may be directed by the Engineer. In the event a part of the Work is suspended, the Contractor, if the suspension is not through its fault or the fault of its Subcontractors or agents, shall be paid on the same basis as Extra Work for costs of work performed in accordance with such orders of the Engineer during such suspension, provided that this shall not include any cost pertaining to Work not suspended by said notice. Work shall be resumed by the Contractor after such suspension on written notice from the District. In the event of suspension of the entire Work by the District, the Contractor, if the suspension is not through fault of the Contractor or the fault of its Subcontractors or agents, shall be paid the sum of $500.00 for each calendar day during which the entire Work shall have been

suspended. Said sum is hereby mutually agreed upon as fixed and liquidated damages in full settlement of all costs and expenses, losses and damages resulting to the Contractor from such suspension. Work shall be resumed by the Contractor after such suspension on written notice from the District.

c) In the event of any suspension of the Work in whole or in part under subsection (b) above, the Contractor shall be entitled to an extension of time wherein to complete the Work to the extent of the delay caused the Contractor thereby.

d) In the event the entire Work shall be suspended by order of the District, as hereinabove provided, and shall remain so suspended for a period of sixty (60) consecutive calendar days, through no fault of the Contractor, and notice to resume the Work shall not have been served on the Contractor as hereinabove provided, Contractor may, at its option, by written notice to the District, terminate the Contract in the same manner as if the termination had been initiated by the District, and the District shall have no claim for damages because of such termination of the Contract.

e) If, through no act or fault of the Contractor, the Work is suspended for a period of more than ninety (90) calendar days by the District or under an order of Court or other public authority, or the Engineer fails to act on any request for payment within thirty (30) calendar days after it is submitted, or the District fails to pay the Contractor substantially the sum approved by the Engineer or any final award by arbitration or litigation within sixty (60) calendar days of its approval and presentation, then the Contractor may, after ten (10) calendar days from delivery of a written notice to the District and the Engineer, terminate the Contract and recover from the District payment for all Work executed and all expenses sustained.

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

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

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

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

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

giving ten (10) calendar days written notice to the Contractor, terminate its right to proceed with the Work or such part of the Work as to which there has been delay.

b) The Contractor's right to proceed shall not be so terminated nor the Contractor charged with resulting damage if:

(i) The delay in the completion of the Work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to Acts of God, acts of the public enemy, acts of the District, acts of another contractor in the performance of a Contract with the District, fires, floods, excluding site flooding due to groundwater, epidemics, quarantine restrictions, unusually severe weather, as determined by the Engineer; and

(ii) The Contractor shall, within 48 hours of the start of the occurrence, give notice to the District of the cause of the potential delay and an estimate of the possible time extension involved. The Contractor, within seven (7) calendar days from the beginning of any such delay (unless the Engineer grants further period of time before the date of final payment under the Contract), notifies the Engineer in writing of the causes of delay and requests an extension of time.

(iii) The Engineer shall ascertain the facts and the extent of the delay and extend the time for completing the Work when, in its judgment, the findings of fact justify such an extension, and its findings of fact shall be final and conclusive on the parties.

c) A request for an extension of time, or the granting of an extension of time, shall not constitute a basis for any claim against the District for additional compensation or damages unless caused by the District or another contractor employed by the District.

d) If the Contractor should be adjudged bankrupt, or if it should make a general assignment for the benefit of its creditors, or if a receiver should be appointed for the Contractor on account of its insolvency and not be discharged within ten (10) calendar days after its appointment, or if the Contractor should fail to make prompt payments to Subcontractors or suppliers, or should it persistently disregard laws, ordinances, or the instructions of the Engineer, or otherwise commit a substantial violation of any provisions of the Contract, the District may, after giving ten (10) calendar days written notice to the Contractor, terminate the Contract and the Contractor's right to proceed with the Work.

e) No extension of time will be considered for time lost due to weather conditions normal to the area. Unusual weather conditions, if determined by the Engineer to be of a severity that could not be predicted, may be considered as cause for an extension of Contract completion time.

f) Delays in delivery of equipment or material purchased by the Contractor or his Subcontractors shall not be considered as a just cause for delay. The Contractor shall be fully responsible for the timely ordering, scheduling, expediting delivery, and installation of all equipment and materials.

g) The rights and remedies of the District provided in this section are in addition to any of the rights and remedies provided by law or under this Contract.

h) In addition to the District's rights under this section, if at any time before completion of the work under the Contract, it shall be determined by the District that reasons beyond the control of the parties hereto render it impossible or against the interests of the District to complete the Work, or if the Work shall be stopped by an injunction of a court of competent jurisdiction or by order of any competent authority, the District may, upon ten (10) calendar days written notice to the Contractor, discontinue the Work and terminate the Contract. Upon service of such notice of termination, the Contractor shall discontinue the Work in such manner, sequence, and at such times as the Engineer may direct. The Contractor shall have no claim for damages for such discontinuance or termination, nor any claim for anticipated profits on the Work thus dispensed with, nor any other

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

B-38 Rights of District Upon Termination

a) In the event the right of the Contractor to proceed with the Work, or any portion thereof, has been terminated because of the fault of the Contractor and the Contractor has been given ten (10) calendar days' notice to cure such fault and has not done so, the District may take over the Work and prosecute the same to completion by contract or any other method the District deems expedient, and may take possession of and utilize in completing the Work such materials, appliances, equipment and plant as may be on the site of the Work and necessary therefor. Whether or not the Contractor's right to proceed with the Work is terminated, it and its sureties shall be liable for all damages including costs of managerial and administrative services, engineering, legal and other consultant fees, sustained or incurred by the District in enforcing the provisions of Section B-37 and in completing or causing to complete the Contract Work.

b) Upon termination the Contractor shall not be entitled to receive any further payment until the Work is finished. If upon completion of the Work the total cost to the District, including engineering, legal and other consultant fees, costs of managerial and administrative services, construction costs, and liquidated damages shall be less than the amount which would have been paid if the Work had been completed by the Contractor in accordance with the terms of the Contract, then the difference shall be paid to the Contractor in the same manner as the final payment under the Contract. If the total cost incurred by the District on account of termination of the Contract and subsequent completion of the Work by the District by whatever method the District may deem expedient shall exceed said amount which the Contractor would otherwise have been paid, the Contractor and its sureties shall be liable to the District for the full amount of such excess expense.

c) The rights and remedies of the District provided in this section are in addition to any of the rights and remedies provided by the law or under this Contract.

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

a) Liquidated Damages - It is agreed by the parties to the Contract that time is of the essence; and that in case all the Work is not completed before or upon the expiration of the time limit as set in the Bid, Contract and Progress Schedule, or within any time extensions that may have been granted, damage will be sustained by the District; and that it may be impracticable to determine the actual amount of damage by reason of such delay; and it is, therefore, agreed that the Contractor shall pay to the District as damages the amount of $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 to the damages noted in subsection (a), 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 disturbed during construction shall be restored by the Contractor to preconstruction condition, 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 applicable California prevailing wage rates can be found at www.dir.ca.gov and are on file with the Agency’s principal office, which shall be available to any interested party upon request. The contractor is also required to have a copy of the applicable wage determination posted and/or available at each jobsite

b) 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. The Contractor shall forfeit $25 per day per worker for all overtime violations (Labor Code Section 1813); $100 per worker per day for failure to submit certified payroll and other requested documentation to the agency within 10 days of request and be subject to apprenticeship violation penalties under Labor Code Section 1777.7 This project is subject to compliance monitoring and enforcement of both the District and the California Department of Industrial Relations.

c) 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.

d) The Contractor shall at all times keep posted at the jobsite current wage rates in effect for this Work.

e) This is a Public Works Project funded with District funds. Therefore, CA State prevailing wage rates will be required on this project. 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, 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.

B-44 Eight-Hour Day Limitation

a) In accordance with the provisions of the Labor Code, and in particular, Labor Code 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 twenty-five dollars ($25) 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 Labor Code 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; DAS 142 – Request to Train Apprentices; and CAC2 or other proof of payment of 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.

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.

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.

f) In order to expedite the passage of public traffic through or around the Work and where ordered by the Engineer, the Contractor shall install signs, lights, flares, barricades, and other facilities for the sole convenience and direction of public traffic. Also, where directed by the Engineer, the Contractor shall provide and station competent flagpersons whose sole duties shall consist of directing the movement of public traffic through or around the Work. The cost of furnishing and installing such signs, lights, flares, barricades, and other facilities, and the cost of providing and stationing such flagpersons, all for the convenience and direction of public traffic, will be considered as included in the Contract price and no additional compensation will be allowed.

g) Flagpersons and guards, while assigned to traffic control, shall perform their duties and shall be provided with the necessary equipment in accordance with the current "Instructions to Flagmen" of the California Department of Transportation. The equipment shall be furnished and kept clean and in good repair by the Contractor at its expense.

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) Shoring and Trench Safety Plan - Attention is directed to Section 832 of the Civil Code of the State of California relating to lateral and subjacent support, and the Contractor shall comply with this law.

j) 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.

k) 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.

l) 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 Humboldt 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.

c) The Contractor is cautioned that it must replace all improvements in rights-of-way and within the public streets to a condition equal to what existed prior to the Contractor's entry onto the job.

d) Type and time of construction required at any road subject to interference by Contract work will be determined by those authorities responsible for maintenance of said road. It shall be the responsibility of the Contractor to determine the nature and extent of all such requirements, including provision of temporary detours as required; however, the construction right-of-way obtained by the District at affected roadways will be adequate for provision of all required detours. As required at any road crossing, the Contractor shall provide all necessary flagpersons, guardrails, barricades, signals, warning signs and lighting to provide for the safety of existing roads

and detours. Immediately after the need for temporary detours ceases, or when directed, the Contractor shall remove such detours and perform all necessary cleanup work, including replacement of fences, and removal of pavement. Included shall be all necessary replacement of existing roadway appurtenances, grading work, soil stabilization and dust control measures, as required and directed. The cost of all work specified under this Section shall be borne by the Contractor.

e) The Contractor shall examine all bridges, culverts, and other structures over which it will move its materials and equipment, and before using them, it shall properly strengthen such structures where necessary. The Contractor shall be responsible for any and all injury or damage to such structures caused by reason of its operations.

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 or 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 Costs

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.

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 County, 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 Owner 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 required by the California Department of Industrial Relations.

B-67 Progress Payments

a) The Contractor is made aware that the District shall have final approval authority for 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 (seven-day return requirement). 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 seven-day return requirement set forth in the paragraph above.

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 the 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 OSHG Installation and Integration Design 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 Contractor or Subcontractors to submit complete, sufficient, correct labor compliance documentation.
(iv) Failure of the Contractor to make payments properly for labor, materials, equipment, or other facilities, or to Subcontractors and/or suppliers;
(v) A reasonable doubt that the Work can be completed for the balance then unearned;
(vi) A reasonable doubt that the Contractor will complete the Work within the agreed time limits;
(vii) Costs to the District resulting from failure of the Contractor to complete the Work within the proper time; or
(viii) Damage to Work or property.
(ix) Damage to another Contractor.
(x) Performance of Work in violation of the Terms of the Contract Documents.
(xi) 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.

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 Contractor’s 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.

PART 4
SPECIFICATIONS

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SECTION 01 01 00

SUMMARY OF WORK

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. Description:

1. The District is planning to transition from chlorine gas to a dilute liquid sodium hypochlorite solution to provide disinfection, which will be accomplished by installing an onsite sodium hypochlorite generator (OSHG). HBMWD has procured the OSHG unit and some of the other equipment related to the system as further identified in the Drawings and Specifications. The Work consists of furnishing all labor, materials, equipment, and supervision for installing the OSHG unit and integrating it with the District's existing systems in place. This includes, but is not limited to, the following: demolishing and removing the existing chlorine gas system; demolishing and removing other electrical, plumbing, and miscellaneous installations within the existing building; installing and anchoring the OSHG unit; installing a new concrete slab for the installation and anchoring of brine and hypochlorite storage tanks; installing new blowers; installing new water softeners; installing new electrical and controls; installing new ventilation piping; and installing new water piping connections.
2. Construct all work in strict accordance with the Drawings and Specifications and subject to the terms and conditions of the Contract Documents.

B. Location of the work:

1. Humboldt Bay Municipal Water District's Essex Facility at 7270 West End Road, Arcata, CA.
2. The Owner shall give right of way access to the work site. Work will be strictly confined to the designated areas.

C. Contractor's duties:

1. Except as specifically noted, provide and pay for all:
   a. Labor, materials and equipment.
   b. Tools, construction equipment and machinery.
   c. Utilities required for construction, except as detailed in Section 01 50 00 of these specifications.
   d. All other facilities and services necessary for proper execution and completion of work.
2. Pay legally required sales, consumer and use taxes.
3. Secure and pay for, as necessary for proper execution and completion of the work, all applicable permits and licenses except when explicitly noted otherwise.
4. Give required notices.
5. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities, which bear on performance of the work.
6. Promptly submit written notice to Engineer of observed variance of Contract Documents from legal requirements.
7. If any Subcontractor or person employed by the Contractor shall appear to the Engineer to be incompetent or to act in a disorderly or improper manner, they

shall be discharged immediately on the requisition of the Engineer, and such person shall not again be employed on the work.

8. The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with this project. The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to all persons on the jobsite.
9. The Contractor shall utilize maintenance procedures that minimize fire hazards to the extent practicable. Combustible debris and waste shall be collected and removed from the jobsite each day.
10. Secondary containment shall be in place for all stationary equipment to prevent discharges of gasoline, oil, hydraulic fluid, or other petroleum products onto the ground or waters adjacent to the site.
11. The Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons (including employees) and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours.
12. Safety provisions shall conform to U.S. Department of Labor (OSHA), the California Occupational Safety and Health Act, and all other applicable Federal, State, county, and local laws, ordinances, codes, the requirements set forth below, and any regulations that may be detailed in other parts of these Specifications.
    a. The Contractor shall have at the worksite, copies or suitable extracts of the Construction Safety Orders of Cal-OSHA.
    b. All work shall comply with the provisions of these and all other applicable laws, ordinances and regulations.

1.2 CONTRACTS

A. All work is contained in these Contract Documents. The limits of work are shown in the Plans. It will be the Contractor's responsibility to coordinate their activities to resolve conflicts.

1.3 WORK SEQUENCE AND CONSTRAINTS

A. The first order of business is submission of submittals. Complete submittals for all items to be incorporated into the work shall be submitted by the Contractor no later than 20 working days following receipt of Notice of Award.

B. The Contractor shall submit a complete work schedule to be approved by the Owner and the Engineer. Contractor shall regularly update and submit updated copies of the schedule to adequately inform the Owner on the progress of the work.

C. While the Contractor is generally in control of the order in which specific construction items occur, the Contractor is required to meet the following construction sequencing constraints:
    1. The Contractor’s sequencing shall not interfere with the Owner’s ability to chlorinate water throughout the entire construction process.
    2. The Owner-supplied equipment includes a dilution panel that will be used to produce liquid sodium hypochlorite for chlorination in the interim between using

the gas system to chlorinate and using the OSHG system to chlorinate. The dilution panel pumps 12.5% liquid sodium hypochlorite from a tote, is fed softened water to dilute the sodium hypochlorite, and pumps the diluted sodium hypochlorite solution (0.8%) to the storage tanks. The owner has installed a temporary system in and adjacent to a portable storage shed at the project site that consists of the following:

a. Two metering pump skids that operate in alternating lead/lag.
b. One water softener system.
c. Dilution panel and controls.
d. 12.5% liquid sodium hypochlorite tote.
e. Temporary water supply plumbed to the dilution panel.
f. Temporary power from the Electrical Room.

3. The first items of construction will include the steps necessary to install at least one sodium hypochlorite storage tank, which includes construction of the tank pad north of the building and construction of inlet and outlet sodium hypochlorite manifolds from the storage tanks. Once at least one tank is installed, the Owner will plumb from the temporary dilution panel setup that has been installed by the Owner to the inlet manifold for the storage tanks. The Owner will also plumb from the outlet manifold for the storage tanks to the temporary dilution panel setup, and from the metering pumps to a chlorine feed line injection point that is to be installed by the Contractor. The temporary chlorine feed line injection point will be installed by the Contractor as shown on the Drawings.
4. The District will install up to two pressure transducers in the installed tanks and provide a temporary signal from the transducer(s) to the District's existing PLC in the Control Room. The Contractor will be required to install the third transducer (provided by the Owner) and route signal from all three transducers to the Microclor OSHG PLC prior to final switchover to the OSHG system as detailed further below.
5. The Owner will plumb a temporary water softener backwash discharge hose to a septic cleanout.
6. Once the system is capable of running from the temporary dilution panel setup and the sodium hypochlorite tank(s) have been filled, the existing chlorine gas system will be decommissioned by the Owner, and existing chlorine gas tanks will be removed from the Process Room by the Owner. This will allow working space for the Contractor to perform the necessary installations in the Process Room.
7. The Contractor shall install and connect the OSHG system, including the pump skid and water softener system not used in the temporary chlorination system installed by the District, to the District's existing system after the above steps have occurred. Note that the District will perform the work required for integration of the new OSHG system with the District's existing SCADA system.
8. The OSHG manufacturer shall verify proper system installation and perform system startup and training for District staff prior to the Contractor switching operation from the dilution panel to the OSHG system.
9. All sodium hypochlorite tanks will be filled via the temporary dilution panel system, and the District will disassemble the temporary dilution panel system.
10. The last piece of work will be the Contractor moving the following items used for the temporary dilution panel system to their final locations and connecting them to the permanent system:
    a. Two metering pump skids.
    b. One water softener system.

c. Dilution panel.
d. 12.5% liquid sodium hypochlorite tote.

11. All other equipment, piping, electrical and control conduits, wiring, and all other items required for a functional system shall be installed to the maximum extent feasible to allow for the quickest possible installation and integration of the items in the above step.

D. The Contractor shall conduct work in an orderly sequence to assure efficient use of materials and equipment and so as not to cause unnecessary delays to other Contractors who might be present on the jobsite

E. The Contractor shall be responsible for providing transportation of personnel, equipment, and materials to and from the site and for providing ingress and egress inside the Collector.

F. The Contractor shall coordinate access to the site with the Owner.

1.4 CONTRACTOR USE OF PREMISES

A. Construction corporation yards and/or storage areas, if required outside the designated areas for staging/laydown on District property, are the responsibility of the Contractor.

B. Confine operations at site to areas permitted by:
1. Permits
2. Contract Documents

C. Do not encumber site with materials or equipment.

D. Do not load structure or roadway with weight that will endanger or render unusable any structures or roadways.

E. Assume full responsibility for protection and safekeeping of products stored on premises.

F. Move any stored products which interfere with operations of the Owner or other Contractors.

G. Obtain and pay for use of additional storage of work area for operations if required.

H. Return all surface areas to their original condition upon completion of the work.

1.5 UTILITIES & FACILITIES

A. The Contractor may utilize Owner's existing electrical systems (as specified in Section 01 50 00 of these specifications) however, they are responsible for extending and supplementing with temporary devices as needed to maintain specified conditions for construction operations. Contractor is responsible for maintaining safe connections and shall coordinate initial establishment of connections with Owner. Contractor is responsible for all grounding, circuit breakers and other equipment

necessary for the safe utilization of the Owner's electrical system. Contractor is responsible for all repairs caused by improper use of the Owner's systems.

B. Contractor shall restore existing utilities and facilities used during construction to original condition.

1.6 CONTRACTOR PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.

B. Collect and remove waste materials, debris, and rubbish generated from the Construction activity from site.

C. The Contractor shall take whatever measures are necessary to protect direct discharge of water, sediments, and any other deleterious materials from entering the Mad River or being deposited adjacent to the river during the construction process.

D. The Contractor is responsible for re-grading and re-stabilizing the site by re-seeding and mulching the areas disturbed by construction activities per the General Notes on the Plans and in accordance with these specifications.

1.7 SUBMITTALS AND REQUESTS FOR INFORMATION

A. The Contractor shall submit a complete work schedule to be approved by the Owner and the Engineer. Contractor shall regularly update and submit updated copies of the schedule to adequately inform the Owner on the progress of the work.

B. Other submittals shall be provided as noted in Section 01 33 00.

END OF SECTION

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SECTION 01 20 00

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 GENERAL

A. Unless otherwise specified in other individual sections of these specifications, quantities of work shall be determined from measurements or dimensions in horizontal planes.

B. Units of measurement shall be in accordance with U.S. Standard Measures.

C. See Section B-67 of the General Conditions for special provisions related to progress payments and payment schedule to the Contractor.

1.2 PAYMENT PROVISIONS

A. The Contractor shall provide unit price information on the Unit Price Bid Summary Sheet.

PART 2 - MATERIALS

2.1 THE MEASUREMENT AND PAYMENT ITEMS ARE LISTED BELOW:

A. The payments to the Contractor are based on the following items. It is the intent that the scope of the description of the following items encompasses the entire scope of the work as shown on the plans and described in the specifications. The bid amounts shall be for complete in place installations.

B. The Contractor is reminded that written permission to dispose of any material must be obtained and delivered to the Owner in advance of any disposal activities. Failure to do so shall result in the contractor accepting all liabilities for the material.

BASE BID SCHEDULE

1. Mobilization and Demobilization

Measurement for this item shall be on a lump sum basis. Payment shall correspond to percent complete as confirmed by the Owner. This Work covers all Contractor costs and effort associated with mobilizing equipment, materials, and labor to the project site as well as demobilization of the same for both the Base Bid Schedule and any additive bid schedule items if awarded. Items covered by this include, but are not limited to, bonds, insurance, attendance of Contractor's staff at meetings, contracting and administrative costs, preparation and administrative costs for processing cost proposals, preparation of project schedules, updates to project schedules, costs associated with temporary facilities and utilities, traffic control, punch list items, repairs of damaged property, site cleanup, and project maintenance and warranty.

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

2. Erosion and Sediment Control

Measurement for this item shall be on a lump sum basis. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary to construct and maintain erosion and sediment control best management practices. This Work covers all Contractor costs and effort associated with providing erosion and sediment control measures including, but not limited to, silt fences, fiber rolls and diversion dikes as described in these Specifications.

3. Demolition, Removal, and Disposal of Existing Equipment

Measurement for this item shall be on a lump sum basis. Payment shall include full compensation for all materials, labor, equipment, disposal costs, and supervision necessary to demolish, remove, and dispose of the existing piping, electrical equipment, asphalt and other materials and equipment as shown on the Contract Drawings.

4. Installation of Onsite Sodium Hypochlorite Generator, Ancillary Equipment, and other Site Modifications

Measurement for this item shall be on a lump sum basis. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary to furnish and install the onsite sodium hypochlorite generator (OSHG) and all associated equipment that is not covered under other items. These components include but are not limited the following: installing and anchoring the OSHG skid; blowers and associated vent piping; installing and anchoring the brine tank and three sodium hypochlorite tanks; water softeners; installing a softener backwash outlet and connecting it to the existing onsite sewer; installing the dilution panel and liquid sodium hypochlorite drum; installing the three skid-mounted sodium hypochlorite metering pumps; all connecting piping, fasteners, and clamps; all fittings, valves, and other appurtenances; connection to the chlorine injection line; hydrogen detector; water filters; roll-up door including framing design submittal; and all other equipment shown on the Contract Drawings and in the P&ID drawings in Appendix A not covered by other bid items. This item also includes work required for temporary system chlorination including switching from the existing gas system to the dilution panel and switching over from the dilution panel to the OSHG unit after testing. Initial testing, startup, and commissioning of the system are also included under this item.

5. Concrete

Measurement for this item shall be on a lump sum basis. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary to install the concrete slab for the tanks and any other miscellaneous concrete work required for completion of the project per the Drawings and Specifications. The Work includes, but is not limited to stripping the vegetative layer in the new slab area, subgrade preparation, forms, finishing, and installation of grating as shown on the Drawings.

6. Electrical and Controls System

Measurement for this item shall be on a lump sum basis. Payment shall include full compensation for all materials, labor, equipment, and supervision necessary to install and connect all electrical and controls components of the project. This includes but is not limited to conduit, wire, outlets, connections to the OSHG unit and PLC, connections to the existing electrical panels, installation of level sensing equipment, connecting to the existing PLC, connecting power and controls to the metering pump skids, metering pump disconnect switches, and installation and connection of other electrical and controls equipment.

END OF SECTION

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SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SCOPE

A. Section includes:
   1. Coordination and project conditions.
   2. Preconstruction meeting.
   3. Progress meetings.

1.2 MEASUREMENT AND PAYMENT

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

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 Shop Drawings & Submittals:
   1. Construction schedule.
   2. Contractor's Organization Chart with titles and contact information for a minimum of the Project Manager, Site Foreman, and Site Superintendent.

1.4 PRECONSTRUCTION MEETING

A. Owner will schedule meeting after Notice to Proceed.

B. Prior to the commencement of Work at the site, a Preconstruction meeting will be held at a mutually agreed time and place. The Preconstruction meeting shall be attended by District representatives, Construction Foreman, Contractor's Construction Superintendent, key Subcontractors, and any other parties requested by the Contractor or the Owner.

C. Unless previously submitted to the Owner, the Contractor shall bring to the conference three (3) copies of each of the following:
   1. Draft Construction Schedule.
   2. Procurement schedule of major equipment and materials and items requiring long lead time.
   3. Shop Drawing/Sample/submittal schedule.
   4. Substitution Requests per Section 01 33 00 Shop Drawings & Submittals.
   5. Letter of Responsibility designating emergency contacts for the Contractor after business hours.

D. The purpose of the meeting is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established.

E. The Owner will preside at the Preconstruction Meeting and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.

F. Agenda:
   1. Notice to Proceed date.
   2. Distribution of Contract Documents.
   3. Designation of personnel representing parties in Contract.
   4. Review of Contractor's Construction Schedule.
   5. Major equipment deliveries and priorities.
   6. Critical work sequencing.
   7. Submission of list of Subcontractors, list of products, schedule of values if not previously submitted.
   8. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal requests, Change Orders, and Contract closeout procedures.
   9. Use of premises by Owner and Contractor.
   10. Owner's requirements and occupancy.
   11. Site Safety: Contractor's assignments for safety and first aid.
   12. Construction facilities and controls provided by Owner.
   13. Temporary utilities provided by Owner.
   14. Application for payment procedures.
   15. Procedures for testing.
   16. Procedures for maintaining record documents.
   17. Requirements for system shut down.

1.5 PROGRESS MEETINGS

A. The Owner shall schedule, arrange, and conduct progress meetings. These meetings shall be conducted once per week, or at a frequency as mutually agreed upon by the Contractor and Owner and shall be attended by the Contractor's superintendent and representatives of key Subcontractors, and others who are active in the execution of the Work. The purpose of these meetings shall be to review the Contractor's schedule provided in accordance with this Section, resolve conflicts, and in general, coordinate and expedite the execution of the Work.

B. Owner will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings and record the meeting minutes.

C. Attendance Required: Job superintendent, key subcontractors, Owner, and others as appropriate to agenda topics for each meeting.

D. Agenda:
   1. Review and acceptance of minutes of previous meeting.
   2. Review of Work progress.
   3. Field observations, problems, and decisions.
   4. Site Safety.
   5. Identification of problems impeding planned progress.
   6. Review of submittals schedule and status of submittals.
   7. Review of delivery schedules.
   8. Maintenance of progress schedule.

9. Corrective measures to regain projected schedules.
10. Planned progress during succeeding work period.
11. Coordination of projected progress.
12. Maintenance of quality and work standards.
13. Effect of proposed changes on progress schedule and coordination.
    a. Progress Payment.
    b. Change Orders.
    c. Claims.
14. Other business relating to Work.

E. The Owner shall record minutes and distribute copies within two days after meeting to participants, with one copy each to Contractor, Owner, and those affected by decisions made.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 33 00

SHOP DRAWINGS AND SUBMITTALS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included:
   1. Wherever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined either by manufacturer's name and catalog number or by reference to recognized industry standards.
   2. To ensure that the specified products are furnished and installed in accordance with design intent, procedures have been established for advance submittal of design data and for its favorable review or rejection by the Engineer.

B. Related work described elsewhere:

1.	Contractual requirement for submittals	General Conditions
2.	Individual submittals required	Pertinent Sections of these Specifications

1.2 MEASUREMENT AND PAYMENT

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

1.3 PRODUCT HANDLING

A. Make all submittals of Shop Drawings, samples, requests for substitutions, and other items, in strict accordance with the provisions of this section of these specifications.

PART 2 - PRODUCTS

2.1 SHOP DRAWINGS

A. Scale required: Unless otherwise specifically directed by the Engineer, make all shop drawings accurately to a scale sufficiently large to show all pertinent features of the item and its method of connection to the work.

B. Type of prints required: Unless otherwise specifically directed by the Engineer, make all shop drawing prints in blue or black line on white background.

C. Number of prints required: Submit all shop drawings electronically unless noted otherwise.

2.2 SAMPLES

A. Accuracy of sample: Unless otherwise specifically directed by the Engineer, all samples shall be of the precise article(s) proposed to be furnished.

B. Number of samples required: Submit all samples in the quantity which is required to be returned plus one which will be retained by the Engineer.

2.3 COLORS

A. General: Unless the precise color and pattern is specifically described in the Contract Documents, whenever a choice of color or pattern is available in a specified product, submit accurate color charts and pattern charts to the Engineer for review and selection.

B. Comparative analysis: Unless all available colors and patterns have identical costs and identical wearing capabilities, and are identically suited for the installation, completely describe the relative costs and capabilities of each.

2.4 SUBSTITUTIONS

A. Engineer's approval required:
1. The Contract is based on the materials, equipment, and methods described in the Contract Documents.
2. The Engineer will consider proposals for substitution of materials, equipment, and methods only when such proposals are accompanied by full and complete technical data and all other information required by the Engineer to evaluate the proposed substitution.
3. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved for this work by the Engineer.

B. "Or equal":
1. Where the phrase "or equal" occurs in the Contract Documents, do not assume that material, equipment, or methods will be approved as equal by the Engineer unless the item has been specifically approved for this work by the Engineer.
2. The decision of the Engineer shall be final.

C. Availability of specified items:
1. Verify prior to bidding that all specified items will be available in time for installation during orderly and timely progress of the work.
2. In the event specified item or items will not be available, so notify the Engineer prior to receipt of bids.
3. Costs of delays because of non-availability of specified items, which such delays could have been avoided by the Contractor, shall be the responsibility of the Contractor and shall not be borne by the Owner.

PART 3 - EXECUTION

3.1 SUBMITTAL FORM

All submittals shall be transmitted with a copy of the form provided at the end of this section or Contractor-supplied form that has been pre-approved by the Engineer.

3.2 COORDINATION OF SUBMITTALS

A. General: Prior to submittal for Engineer's review, use all means necessary to fully coordinate all material, including the following procedures:
   1. Determine and verify all field dimensions and conditions, materials, catalog numbers, and similar data.
   2. Coordinate as required with all trades and with all public agencies involved.
   3. Secure all necessary approvals from public agencies and others and signify by stamp, or other means, that they have been secured.
   4. Clearly indicate all deviations from the Contract Documents.

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

C. Shop drawings shall be submitted only by the Contractor, who shall indicate by a signed stamp or other approved means that the work shown is in conformance with the Contract Documents and has been checked for dimensions and relationship with work of all other trades involved.

3.3 TIMING OF SUBMITTALS

A. General:
   1. Make all submittals far enough in advance of scheduled dates of installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery.
   2. In scheduling, allow at least fifteen (15) working days for the Engineer's review following receipt of the submittal.
   3. Contractor shall coordinate on-site grain size analysis and screen selection with the Engineer in advance of performance of the work. Sufficient time shall be allowed and previously agreed upon for the Engineer to review sieve data and approve screen size selection prior to the installation of the screen.

B. Delays: Costs of delays occasioned by tardiness of submittals are the responsibility of the Contractor and shall not be borne by the Owner.

C. Scheduling: Until submittals have been favorably reviewed by the Engineer, progress payments beyond the scheduled date of the submittals will not be made to the Contractor.

3.4 SUBMITTALS REQUIRED

A. The Contractor is directed to each Specification section for required submittals. Contractor shall also provide submittals for all new materials provided by the Contractor that are shown in the Drawings that may not be addressed in the Specifications.

3.5 RESUBMITTALS

A. The practice of submitting incomplete or unchecked shop drawings for the Engineer to correct or finish will not be acceptable, and shop drawings which, in the opinion of the Engineer, clearly indicate that they have not been checked by the Contractor will be considered as not complying with the intent of the Contract Documents and will be returned to the Contractor for resubmission in the proper form.

B. Engineer shall complete two detailed reviews of shop drawings and submittals at no cost to the Contractor. The cost of additional reviews resulting from improper submission or completion of shop drawings shall be deducted by the Owner from the contract sum.

END OF SECTION

Humboldt Bay Municipal Water District
SHOP DRAWING & SUBMITTAL REVIEW FORM

Date:	**Contract Title:** OSHG Installation and Integration GHD Job #: 12616149
To: GHD, Inc. 718 Third Street Eureka, CA 95501 **Attention:** Nathan Stevens, PE Email: nathan.stevens@ghd.com Phone: (707) 267-2204	**From:** Contractor Name Contractor Address Line 1 Contractor Address Line 2 **Submitted By:** **Signature:** Phone:

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

Engineer's Review Comments:

Signature: **Date:**

Review Action Explanation:

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

Shaded areas for Engineer use only.

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

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SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section covers the work necessary to move in personnel and equipment, and related facilities necessary to prepare the work area for construction. Temporary facilities and controls required for this work include, but are not necessarily limited to:

1. Temporary utilities such as water and electricity
2. Sanitary facilities.

1.2 MEASUREMENT AND PAYMENT

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

1.3 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to maintain temporary facilities and controls in proper and safe condition throughout progress of the work.

PART 2 - PRODUCTS

2.1 UTILITIES

A. General: The Contractor is responsible for coordinating all onsite utility connections and usage with the Owner.

B. Temporary water: Water is generally available at the site. The Contractor shall make arrangements with the Owner.

C. Electricity: Electricity is generally available at the site. The Contractor shall make arrangements with the Owner.

2.2 SANITARY FACILITIES

A. Contractor is responsible for providing and maintaining temporary sanitary facilities. Furnish and install all required temporary facilities with sanitary toilets for use of all workers; comply with all minimum requirements of the Health Department or other public agency having jurisdiction; maintain in a sanitary condition at all times. Protect facilities against vandalism.

2.3 FIELD OFFICES

A. Contractor and Subcontractors:

1. The contractor and their subcontractors may maintain such office and storage facilities on the site as may be necessary for the proper conduct of the work. These shall be located so as to cause no interference with any work to be performed on the site.

B. Removal:

1. Upon completion of the project, or as directed by the Owner or Engineer, the Contractor shall remove all such temporary structures and facilities from the site and leave the premises in the condition required by the Owner.

PART 3 - EXECUTION

3.1 REMOVAL

Maintain all temporary facilities and controls as long as needed for the safe and proper completion of the Work; remove all such temporary facilities and controls as rapidly as progress of the Work will permit or as directed by the Engineer.

END OF SECTION

SECTION 01 57 13

EROSION CONTROL

PART 1 GENERAL

1.1 GENERAL

A. Minimize the extent of all ground disturbing activities.

B. Upon completion of construction activities, natural drainage shall be restored and re-contoured as nearly as practicable to pre-project conditions, and shall match adjacent natural channel contours.

1.2 RELATED SECTIONS

Related work specified in other sections:

A. Section 31 25 13 – Hydroseeding and Revegetation

1.3 MEASUREMENT AND PAYMENT

A. Measurement and Payment for the requirements of this section shall be paid for under the Erosion and Sediment Control Item and no additional measurement or payment will be made for this contract item.

1.4 SUBMITTALS

A. Mill Certificate or Affidavit. A mill certificate or affidavit shall be provided attesting that the erosion control fabric and factory seams meet chemical, physical, and manufacturing requirements specified above.

B. Erosion Control Plan.

1.5 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

B. American Society for Testing and Materials (ASTM)
   1. ASTM D4439-04 - Standard Terminology for Geosynthetics.
   2. ASTM D4491-99a(2009) - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
   3. ASTM D4533- 04(2009) - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
   4. ASTM D4632-08 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
   5. ASTM D4751-04 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.
   6. ASTM D4873-02(2009) - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.

1.6 EROSION AND SEDIMENT CONTROLS

A. The controls and measures required by the Contractor are described but not limited to the below.
   1. Structural Practices: Structural practices shall be implemented to divert flows from steep slopes, exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Structural practices shall be implemented in a timely manner during the construction process to minimize erosion and sediment runoff. Structural practices shall include the following devices.
      a. Silt Fences. The Contractor shall provide silt fences as a temporary structural practice to minimize erosion and sediment runoff. Silt fences shall be properly placed and installed to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (e.g. clearing and grubbing, trench excavation, backfilling, and grading). Silt fences shall be installed in the locations as directed by the Engineer. Final removal of silt fence barriers shall be upon approval by the Engineer.
      b. Fiber Rolls (sediment logs or wattles): Contractor shall provide fiber rolls as temporary structural practice to minimize erosion and sediment runoff. Fiber rolls shall be properly placed and installed to effectively retain sediment immediately after completing each phase of work (e.g., clearing and grubbing, trench excavation, backfill, and grading) in each independent runoff area (e.g., after clearing and grubbing in an area between a ridge and drain, fiber rolls shall be placed as work progresses; fiber rolls shall be removed/replaced/relocated as needed for work to progress in the drainage area). Final removal of fiber roll barriers shall be upon approval by the Engineer. Fiber Rolls shall be provided as follows, or as required to conform to the intent of this section:
         (1) Along the downhill perimeter edge of all areas disturbed.
         (2) Along the top of the slope or top bank of drainage ditches, channels, swales, etc. that traverse disturbed areas.
         (3) Along the toe of all cut slopes and fill slopes of the construction areas.
         (4) Perpendicular to the flow in the bottom of existing drainage ditches, channels, swales, etc. that traverse disturbed areas or carry runoff from disturbed areas. Rows shall be spaced a maximum of 100 feet apart.
         (5) Perpendicular to the flow in the bottom of new drainage ditches, channels, and swales. Rows shall be spaced a maximum of 100 feet apart.
         (6) At the entrance to culverts that receive runoff from disturbed areas.
      c. To minimize wildlife entanglement and plastic debris pollution, the use of plastic netting (such as polypropylene, nylon, polyethylene, polyester, or other synthetic fibers used in fiber rolls, erosion control blankets, and mulch control netting) in temporary rolled erosion and sediment control products is prohibited. Any erosion control associated netting shall be made of natural fibers and constructed in a loose-weave design with movable joints between the horizontal and vertical twines.

2. All trees and natural vegetation shall be retained, unless specifically noted otherwise, to stabilize hillsides, retain moisture, reduce erosion, and minimize siltation and nutrient runoff.

PART 2 PRODUCTS

2.1 SILT FENCES

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

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

B. Mill Certificate or Affidavit. A mill certificate or affidavit shall be provided attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above.

C. The Contractor may use either wooden stakes or steel posts for silt fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 inches by 2 inches when oak is used and 4 inches by 4 inches when pine is used. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum weight of 1.33 pounds per linear foot.

2.2 FIBER ROLLS (SEDIMENT LOGS OR WATTLES)

A. Composed of certified weed free rice straw or coconut fiber in 8.5 to 9-inch diameter rolls with and approximate weight of 2lbs/lineal foot, contained in a core, jute, or burlap netting.

B. Manufacturers:
   1. Earth Savers 9”-Coir Log
   2. Erosion Control Blanket, 9-inch Stenlog
   3. Substitutions: Section 01 33 00 – Shop Drawings and Submittals

C. The Contractor shall use wooden stakes for fiber roll installation. Wooden stakes used for fiber roll installation shall have a minimum cross section of 1 inch by 2 inches, or as suggested by the fiber roll manufacturer.

PART 3 EXECUTION

3.1 DUST CONTROL

A. All construction areas shall be treated and maintained as necessary to minimize the emission of dust.

3.2 INSTALLATION OF SILT FENCES

A. Silt fences shall extend a minimum of 24 inches above the ground surface and shall not exceed 34 inches above the ground surface. Filter fabric shall be from a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter fabric shall be spliced together at a support post, with a minimum 6 inch overlap, and securely sealed. A trench shall be excavated approximately 6 inches wide and 6 inches deep on the upslope side of the location of the silt fence. The 6-inch by 6-inch trench shall be backfilled and the soil compacted over the filter fabric. Silt fences shall be removed upon approval by the Engineer.

B. Maximum spacing for post supports shall be 6 feet on center. Posts shall be buried 18 inches minimum and shall not exceed 36-inches above the ground surface.

3.3 INSTALLATION OF FIBER ROLLS (SEDIMENT LOGS OR WATTLES)

A. Fine grade the subgrade by hand, dressing where necessary to remove local deviations and to remove larger stones or debris that will inhibit intimate contact of the fiber roll with the subgrade. Prior to roll installation, contour a concave key trench 2 to 4 inches deep along the proposed installation route. Soil excavated in trenching shall be placed on the uphill or flow side of the roll to prevent water from undercutting the roll.

B. Place fiber rolls into the key trench and stake on both sides of the roll within 6 feet of each end. Spacing for stakes shall be 3 to 5 feet. Stakes are typically driven in on alternating sides of the roll. Stakes shall be buried 12 inches minimum.

C. When more than one fiber roll is placed in a row, the rows should be abutted securely to one another to provide a tight joint, not overlapped. Fiber rolls shall be placed in a single row, lengthwise on the contour, with ends of adjacent rolls tightly abutting one another.

3.4 MAINTENANCE

A. The Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures. The following procedures shall be followed to maintain the protective measures.
   1. Silt Fence Maintenance. Silt fences shall be inspected in accordance with Part 4 of this Specification. Any required repairs shall be made promptly. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become

ineffective, and the barrier is still necessary, the fabric shall be replaced promptly. Sediment deposits shall be removed when deposits reach one-third of the height of the barrier. When a silt fence is no longer required, it shall be removed. The immediate area occupied by the fence and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be re-vegetated.

2. Fiber Roll Maintenance. Fiber roll barriers shall be inspected in accordance with Part 4. Close attention shall be paid to the repair of damaged rolls, end runs and undercutting beneath rolls. Necessary repairs to barriers or replacement of rolls shall be accomplished promptly. Sediment deposits shall be removed when deposits reach one-half of the height of the barrier. Roll rows used to retain sediment shall be turned uphill at each end of each row. When a fiber roll barrier is no longer required, it shall be removed. The immediate area occupied by the roll and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be re-vegetated.

PART 4 INSPECTION

4.1 SITE INSPECTIONS

A. Person(s) Responsible for Inspecting Site
   1. The person inspecting the site may be on the Contractor's staff or a third party hired by the Contractor to conduct such inspection. Contractor is responsible for ensuring that the person who conducts inspections is a "qualified person".
   2. A "qualified person" is a person knowledgeable in the principles and practice of erosion and sediment controls and pollution prevention, who possesses the skill to access conditions at the construction site that could impact stormwater quality, and the skills to assess the effectiveness of any stormwater controls selected and installed to meet the requirements of this permit.

B. Frequency of Inspections:
   1. At a minimum, conduct a site inspection in accordance with one of the two schedules listed below:
      a. At least once every seven (7) calendar days; or
      b. Once every 14 calendar days and within 24 hours of the occurrence of a storm event of 0.25 inches or greater. To determine if a storm event of 0.25 inches or greater has occurred on the project site, you must either keep a properly maintained rain gauge on the site, or obtain the storm event information from a weather station that is representative of the project location. For any day of rainfall during normal business hours that measures 0.25 inches or greater, you must record the total rainfall measured for that day.
      c. Inspections are only required during the project's normal working hours.

C. Reduction in Inspection Frequency:
   1. Inspection frequency may be reduced as follows:
      a. For Stabilized Areas. Contractor may reduce frequency of inspection to once per month in any area of the site where the stabilization steps. If construction activity resumes in this portion of the site at a later date, the inspection frequency immediately increases to that required for general construction.

Contractor must document the beginning and ending dates of this period in their records.

D. Areas that need to be inspected. During site inspection, the following areas of the site must be inspected at a minimum:
   1. All areas that have been cleared, graded, or excavated and that have not yet completed stabilization;
   2. All stormwater controls (including pollution prevention measures) installed at the site;
   3. Materials, waste, borrow, or equipment storage and maintenance areas;
   4. All areas where stormwater typically flows within the site, including drainage ways designed to divert, convey and/or treat stormwater;
   5. All points of discharge from the site; and
   6. All locations where stabilization measures have been implemented.

E. Requirements for Inspections. During site inspection, the Contractor's inspector must at a minimum:
   1. Check whether all erosion and sediment controls and pollution prevention controls installed appear to be operational and are working as intended to minimize pollutant discharges. Determine if any controls need to be replaced, repaired, or maintained;
   2. Check for presence of conditions that could lead to spills, leaks, or other accumulations of pollutants on the site;
   3. Identify any locations where new or modified stormwater controls area necessary to meet the requirements of these specifications or the applicable permit conditions;
   4. At points of discharge and, if applicable, the banks of any surface waters flowing within site boundaries or immediately adjacent to the site, check for signs of visible erosion and sedimentation that have occurred and are attributable to discharge; and
   5. Identify any and all incidents of noncompliance observed.
   6. If a discharge is occurring during inspection, the Contractor's inspector is required to:
      a. Identify all points of the property from which there is a discharge
      b. Observe and document the visual quality of the discharge, and take note of the characteristics of the stormwater discharge, including color, odor, floating, settled, or suspended solids, foam, oil sheen, and other obvious indicators or stormwater pollutants; and
      c. Document whether the stormwater controls are operating effectively, and describe any such controls that are clearly not operating as intended or are in need of maintenance.
   7. Based on the results of the inspection, initiate corrective action under Part 5.

F. Inspection Report
   1. Requirements to Complete Inspection Report: The Contractor or Contractor's representative must complete an inspection report within 24 hours of completing any site inspection. Each inspection report must include the following:
      a. The inspection date;
      b. Names and titles of the personnel making the inspections;

c. A summary of inspection findings, covering at a minimum the observations made in accordance with Part 4.1.E;
d. If the site is being inspected at the frequency specified in Part 4.1.B.1. and an inspection was conducted because of rainfall measuring 0.25 inch or greater, the applicable rain gauge or weather station readings that triggered the inspection must be included; and
e. If it has been determined that it is unsafe to inspect a portion of the site, the reason it was found to be unsafe must be described, and the locations that this condition applied to must be specified.

2. Record Keeping Requirements: Contractor is required to keep a current copy of all inspection reports at the site or at an easily accessible location, so that it can be made available at the time of an onsite inspection or upon request by the County or CA Regional Water Quality Control Board. The inspection reports may be kept electronically if the records are:
   a. In a format that can be read in a similar manner as a paper record;
   b. Legally dependable with no less evidentiary value than their paper equivalent; and
   c. Accessible to the inspector during an inspection to the same extent as a paper copy stored at a site would be, if the records were stored in paper form. All inspection reports completed for this part must be retained for at least 3 years from the date that the permit expires or is terminated.

4.2 INSPECTIONS BY REGULATORY AGENCIES

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

PART 5 CORRECTIVE ACTION

5.1 “CORRECTIVE ACTIVE” DEFINED

A. Corrective actions are actions taken in compliance with this Section , which include:
   1. Repair, modify, or replace any stormwater control used at the site;
   2. Clean up and properly dispose of spills, releases, or other deposits; or
   3. Remedy a permit violation

5.2 REQUIREMENTS FOR TAKING CORRECTIVE ACTION

A. Contractor must complete the following corrective action in accordance with the deadlines specified in this Part. In all circumstances, Contractor must immediately take all reasonable steps to minimize or prevent the discharge of pollutants until a

permanent solution is installed and made operational, including cleaning up any contaminated surfaces so that the material will not discharge in subsequent storm events.

B. For any of the following conditions on the site, Contractor must install a new or modified erosion control measure and make it operational, or complete the repair, but no later than seven (7) calendar days from the time of discovery. If it is infeasible to complete the installation or repair within seven (7) calendar days, Contractor must document in their records why it is infeasible to complete the installation or repair within the seven (7) calendar day timeframe and document the schedule for installing the stormwater control(s) and making it operational as soon as practicable after the seven (7) day timeframe.
   1. A required storm water control was never installed, was installed incorrectly, or not in accordance with the requirements of Section 01 57 13.
   2. If the Contactor determines that erosion control measures installed are not effective enough for the discharge to meet applicable water quality standards; or
   3. Any of the prohibited discharges listed below are occurring or has occurred:
      a. Wastewater from washout of concrete or slurry, unless managed by an appropriate control.
      b. Wastewater from washout and cleanout of any other construction materials, unless managed by an appropriate control.
      c. Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance
      d. Soaps, solvents, or detergents used in vehicle and equipment washing
      e. Toxic or hazardous substances from a spill or other release

5.3 CORRECTIVE ACTION REQUIRED BY REGULATORY AGENCY

A. Contractor must comply with any corrective actions required by the County or State as a result of permit violations found during an inspection carried out under Part 4.2.

5.4 CORRECTIVE ACTION REPORT

A. For each corrective action taken in accordance with this Part, Contractor must complete a corrective action report, which includes the applicable information listed below. Note that these reports must be maintained in Contractor’s records but do not need to be provided to any regulatory agency except upon request.
   1. Within 24 hours of discovering the occurrence of one of the triggering conditions in Part 5.02.B at the site, Contractor must complete a report of the following:
      a. Which condition was violated
      b. The nature of the condition identified; and
      c. The date and time of the condition identified and how it was identified.
   2. Within seven (7) calendar days of discovering the occurrence of one of the triggering conditions in Part 5.2.B at the site, Contractor must complete a report of the following:
      a. Any follow-up actions taken to review the design, installation, and maintenance of stormwater controls, including the dates such actions occurred;

   b. A summary of stormwater control modifications taken or to be taken, including a schedule of activities necessary to implement changes, and the date the modifications are completed or expected to be completed
3. Record Keeping Requirements: Contractor is required to keep a current copy of all inspection reports at the site or at an easily accessible location, so that it can be made available at the time of an onsite inspection or upon request by the County or the CA Regional Water Quality Control Board. The inspection reports may be kept electronically if the records are:
   a. In a format that can be read in a similar manner as a paper record;
   b. Legally dependable with no less evidentiary value that their paper equivalent; and
   c. Accessible to the inspector during an inspection to the same extent as a paper copy stored at a site would be, if the records were stored in paper form. All corrective action reports completed for this part must be retained for at least 3 years from the date that the permit expires or is terminated.

PART 6 STAFF TRAINING REQUIREMENTS

6.1 STAFF TRAINING REQUIREMENTS

A. Prior to commencement of earth-disturbing activities or pollutant-generating activities, whichever occurs first, Contractor must ensure that the following personnel understand the requirements of the applicable permits, this Section and their specific responsibilities with respect to those requirements:
   1. Personnel who are responsible for the design, installation, maintenance, and/ or repair of stormwater controls (including pollution prevention measures);
   2. Personnel responsible for the application and storage of treatment chemicals
   3. Personnel who are responsible for conducting inspections as required in Part 4.1; and
   4. Personnel who are responsible for taking corrective actions as required in Part 5.2.

B. Contractor is responsible for ensuring that all activities on the site comply with the requirements of this Specification. Contractor is not required to provide or document formal training for subcontractors or other outside service providers, but must ensure that such personnel understand any requirements of the applicable permits or these Specifications that may be affected by the Work they are subcontracted to perform.

C. At a minimum must be trained to understand the following if related to the scope of their job duties (e.g., only personnel responsible for conducting inspections need to understand how to conduct inspections):
   1. The location of all stormwater controls on the site required by this permit, and how they are to be maintained;
   2. The proper procedures to follow with respect to the Work’s pollution prevention requirements; and
   3. When and how to conduct inspections, record applicable findings, and take corrective actions.

END OF SECTION

SECTION 01 74 00

SITE AND AREA CLEANUP

PART 1 - GENERAL

1.1 DESCRIPTION

A. Maintain work areas free from accumulations of waste, debris, dust, and mud caused by Contractor's operations.

B. At completion of Work, remove all waste materials, tools, equipment, machinery, surplus materials; leave property clean; leave all rights of ways in a condition equal to that at the beginning of Work.

1.2 MEASUREMENT AND PAYMENT

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

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 PROTECTION

A. The Contractor shall contact Underground Service Alert (USA) (800) 227-2600 in accordance with the requirements of Section 01 50 00, “Temporary Facilities and Controls.”

B. The Contractor shall be solely responsible for the protection of site facilities, properties, structures, streets, and utilities. Any damage shall be repaired to its original condition or better, as determined by the Engineer, at the Contractor’s expense.

C. The Contractor shall protect benchmarks, survey control points, and existing structures not identified for removal from damage or displacement.

3.2 CLEARED MATERIAL

A. Clearing and grubbing shall consist of removal of all objectionable material within the limits of work shown on the Plans and as directed by the Engineer. Objectionable materials shall include but are not limited to all abandoned pipes, conduits, waste concrete, undergrowth and dead wood. All objectionable cleared material which originated on site shall become the property of the Owner and shall be stockpiled onsite per the direction of the Owner.

3.3 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded without mixing with foreign materials for use in finish grading.

B. Stockpile and protect from erosion per sediment and erosion control plan.

3.4 DURING CONSTRUCTION

A. Execute cleaning to ensure that any private property, grounds and especially access roads and Owner and public properties are maintained free from accumulation of waste materials, dust, mud, and debris.

B. The Contractor shall keep all access roads clean and free of dust, mud and debris resulting from Contractor's operations.

C. All waste materials, debris and rubbish shall be disposed of at sites to be chosen by Contractor and at facilities properly permitted and licensed to accept such waste materials. Prior to dumping on any private property, a letter allowing such dumping shall be obtained from the property owner and presented to the Engineer and Humboldt County Department of Environmental Health for approval.

Senior REHS, Solid Waste Program
DHHS, Department of Environmental Health
100 H Street, Suite 100
Eureka, CA 95501
Fax: (707) 441-5699

Contractor shall have the sole responsibility of ensuring that disposal on private property conforms to and is in compliance with all necessary permitting and regulatory approval.

D. Secondary containment and spill response materials shall always be in place. Hydrocarbon spills shall be cleaned with absorbent pads and other absorbent materials and any impacted soil or water removed and properly disposed of by the Contractor.

3.5 AFTER CONSTRUCTION

A. All other sanitary and other temporary facilities, construction materials, equipment, and other debris shall be completely removed from the site and recycled or disposed of properly by the Contractor.

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

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

END OF SECTION

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SECTION 02 01 00

SITE CONDITIONS

PART 1 - GENERAL

1.1 RELATED INFORMATION

A. Related information and requirements are included in the General Conditions and the individual Sections of these Specifications.

1.2 MEASUREMENT AND PAYMENT

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

1.3 INFORMATION ON SITE CONDITIONS

A. Information obtained by the Engineer regarding site conditions, existing facilities, and similar data are shown on the Plans and in the Specifications, including attachments. This information is based on best available information, but is in no way exhaustive.

1.4 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor shall satisfy themself as to the nature and location of the work, the general and local conditions, particularly those bearing upon availability of transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads, work in sensitive environment and uncertainties of weather, or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment facilities needed preliminary to and during the prosecution of the work and all other matters which can in any way affect the work or the cost thereof under this contract. Submission of a bid shall be considered conclusive evidence that the bidder has familiarized themselves with the above items and is satisfied as to the conditions to be encountered in performing the work and requirements specified in the proposal.

B. The Contractor further shall satisfy themself as to the character, quality, and quantity of surface and subsurface materials to be encountered from inspecting the site, any exploratory work done by the Owner, as well as from information presented by the Plans and Specifications made a part of this contract. Any failure by the Contractor to acquaint themself with all the available information will not relieve him from responsibility for properly estimating the difficulty or cost of successfully performing the work.

C. The Contractor shall anticipate underground obstructions such as utility lines, potentially high water table, varying soil conditions and debris. No extra payment will be allowed for the removal, replacement, repair, or possible increased cost caused by

underground obstructions. Any such utilities or obstructions indicated on the plans show only the approximate location and must be verified in the field by the Contractor. The Owner and Engineer will endeavor to familiarize the Contractor with all known underground obstructions, but this will not relieve the Contractor from full responsibility in anticipating and locating all underground obstructions.

D. The Contractor shall note that many of the existing access roads and streets are gravel or residential in character and that heavy truck and equipment operations may cause roadway damage in excess of normal usage. Damage caused to the access roads or streets by Contractor's operations shall be repaired by the Contractor at no additional cost to the Owner.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01. SUMMARY

A. Section Includes:

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

1.02. REFERENCES

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 305 - Hot Weather Concreting.
3. ACI 306.1 - Standard Specification for Cold Weather Concreting.
4. ACI 318 - Building Code Requirements for Structural Concrete.
5. ACI 350.4 – Design Considerations for Environmental Engineering Concrete Structures.

B. ASTM International:

1. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
2. ASTM C33 - Standard Specification for Concrete Aggregates.
3. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
5. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
6. ASTM C150 - Standard Specification for Portland Cement.
7. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.

8. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

9. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

10. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.

11. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

12. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

13. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.

14. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

15. 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.

1.03. SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on joint devices, attachment accessories and admixtures.

C. Design Data:

1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:

a. Hot and cold weather concrete work.

b. Air entrained concrete work.

2. Identify mix ingredients and proportions, including admixtures.

D. Manufacturer's Installation Instructions: Submit installation procedures and interface required with adjacent Work.

1.04. CLOSEOUT SUBMITTALS

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

1.05. QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Conform to ACI 305 when concreting during hot weather.

C. Conform to ACI 306.1 when concreting during cold weather.

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

E. Maintain one copy of each document on site.

1.06. COORDINATION

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

PART 2 PRODUCTS

2.01. FORM MATERIALS AND ACCESSORIES

A. Form Materials: At discretion of Contractor. New materials to be used.

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

2.02. REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield, deformed billet bars, uncoated finish. Welded reinforcing: ASTM A704/A704M, 60 ksi yield.

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

C. Fabricate concrete reinforcement in accordance with ACI 318.

D. Weld reinforcement in accordance with AWS D1.4.

2.03. CONCRETE MATERIALS

A. Cement: ASTM C150, Portland Cement Type II – Moderate.

B. Normal Weight Aggregates: ASTM C33.

1. Coarse Aggregate Maximum Size: 1 inch in accordance with ACI 318.

C. Water: ACI 318; potable, clean and without deleterious amounts of chloride ions.

2.04. ADMIXTURES

A. Air Entrainment: ASTM C260, containing no chlorides or other corrosion causing chemicals.

B. Chemical: ASTM C494/C494M Type A – Water Reducing, Type D – Water Reducing and Retarding, containing no chlorides or other corrosion causing chemicals.

C. Fly Ash: ASTM C618 Class C or F.

D. Plasticizing: ASTM C1017/C1017M Type I, plasticizing and Type II, plasticizing and retarding.

2.05. ACCESSORIES

A. Epoxy Bonding Compound: ASTM C881. Provide Type I for bonding hardened concrete to hardened concrete; Type II for bonding freshly mixed concrete to hardened concrete; and Type III as a binder in epoxy mortar or concrete, or for use in bonding skid-resistant materials to hardened concrete. Provide Grade 1 or 2 for horizontal surfaces and Grade 3 for vertical surfaces. Provide Class A if placement temperature is below 40 degrees F; Class B if placement temperature is between 40 and 60 degrees F; or Class C if placement temperature is above 60 degrees F.

B. Vapor Retarder: ASTM E1745 10 mil thick; type recommended for below grade application. Furnish joint tape recommended by manufacturer.

C. Non-Shrink Grout: ASTM C1107/C1107M; Grade A; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 3,000 psi in 72 hours and 7,000 psi in 28 days.

D. Aluminum Metal Isolation: Two coats of a high build polymide epoxy paint, such as Tnemec 66, or equal (8 mils). Total thickness of system DFT = 8.0 mils.

2.06. JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler: ASTM D1751; Asphalt impregnated fiberboard or felt, 1/4 inch thick; tongue and groove profile.

B. Joint Sealant: ASTM C920 unless otherwise noted; suitable for materials to which applied.

1. Horizontal Joints: Grade P, use T.

2. Vertical Joints: Grade NS.

2.07. CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C94, Option C.

B. Select proportions for concrete in accordance with ACI 301.

C. Provide concrete to the following criteria:

D. For all concrete shown on structural drawings:

1. See Concrete Notes on S-001.

E. For all miscellaneous concrete not shown on structural drawings:

1. See Concrete Notes on S-001.

F. Admixtures: Include admixture types and quantities approved through the submittal process.

1. Use accelerating admixtures in cold weather only when approved by the Engineer. Use of admixtures will not relax cold weather placement requirements.

2. Do not use calcium chloride nor admixtures containing calcium chloride.

3. Use set retarding admixtures during hot weather only when approved by the Engineer.

4. Add air entrainment admixture to concrete mix for work exposed to exterior.

G. Evaporation Retardant:

1. Provide to retard rapid evaporation of water from fresh exposed concrete.

2. Fluorescent color tint which shall disappear completely upon drying is optional.

3. Manufacturers:

a. Master Builders Co., Cleveland, OH, Confilm or Confilm LL-898.

b. Evelid Chemical Co., Cleveland, OH, Eucobar.

c. Or approved equal.

PART 3 EXECUTION

3.01. FORMWORK ERECTION

A. Erect formwork, shoring, and bracing to achieve design requirements. Use new materials for all formwork.

B. Camber slabs and framing to achieve ACI 301 tolerances.

C. Provide bracing to ensure stability of formwork.

D. Form external corners of equipment pads with 3/4 inch chamfer.

E. Apply form release agent to formwork prior to placing form accessories and reinforcement.

F. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings affected by agent.

G. Clean forms as erection proceeds, to remove foreign matter.

3.02. INSERTS, EMBEDDED COMPONENTS, AND OPENINGS

A. Provide formed openings where required for work to be embedded in and passing through concrete members.

B. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

C. Install concrete accessories straight, level, and plumb.

3.03. REINFORCEMENT PLACEMENT

A. Place reinforcement, supported and secured against displacement.

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

C. Weld reinforcement in accordance with AWS D1.4.

1. Do not weld crossing reinforcement bars for assembly except as permitted by Architect/Engineer.

D. Space reinforcement bars with minimum clear spacing in accordance with ACI 318.

E. Maintain concrete cover around reinforcement in accordance with ACI 318.

3.04. EXAMINATION

A. Verify requirements for concrete cover over reinforcement.

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

3.05. PREPARATION

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

B. 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.

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

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

3.06. PLACING CONCRETE

A. Place concrete in accordance with ACI 301.

B. Notify testing laboratory minimum 48 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints, and anchor bolts are not disturbed during concrete placement.

D. Install vapor retarder under interior slabs on grade in accordance with ASTM E1643. Lap joints minimum 6 inches and seal watertight in accordance with manufacturer’s recommendations.

E. Repair vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight in accordance with manufacturer’s recommendations.

F. Separate slabs on grade from vertical surfaces with 1/4 inch thick joint filler.

G. Deposit concrete at final position. Prevent segregation of mix.

H. Place concrete in continuous operation for each panel or section determined by predetermined joints.

I. Do not interrupt successive placement: do not permit cold joints to occur.

J. Consolidate concrete.

K. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

L. Saw cut joints within 12 hours after placing. Saw cut joints as soon as concrete surface is firm enough not to be torn or damaged by blade and before random shrinkage cracks can form. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.

M. Screed slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 ft.

3.07. CONCRETE FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1.

B. Steel trowel surfaces which are indicated to be exposed.

C. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

3.08. CURING AND PROTECTION

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

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure slab surfaces in accordance with ACI 301.

3.09. FIELD QUALITY CONTROL

A. Field inspection and testing will be performed by Contractor’s testing laboratory in accordance with ACI 301 and under provisions of General Conditions.

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: ASTM C172.

2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, field cured.

3. Sample concrete and make one set of four 4” x 8” cylinders for every 100 cu yds or less of each class of concrete placed each day and for every 5,000 sf of surface area for slabs and walls.

4. When volume of concrete for any class of concrete would provide less than 5 sets of cylinders, take samples from five randomly selected batches, or from every batch when less than 5 batches are used.

5. Make one additional cylinder during cold weather concreting, and field cure.

E. Field Testing:

1. Slump Test Method: ASTM C143/C143M.

2. Air Content Test Method: ASTM C173/C173M.

3. Temperature Test Method: ASTM C1064/C1064M.

4. Measure slump and temperature for each compressive strength concrete sample.

5. Measure air content in air entrained concrete for each compressive strength concrete sample.

F. Cylinder Compressive Strength Testing:

1. Test Method: ASTM C39/C39M.

2. Test Acceptance: In accordance with ACI 318.

3. Test one cylinder at 7 days.

4. Test three cylinders at 28 days.

5. Retain one for testing when requested by Engineer.

6. Dispose remaining cylinders when testing is not required.

G. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.10. PATCHING

A. Allow Engineer to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.

C. Patch imperfections in accordance with ACI 301.

3.11. DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by Engineer.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

END OF SECTION

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SECTION 03 60 00

GROUT

PART 1 GENERAL

1.1 SUMMARY OF SECTION

A. The principal items specified herein are:
   1. Non-Shrink Grout: Non-Shrink grout is to be used unless another type is specifically referenced or as shown on the Drawings.
   2. Epoxy Grout
   3. Cement Grout

B. The Contractor shall provide all materials, equipment, and labor necessary to furnish and place grout and shall form, mix, place, cure, repair, finish, and do all other work as necessary to produce finished grout as shown on the Drawings and as specified herein.

1.2 MEASUREMENT AND PAYMENT

A. Measurement and payment for the placement of grout shall be included in the bid item to which it relates. No separate measurement or payment shall be made for the requirements of this section.

1.3 REFERENCED CODES AND SPECIFICATIONS

The following standards apply:

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

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00 Shop Drawings & Submittals:

A. The CONTRACTOR shall submit manufacturer's literature containing instructions and recommendations on the mixing, handling, placement and appropriate uses for each type of non-shrink and epoxy grout used in the WORK.

PART 2 PRODUCTS

2.1 PREPACKAGED GROUTS

A. Non-Shrink Grout:
   1. Non-shrink grout shall be a prepackaged, inorganic, non-gas-liberating, non-metallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout specified herein shall be that recommended by the manufacturer for the particular application.
   2. Non-shrink grouts shall have a minimum 28-day compressive strength of 5,000 psi; shall have no shrinkage (zero percent) and a maximum 4.0 percent expansion in the plastic state when tested in accordance with ASTM C 827; and shall have no shrinkage (zero percent) and a maximum of 0.2-percent expansion in the hardened state when tested in accordance with CRD C 621.
   3. Application: Non-shrink grout shall be used for the repair of all holes and defects in concrete members, and at all locations where non-shrink grout is specified.

B. Epoxy Grout:
   1. Epoxy grout shall be a pourable, non-shrink, 100-percent solids system. The epoxy grout system shall have 3 components: resin, hardener, and specially blended aggregate, all premeasured and prepackaged. The resin component shall not contain any non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are not acceptable. Variation of component ratios is not permitted unless specifically recommended by the manufacturer. Manufacturer's instructions shall be printed on each container in which the materials are packaged.
   2. The chemical formulation of the epoxy grout shall be that recommended by the manufacturer for the particular application.
   3. The mixed epoxy grout system shall have a minimum working life of 45 minutes at 75 degrees F.
   4. The epoxy grout shall develop a compressive strength of 5000 psi in 24 hours and 10,000 psi in 7 days when tested in accordance with ASTM C 579, Method B. There shall be no shrinkage (zero percent) and a maximum 4.0 percent expansion when tested in accordance with ASTM C 827.
   5. Application: Epoxy grout shall be used to embed all anchor bolts and reinforcing steel required to be set in grout, and for all other applications required in the Contract Documents.

2.2 CONSISTENCY

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

2.3 MEASUREMENT OF INGREDIENTS

A. Measurements for cement grout shall be made accurately by volume using appropriate containers. Shovel measurement will not be allowed.

B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

PART 3 EXECUTION

3.1 GENERAL

A. Where grout is to be placed against old concrete (any concrete which is greater than sixty (60) day of age), the surface of the old concrete shall be thoroughly cleaned and roughened.

B. Surfaces shall be thoroughly wetted by sprinkling prior to the placing of any grout, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing grout thereon. The surface shall be free from standing water, mud, and debris at the time of placing grout.

C. Base concrete shall have attained its design strength before grout is placed, unless otherwise authorized by the Engineer.

D. The surfaces of all metalwork to be in contact with grout shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the grout is placed.

E. All inserts or other embedded items shall conform to the requirements contained on the plans or in these specifications.

F. All reinforcement, anchor bolts, sleeves, inserts, and similar items shall be set and secured where shown on the Project Drawings or by shop drawings or as required to support work floors or other items required in the work, and shall be acceptable to the Engineer before any grout is placed. Accuracy of placement is the responsibility of the Contractor.

G. No grout shall be placed until all water entering the space to be filled with grout has been properly cut off or has been diverted, and carried clear of the work. No grout shall be deposited underwater nor shall the Contractor allow still water to rise on any grout until the grout has attained its initial set. Water shall not be permitted to flow over the surface of any grout in such manner and at such velocity as will injure the surface finish or setting of the grout.

H. Corrosion Protection: Anchor bolts, pipe, dowels, and other ferrous items required to be embedded in concrete and grouted around, shall be so positioned and supported prior to placement of grout that there will be a minimum of two (2) inches clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding them to the reinforcement will not be permitted.

I. Anchor bolts shall be accurately set and shall be maintained in position by templates while being embedded in concrete.

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

K. The finish of the grout surface shall match that of the adjacent concrete.

3.2 CONSOLIDATION

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

END OF SECTION

SECTION 04 05 03

MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.01. SUMMARY

A. Section includes mortar and grout for masonry.

B. Related Sections:

1. Section 01 30 00 Administrative Requirements
2. Section 01 33 00 Submittals
3. Section 01 40 00 Quality Requirements
4. Section 04 20 00 Unit Masonry: Installation of mortar and grout.

1.02. REFERENCES

A. American Concrete Institute:

1. ACI 530 - Building Code Requirements for Masonry Structures.
2. ACI 530.1 - Specifications for Masonry Structures.

B. ASTM International:

1. ASTM C5 - Standard Specification for Quicklime for Structural Purposes.
2. ASTM C91 - Standard Specification for Masonry Cement.
3. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
4. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
5. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
6. ASTM C150 - Standard Specification for Portland Cement.
7. ASTM C199 - Standard Test Method for Pier Test for Refractory Mortars.
8. ASTM C206 - Standard Specification for Finishing Hydrated Lime.
9. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
10. ASTM C387/C387M - Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
11. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.

12. ASTM C476 - Standard Specification for Grout for Masonry.

13. ASTM C595 - Standard Specification for Blended Hydraulic Cements.

14. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

15. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.

16. ASTM C1142 - Standard Specification for Extended Life Mortar for Unit Masonry.

17. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms.

18. ASTM C1329 - Standard Specification for Mortar Cement.

19. ASTM C1357 - Standard Test Method for Evaluating Masonry Bond Strength.

1.03. SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal requirements.

B. Design Data: Submit design mix when Property specification of ASTM C270 is to be used, required environmental conditions, and admixture limitations.

C. Test Reports:

1. Submit reports on mortar indicating conformance of mortar to property requirements of ASTM C270 and compressive strength.

2. Submit reports on grout indicating conformance of grout to property requirements of ASTM C476.

D. Manufacturer's Installation Instructions: Submit premix mortar manufacturer's installation instructions.

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

1.04. QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 and ACI 530.1.

1.05. ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F.

B. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than eight (8) mph.

PART 2 PRODUCTS

2.01. COMPONENTS

A. Masonry Cement: ASTM C91, Type S.

B. Mortar Aggregate: ASTM C144, standard masonry type.

C. Grout Aggregate: ASTM C404, fine and coarse.

D. Water: Clean and potable.

E. Calcium chloride is not permitted.

2.02. MIXES

A. Mortar Mixes:

1. Mortar for Structural Masonry: ASTM C270, Type S using proportion specifications.

2. 2,000 psi strength at 28 days.

B. Mortar Mixing:

1. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.

2. Achieve uniformly damp sand immediately before mixing process.

3. Re-temper only within two hours of mixing.

C. Grout Mixes:

1. 2,000 psi strength at 28 days; eight (8) to eleven (11) inches slump; mixed in accordance with ASTM C476 Fine or Coarse grout.

2. Do not use admixtures unless approved by the Engineer.

3. Do not use anti-freeze compounds to lower freezing point of grout.

D. Grout Mixing - Either of the following may be used:

1. Mix grout in accordance with ASTM C94/C94M modified to use ingredients complying with ASTM C476.

2. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476.

PART 3 EXECUTION

3.01. EXAMINATION

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

B. Request inspection of spaces to be grouted.

3.02. INSTALLATION

A. Install mortar and grout in accordance with ACI 530.1 Specifications for Masonry Structures.

B. Grouting Technique: At the contractor's option, use either low-lift or high-lift grouting in accordance with ACI 530.1 Specifications for Masonry Structures.

3.03. FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Testing Frequency: In accordance with TMS 602-16, test masonry by unit strength method for every 5,000 sf of completed wall area.

C. Testing of Mortar Mix: In accordance with ASTM C780 for aggregate ratio, water content, and compressive strength.

D. Testing of Grout Mix: In accordance with ASTM C1019 for compressive strength, and in accordance with ASTM C143/C143M for slump.

END OF SECTION

SECTION 04 20 00

UNIT MASONRY

PART 1 GENERAL

1.01. SUMMARY

A. Section includes concrete masonry units, reinforcement, anchorage, and accessories.

B. Related Sections:

1. Section 01 30 00 Administrative Requirements

2. Section 01 33 00 Submittals

3. Section 04 05 03 Masonry Mortaring and Grouting: Mortar and grout.

1.02. REFERENCES

A. American Concrete Institute:

1. ACI 530 - Building Code Requirements for Masonry Structures.

2. ACI 530.1 - Specifications for Masonry Structures.

B. ASTM International:

1. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

2. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.

3. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

4. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.

5. ASTM C140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.

1.03. PERFORMANCE REQUIREMENTS

A. Concrete Masonry Compressive Strength (f'm): 1,500 psi; determined by unit strength method.

1. Concrete Masonry Units: 2000 psi minimum net area compressive strength.

1.04. SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal requirements.

B. Product Data:

1. Submit data for concrete masonry units and other accessories.

1.05. QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 Building Code Requirements for Masonry Structures and ACI 530.1 Specification for Masonry Structures.

1.06. QUALIFICATIONS

A. Installer: Company specializing in performing Work of this section with minimum three years' experience.

1.07. ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than forty (40) degrees F.

B. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than ninety (90) degrees F with wind velocity greater than eight (8) mph.

1.08. COORDINATION

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

B. Coordinate masonry work with installation of doors and louvers.

PART 2 PRODUCTS

2.01. COMPONENTS

A. Hollow Load Bearing Concrete Masonry Units (CMU): ASTM C90; normal weight.

B. Concrete Masonry Unit Size and Shape: Nominal modular size of 8x8x16 inches. Furnish special units 90 degree corners, bond beams, and lintels.

C. Color: Tan. Submit color sample to owner for approval prior to construction.

D. Type: Split face.

2.02. ACCESSORIES

A. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade, deformed billet bars, uncoated finish.

B. Anchor Rods: ASTM A307; Grade C; J-shaped or L-shaped; complete with washers and heavy hex nuts; sized for minimum fifteen (15) inch embedment; galvanized finish.

1. Hot-Dipped Galvanizing: ASTM A153/A153M.

C. Mortar and Grout: As specified in Section 04 05 03.

D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials, recommended by masonry unit manufacturer.

PART 3 EXECUTION

3.01. EXAMINATION

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

B. Verify field conditions are acceptable and are ready to receive work.

C. Verify items provided by other sections of work are properly sized and located.

D. Verify built-in items are in proper location, and ready for roughing into masonry work.

3.02. PREPARATION

A. Direct and coordinate placement of metal anchors supplied to other sections.

B. Furnish temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent support.

3.03. INSTALLATION

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form bed and head joints of uniform thickness.

C. Coursing of Concrete Masonry Units:

1. Bond: Running.

2. Coursing: One unit and one mortar joint to equal 8 inches.

3. Mortar Joints: Concave.

D. Placing And Bonding:

1. Lay hollow masonry units with face shell bedding on head and bed joints.

2. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.

3. Remove excess mortar as work progresses.

4. Interlock intersections and external corners.

5. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment is required, remove mortar and replace.

6. Perform job site cutting of masonry units with proper tools to assure straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

E. Grouted Components:

1. Lap splices bar diameters required by code.

2. Support and secure reinforcing bars from displacement.

3. Place and consolidate grout fill without displacing reinforcing.

F. Reinforced Masonry:

1. Lay masonry units with cells vertically aligned and cavities between wythes clear of mortar and unobstructed.

2. Place reinforcement bars as indicated on Drawings.

3. Support and secure reinforcement from displacement.

4. Place and consolidate grout fill without displacing reinforcing.

5. Place grout in accordance with ACI 530.1 Specification for Masonry Structures.

G. Control Joints:

1. Install control joints where indicated on Drawings:

2. Do not continue horizontal joint reinforcement through control joints.

3. Form control joint with sheet building paper bond breaker fitted to one side of hollow contour end of block unit. Fill resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.

H. Built-In Work:

1. As work progresses, install built-in metal door frames, and other items to be built-in the work and furnished by other sections.

2. Install built-in items plumb and level.

3. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout or mortar.

4. Do not build in materials subject to deterioration.

I. Cutting And Fitting:

1. Cut and fit for pipes and gable end roof slope. Coordinate with other sections of work to provide correct size, shape, and location.

2. Obtain Engineer’s approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.04. ERECTION TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

E. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.

F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

G. Maximum Variation for Steel Reinforcement:

1. Install reinforcement within the tolerances specified in ACI 530.1 for foundation walls.

2. Plus or minus 1/2 inch when distance from centerline of steel to opposite face of masonry is 8 inches or less.

3. Plus or minus 1 inch when distance is between 8 and 24 inches.

4. Plus or minus 1-1/4 inch when distance is greater than 24 inches.

5. Plus or minus 2 inches from location along face of wall.

3.05. FIELD QUALITY CONTROL

A. Concrete Masonry Units: Test each type in accordance with ASTM C140.

3.06. CLEANING

A. Remove excess mortar and mortar smears as work progresses.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.07. PROTECTION OF FINISHED WORK

A. Protect exposed external corners subject to damage.

B. Protect base of walls from mud and mortar splatter.

C. Protect masonry and other items built into masonry walls from mortar droppings and staining caused by mortar.

D. Protect tops of masonry work with waterproof coverings secured in place without damaging masonry. Provide coverings where masonry is exposed to weather when work is not in progress.

END OF SECTION

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SECTION 22 05 18

ESCUTCHEONS FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Escutcheons.
   2. Floor plates.

1.2 ACTION SUBMITTALS

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

PART 2 PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
   1. Escutcheons for New Piping:
      a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
      b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
      c. Insulated Piping: One-piece, stamped-steel type.
      d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
      e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
      f. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
      g. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
   1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 22 05 23

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Brass ball valves.
2. Bronze ball valves.

B. Related Sections:
1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
2. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

1.3 QUALITY ASSURANCE

A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

B. NSF Compliance: NSF 61 for valve materials for potable-water service.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:
1. Hand Lever: For quarter-turn valves NPS 6 and smaller.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

F. Valve-End Connections:
1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:
   1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:
      a. Crane Co.; Crane Valve Group; Crane Valves.
      b. Hammond Valve.
      c. NIBCO INC.
      d. Red-White Valve Corporation.
      e. Approved equal.
   2. Description:
      a. Standard: MSS SP-110.
      b. SWP Rating: 150 psig.
      c. CWP Rating: 600 psig.
      d. Body Design: Two piece.
      e. Body Material: Forged brass.
      f. Ends: Threaded.
      g. Seats: PTFE or TFE.
      h. Stem: Brass.
      i. Ball: Chrome-plated brass.
      j. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:
   1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:
      a. Crane Co.; Crane Valve Group; Crane Valves.
      b. NIBCO INC.
      c. Red-White Valve Corporation.
      d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
      e. Approved equal.
   2. Description:
      a. Standard: MSS SP-110.
      b. SWP Rating: 150 psig.
      c. CWP Rating: 600 psig.
      d. Body Design: Two piece.
      e. Body Material: Bronze.
      f. Ends: Threaded.
      g. Seats: PTFE or TFE.
      h. Stem: Bronze.
      i. Ball: Chrome-plated brass.
      j. Port: Full.

PART 3 EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

3.2 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:
   1. Shutoff Service: Ball valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:
   1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

3.4 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:
   1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
   2. Ball Valves: Two piece, full port, bronze with bronze trim.

END OF SECTION

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fastener systems.
4. Pipe positioning systems.
5. Equipment supports.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:
1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:
1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:
1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.3 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.4 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.5 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
   1. Properties: Non-staining, noncorrosive, and nongaseous.
   2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Fastener System Installation:
   1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
   2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

C. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

D. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

E. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

G. Install lateral bracing with pipe hangers and supports to prevent swaying.

H. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, 2-1/2 in and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

K. Insulated Piping:
   1. Attach clamps and spacers to piping.
      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
      b. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
   2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   4. Shield Dimensions for Pipe: Not less than the following:
      a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
      b. NPS 4: 12 inches long and 0.06 inch thick.
      c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 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 a 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 A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.

G. Use copper-plated pipe hangers and stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes ½ in to 30 in.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes 4 in to 24 in, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes ¾ in to 36 in, requiring clamp flexibility and up to 4 inches of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated, stationary pipes ½ in to 8 in.
5. U-Bolts (MSS Type 24): For support of heavy pipes ½ in to 30 in.
6. Pipe Saddle Supports (MSS Type 36): For support of pipes 4 in to 36 in, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes 4 in to 36 in, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes 1 in to 30 in, from two rods if longitudinal movement caused by expansion and contraction might occur.
9. Complete Pipe Rolls (MSS Type 44): For support of pipes 2 in to 42 in if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers ¾ in to 24 in.
   2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers ¾ in to 24 in if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
   2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
   2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
   3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
   4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
   5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
   6. C-Clamps (MSS Type 23): For structural shapes.
   7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
      a. Light (MSS Type 31): 750 lb.
      b. Medium (MSS Type 32): 1500 lb.
      c. Heavy (MSS Type 33): 3000 lb.
   8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
   9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
   2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
   3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.2 ACTION SUBMITTAL

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

PART 2 PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:
1. Material and Thickness: Aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pre-tensioned Pipe Labels: Pre-coiled, semi-rigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
   1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
   2. Lettering Size: At least 1-1/2 inches high.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment and piping / venting system.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
   1. Near each valve and control device.
   2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
   3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
   4. At access doors, manholes, and similar access points that permit view of concealed piping.
   5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 20 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:
   1. Domestic Cold and Hot Water Piping:
      a. Background Color: White.
      b. Letter Color: Black.
   2. Condensate Drain Piping:
      a. Background Color: White.
      b. Letter Color: Black

END OF SECTION

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SECTION 26 05 00

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes equipment grounding conductors; bonding methods and materials; conduit and equipment supports; anchors and fasteners; nameplates and labels; and wire markers.

1.2 REFERENCES

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

B. NETA ATS (International Electrical Testing Association) – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

C. IEEE 142 (Institute of Electrical and Electronics Engineers) - Recommended Practice for Grounding of Industrial and Commercial Power Systems.

D. NFPA 70 - National Electrical Code (NEC).

E. ASTM B 8 - Specifications for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

F. ASTM B 187 - Specifications for Copper Bus, Rod, and Shapes.

G. UL 83 - Thermoplastic-Insulated Wires and Cables.

H. UL 467 - Electrical Grounding and Bonding Equipment.

1.3 SYSTEM DESCRIPTION

A. Anchor and fasten electrical products to building elements and finishes as follows:
   1. Concrete Structural Elements: Provide preset inserts.
   2. Concrete Surfaces: Provide expansion anchors.
   3. Solid Masonry Walls: Use expansion anchors and preset inserts.

B. Identify electrical components as follows:
   1. Nameplate for each electrical distribution and control equipment enclosure.
   2. Label for identification of individual wall switches and receptacles, control device stations, and equipment.
   3. Wire marker for each conductor at panelboard gutters; pull boxes; and each load connection.

1.4 DESIGN REQUIREMENTS

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

B. Grounding shall be in accordance with the National Electrical Code (NEC). Where size, type, rating and quantities indicated or specified are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

C. Select materials, sizes, and types of anchors, fasteners, and supports to carry loads of equipment and raceway, including weight of wire and cable in raceway.

1.5 SUBMITTALS

A. Submit all product data, shop drawings, laboratory test results, material source information, and certificates of compliance listed in this Section under a single submittal cover for review. Incomplete submittals will not be reviewed.

B. Product Data: Submit grounding electrodes and connections for fastening components and nameplates, labels, and markers.

1.6 CLOSEOUT SUBMITTALS

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

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' experience.

B. Installer: A firm with at least five years of successful installation experience on projects with electrical grounding work similar to that required for this project.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 GROUNDING SYSTEM

A. Except as otherwise indicated, provide for each electrical ground indicated, an assembly of materials, including, but not necessarily limited to, cable/wire, connectors, terminals (solderless lugs), bonding jumper braid, and other items and accessories needed for a complete installation. Where more than one type meets indicated requirements, selection is Contractor's option. Where materials or components are not otherwise indicated, provide products as recommended by the

accessories manufacturers and in compliance with the NEC, and established industry standards.

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

2.2 WIRE

A. Electrical Equipment Grounding Conductor: Insulated, soft-drawn copper, Class B stranding or solid, with green-colored polyvinyl chloride insulation, UL 83, sized according to the NEC, unless otherwise noted.

2.3 MECHANICAL CONNECTORS

A. Description: Bolt-on bronze connectors, suitable for grounding and bonding applications in configurations required for the particular installation.

2.4 ANCHORS AND FASTENERS

A. Materials and Finishes: Corrosion resistant.

2.5 FORMED STEEL CHANNEL

A. Description: Stainless steel.

2.6 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, white letters on black background.

B. Letter Size:
1. 1/8-inch (3 mm) letters for identifying individual equipment and loads.
2. 1/4-inch (6 mm) letters for identifying grouped equipment and loads.

C. Labels: Embossed adhesive tape, with 3/16-inch white letters on black background.

2.7 WIRE MARKERS

A. Description: Cloth tape, split sleeve, or tubing-type wire markers.

B. Legend:
1. Power Circuits: Branch circuit or feeder number as indicated on Drawings.
2. Control Circuits: Control wire number as indicated on shop drawings.

PART 3 EXECUTION

3.1 EXISTING WORK

A. Perform work on energized equipment or circuits with experienced and trained personnel.

B. Remove, relocate, and extend existing installations to accommodate new construction.

3.2 GROUNDING AND BONDING INSTALLATION:

A. Installation:
   1. Remove paint, rust, mill-oils, and surface contaminants at connection points.
   2. Bond together each metallic raceway, pipe, duct and other metal object entering enclosures and exiting slabs. Install minimum # 12 AWG bare copper conductor.
   3. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
   4. Permanently ground entire electrical system in accordance with NEC, including service equipment, distribution panels, lighting panel boards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.
   5. Permanently attach equipment and grounding conductors prior to energizing equipment.

3.3 GROUND CONDUCTORS

A. Grounding conductors shall be located and connected as indicated on drawings.

B. Exposed conductors shall be installed inconspicuously in vertical or horizontal positions on supporting structures. When located on irregular supporting surfaces or equipment, the conductors shall run parallel to or normal to dominant surfaces.

C. Conductors routed over concrete, steel, or equipment surfaces shall be kept in close contact with those surfaces by using fasteners located at intervals not to exceed 3 feet.

D. Provide a separate equipment-grounding conductor for low voltage distribution systems, single or three phase feeder circuit and each branch circuit with single or three phase protective devices. Install a grounding conductor in conduit with phase and neutral conductors. Single-phase branch circuits for 120 and 277 volt lighting, receptacles, and motors shall have a phase, neutral, and ground conductors installed in the common conduit. Provide suitable bonding jumpers and approved grounding type bushings for flexible conduits used for equipment connection utilized in conjunction with the above branch circuits with. Single-phase circuits for equipment and all branch circuits installed in non-metallic or flexible conduits shall be provided with a separate grounding conductor.

3.4 CONDUIT GROUNDING

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

3.5 EQUIPMENT GROUNDING

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

B. Install equipment grounding system such that all metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment and other conductive items in close proximity with electrical circuits will operate continuously at ground potential and provide a low impedance path for possible ground fault currents. The system shall comply with the NEC, Table 250-95.

C. Where grounding system extension stingers are indicated on the drawings to be provided for connection to electrical equipment, connect the bare grounding conductor to the equipment ground bus, pad, or lug. Except where otherwise indicated on the drawings, all equipment ground conductors that are not an integral part of a cable assembly, shall be sized in accordance with the requirements of NEC. All ground conductors installed in metallic conduit shall be insulated.

D. Suitable grounding facilities, acceptable to the Owner, shall be furnished on electrical equipment not so equipped. The grounding facilities shall consist of compression type terminal connectors bolted to the equipment frame or enclosure and providing a minimum of joint resistance.

3.6 ANCHORS, FASTENERS AND SUPPORT

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

B. Supports:
   1. Fabricate supports from structural steel or formed steel members. Rigidly weld members or install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
   2. Install surface-mounted cabinets and panel board with minimum of four anchors.

3. In wet and damp locations use steel channel supports to stand cabinets and panel boards 1-inch off wall.

3.7 IDENTIFICATION OF COMPONENTS

A. Installation:
   1. Degrease and clean surfaces to receive nameplates and labels.
   2. Install nameplate and label parallel to equipment lines.
   3. Secure nameplate to equipment front using screws, rivets or adhesive.

3.8 ACCEPTANCE TESTING

A. Grounding and Bonding: Perform inspections and tests in accordance with NETA ATS.

END OF SECTION

SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes building 600 volt wire and cable, instrumentation cable, control cable, wiring connectors and connections.

1.2 REFERENCES

A. NECA (National Electrical Contractors Association) - Standard of Installation.

B. NETA ATS (International Electrical Testing Association) - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

C. ANSI/NFPA 70 - National Electrical Code

1.3 DESCRIPTION OF WORK

A. The requirements of this section apply to cable and wires specified on the drawings and in these specifications. The extent of electrical wire and cable work is indicated on drawings and schedules, and by the requirements of this section. The applications for cable, wire and connectors required, but not limited to, are as follows:
   1. Power distribution circuitry.
   2. Lighting circuitry.
   3. Equipment circuitry.
   4. Wiring for motors of mechanical equipment.

B. Conductor sizes are based on copper. Wire and cable routing shown on drawings is diagrammatic unless dimensioned. Route wire and cable as required for project conditions. Support raceway and cables in accordance with other sections of these specifications.

1.4 REGULATORY REQUIREMENTS

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

1.5 SUBMITTALS

A. Submit all product data, shop drawings, laboratory test results, material source information, and certificates of compliance listed in this Section under a single submittal cover for review. Incomplete submittals will not be reviewed.

B. Product Data: Submit manufacturer’s catalog cuts and technical data for building wire and cables.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of components and circuits.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years' experience.

1.8 FIELD MEASUREMENTS

A. Verify field measurements as indicated on drawings.

1.9 COORDINATION

A. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

B. Wire and cable routing indicated is approximate unless dimensioned. Include wire and cable lengths within 10 feet of length shown.

PART 2 PRODUCTS

2.1 BUILDING WIRE AND CABLE

A. Building wire and cable shall be insulated, single conductor, copper, stranded, rated for 600-volts AC. The insulation shall be thermoplastic material rated for 90 degrees Celsius dry locations, 75 degrees Celsius wet locations, THHN/THWN, RHW or XHHW, per ANSI/NFPA 70.

B. For Interior Dry Location: Use only building wire, THHN/THWN insulation, in raceway.

C. For Exterior Wet or Dry Locations: Use only building wire, THHN/THWN insulation, in raceway.

D. For Underground Dry or Wet Locations: Use only RHW or XHHW insulation in raceway.

2.2 INSTRUMENTATION CABLE

A. Instrumentation cables for field mounted equipment and devices shall be minimum two (2) conductor No. 16 AWG, tin-coated copper, stranded, shielded twisted pair, 80 degree Celsius, PVC insulation foil shield with overall heavy duty polyethylene jacketing, rated for 600-volt AC, Belden No. 9342, General Cable No. C2536, or approved equal.

B. Control cables to field mounted equipment and devices shall be a single conductor, insulated, No. 12 AWG minimum, copper, solid or stranded, rated for 600-volts AC. The insulation shall be thermoplastic material rated for 90 degrees

Celsius dry locations, 75 degrees Celsius wet locations, THHN/THWN or XHHW, per ANSI/NFPA 70 and compliant with UL 83.

C. Multi-conductor control cables for field mounted equipment and devices shall consist of several single conductor, insulated No. 12 AWG minimum, copper, solid or stranded, rated for 600-volts AC with an overall protective PVC jacket. The insulation shall be thermoplastic material rated for 90 degrees Celsius dry locations, 75 degrees Celsius wet locations, THHN/THWN or XHHW, per ANSI/NFPA 70 and compliant with UL 83. Circuit identification shall consist of Method 1 - color coding in accordance with ICEA S-66-524, Appendix K Table K-2.

D. Instrumentation and control cable connected to equipment or devices within control panels shall be sized per requirements of equipment manufacturer (minimum #16 AWG).

2.3 WIRE COLOR CODE

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

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

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that mechanical work likely to damage wire and cable has been completed.

B. Verify that raceway installation is complete and supported.

3.2 PREPARATION

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

3.3 EXISTING WORK

A. Extend existing circuits using materials and methods and compatible with existing electrical installations, or as otherwise specified.

B. Remove all unused and abandoned signal and control wiring from end to end.

3.4 INSTALLATION

A. General:
1. Install wire and cable in accordance with manufacturer's instructions and NECA “Standard of Installation”.
2. Route wire and cable as required for project conditions.
3. Identify and color code wire and cable. Identify each conductor with its circuit number or other designation indicated.
4. Protect exposed cable from damage.
5. Pull all conductors into raceway at same time.
6. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
7. Support cables above accessible ceiling using standard support methods to support cables from structure. Do not rest cable on ceiling panels.
8. Neatly train and lace wiring inside boxes, equipment, and panelboards

B. Cable and Wire Size:
1. Use conductor not smaller than 12 AWG for power and lighting circuits.
2. Use conductor not smaller than 14 AWG for control circuits.
3. Use 10 AWG conductors for 20 ampere, 120-volt branch circuits longer than 75 feet.
4. Use 10 AWG conductors for 20 ampere, 277-volt branch circuits longer than 200 feet.
5. Use stranded conductor for all equipment, branch and control circuits.

C. Special Techniques - Wiring Connections:
1. Clean conductor surfaces before installing lugs and connectors. Where an anti-oxidation lubricant is used, apply liberally, coating all exposed conductor surfaces.
2. Use suitable cable fittings and connectors.
3. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
4. Tape un-insulated conductors and connector with two layers of half-lapped rubber insulating compound tape and two layers of half-lapped, 7-mil electrical tape, Scotch 33+, or equal.
5. Use split bolt connectors for copper conductor splices and taps, 8 AWG and larger.
6. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
7. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

8. Stranded conductors for control circuits shall have fork or ring terminals crimped on for all device terminations. Bare stranded conductors shall not be placed directly under the screws.

3.5 FIELD QUALITY CONTROL

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

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

C. Test Values
   1. Compare bolted connection resistance to values of similar connections.
   2. Bolt-torque levels should be in accordance with NETA ATS Table 10.12 unless otherwise specified by the manufacturer.
   3. Minimum insulation-resistance values should not be less than 50 meg-ohms.
   4. Investigate deviations between adjacent phases.

END OF SECTION

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SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01. SUMMARY

A. This section includes grounding electrodes and conductors; equipment grounding fasteners; sealing and fireproofing of sleeves and openings between conduits and wall.

1.02. REFERENCES SPECIFICATIONS, CODES AND STANDARDS

A. The standards referred to, except as modified in the Contract Documents, shall have full force and effect as though printed in these Specifications. These standards are not furnished to the Contactor since manufacturers and trades involved are assumed to be familiar with their requirements. The Contractor shall obtain copies of reference standards direct from publication sources as needed for proper performance and completion of the work.

B. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.

C. NECA - Standard of Installation.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

E. NFPA 70 - National Electrical Code (NEC). Latest edition.

F. UL 467 - Electrical Grounding and Bonding Equipment.

1.03. SYSTEM DESCRIPTION

A. Grounding electrode system consists of the following elements:

1. Metal underground water pipe
2. Metal frame of the building
3. Concrete encased electrode
4. Rod electrodes
5. Service equipment
6. Enclosures
7. Separately derived systems.

B. Anchor and fasten electrical products to building elements and finishes as follows:

1. Concrete Structural Elements: Provide preset inserts.

2. Concrete Surfaces: Provide expansion anchors.

3. Interior Structural Steel: Provide appropriate size beam clamps.

4. Solid Masonry Walls: Use expansion anchors and preset inserts.

5. Sheet Metal: Provide sheet metal screws.

1.04. DESIGN REQUIREMENTS

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

B. Grounding shall be in accordance with the National Electrical Code (NEC). Where size, type, rating and quantities indicated or specified are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

C. Select materials, sizes, and types of anchors, fasteners, and supports to carry at least twice the loads of equipment and raceway, including weight of wire and cable in raceway.

1.05. CONTRACTOR SUBMITTALS

A. Product Data: Submit grounding electrodes and connections for fastening components.

B. Test Report: Measure overall resistance to ground. Provide certified test report for Owner’s Review.

1.06. CLOSEOUT SUBMITTALS

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

1.07. QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years’ experience.

B. Installer: A firm with at least five years of successful installation experience on projects with electrical grounding work similar to that required for this project.

1.08. FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01. GROUNDING SYSTEM

A. Except as otherwise indicated, provide for each electrical grounding indicated, an assembly of materials, including, but not necessarily limited to, cable/wire, connectors, terminals (solderless lugs), grounding rods/electrodes, bonding jumper braid, and other items and accessories needed for a complete installation. Where more than one type meets indicated requirements, selection is Installer's option. Where materials or components are not otherwise indicated, provide products as recommended by the accessories manufacturers and in compliance with the NEC, and established industry standards.

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

2.02. WIRE

A. Service Equipment Grounding Electrode Conductor: Bare, soft-drawn copper, Class AA stranding, ASTM B 8. Size per the NEC, Article 250, unless otherwise noted.

B. Electrical Equipment Grounding Conductor: Insulated, soft-drawn copper, Class B stranding or solid, with green-colored polyvinyl chloride insulation, UL 83, sized according to the NEC, unless otherwise noted.

2.03. MECHANICAL CONNECTORS

A. Description: Bolt-on bronze connectors, suitable for grounding and bonding applications in configurations required for the particular installation.

B. Manufacturer

1. Burndy Corp.
2. Anderson
3. Thomas & Betts
4. 3-M Co.

2.04. BONDING PLATES, CONNECTIONS, TERMINALS AND CLAMPS

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

2.05. UFER GROUND

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

2.06. ROD ELECTRODES

A. Material: Copper

B. Diameter: 5/8-inch (16 mm)

C. Length: 10 feet (3,000 mm)

2.07. GROUNDING WELL COMPONENTS

A. Well Pipe: 8 inches NPS (DN200) by maximum 12 inches (300-mm) long, concrete or fiberglass pipe with belled end.

B. Well Cover: Cast iron with legend "GROUND" embossed on cover.

2.08. ANCHORS AND FASTENERS

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

2.09. FORMED STEEL CHANNEL

A. Manufacturers:

1. Unistrut
2. Kindorf
3. Superstrut
4. B-Line
5. Approved Equal

B. Description: Galvanized steel.

2.10. SEALING AND FIREPROOFING

A. Fire and Smoke Rated Surfaces:

1. Manufacturers:

a. 3M CP 25WB + Caulk

b. 3M FS 195 wrap or strip with restricting collar

c. 3M CS 195 composite sheets

d. Proset Systems fire rated floor and wall penetrations

e. Dow Corning Fire Stop System

f. Substitutions: Not permitted.

2. Non-Rated Surfaces:

a. Use stamped steel, chrome plated, hinged, split ring escutcheons or floor/ceiling plates for covering openings in occupied areas where conduit is exposed.

b. In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the conduit and the cored opening or a water-stop type wall sleeve.

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

3. General:

a. Furnish UL listed products or products tested by an independent testing laboratory.

b. Select products with rating not less than rating of wall or floor being penetrated.

PART 3 EXECUTION

3.01. EXAMINATION

A. Verify that final backfill and compaction have been completed before driving rod electrodes.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

3.02. GROUNDING AND BONDING INSTALLATION

A. Installation:

1. Remove paint, rust, mill-oils, and surface contaminants at connection points.

2. Install grounding electrode conductor and connect to reinforcing steel in slab or foundation.

3. Bond together metal siding not attached to grounded structure; bond to ground.

4. Bond together reinforcing steel and metal accessories.

5. Bond together each metallic raceway, pipe, duct and other metal object entering enclosures and exiting slabs. Install minimum # 12 AWG bare copper conductor.

6. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

7. Connect to site grounding system.

8. Permanently ground power system in accordance with NEC, including service equipment, distribution panels, lighting panel boards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.

9. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes or metal enclosures of service equipment. Ground conduits by means of grounding bushings on terminations at panel boards with installed # 12 AWG conductor to grounding bus.

10. Ground electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC.

11. Permanently attach equipment and grounding conductors prior to energizing equipment.

3.03. GROUND CONDUCTORS

A. Grounding conductors shall be located and connected as indicated on drawings.

B. Ground conductors under buildings or structures shall be buried with at least 6 inches of earth cover. Buried grounding conductors extending beyond the foundations of buildings or structures shall have at least 18 inches of earth cover.

C. Exposed conductors shall be installed inconspicuously in vertical or horizontal positions on supporting structures. When located on irregular supporting surfaces or equipment, the conductors shall run parallel to or normal to dominant surfaces.

D. Conductors routed over concrete, steel, or equipment surfaces shall be kept in close contact with those surfaces by using fasteners located at intervals not to exceed 3 feet.

E. Provide a separate equipment-grounding conductor for low voltage distribution systems, single or three phase feeder circuit and each branch circuit with single or three phase protective devices. Install a grounding conductor in conduit with phase and neutral conductors. Single-phase branch circuits for 120 and 277 volt lighting, receptacles, and motors shall have a phase, neutral, and ground conductors installed in the common conduit. Provide suitable bonding jumpers and approved grounding type bushings for flexible conduits used for equipment connection utilized in conjunction with the above branch circuits with. Single-phase circuits for equipment and all branch circuits installed in non-metallic or flexible conduits shall be provided with a separate grounding conductor.

F. Ground the neutral of transformers of separately derived systems with a bare copper conductor, installed in conduit, from the neutral directly to the building interior cold

water pipe or nearest solidly grounded structural reinforcing steel, in accordance with the provisions of NEC Article 250-24. Use bolted accessible connections to the ground system so that the neutral ground can be disconnected for test. Ground the system ground conduit as detailed on drawing. Size the grounding electrode conductors in accordance with the NEC, Table 250-66, or as indicated.

3.04. CONNECTIONS

A. All connections shall be made by the exothermic welding process, except where otherwise indicated on the drawings or in these specifications. The manufacturer's instructions on the use of exothermic welding materials shall be followed in all details. All surfaces to be joined by the welds shall be thoroughly cleaned. Paint, scale, and other deleterious substances shall be removed from surfaces of ungalvanized structural steel members by grinding. Galvanized steel surfaces shall be cleaned with emery paper. Powder and molds shall be kept dry and warm until used. Worn or damaged molds shall not be used.

B. All exothermic welded connections shall successfully resist moderate hammer blows. Any connection which fails such test or which, upon inspection, indicates a porous or deformed weld shall be remade.

C. All exothermic welds shall encompass 100 percent of the ends of the materials being welded. Welds, which do not meet this requirement, shall be remade.

D. Worn, damaged, incorrectly sized, or improperly shaped molds which, in the opinion of the Owner, do not make satisfactory welds, shall be removed from the jobsite after being physically rendered inoperable.

E. All contact surfaces of bolted and screwed connections shall be thoroughly cleaned and coated with oxide inhibitor before being securely tightened.

3.05. CONDUIT GROUNDING

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

3.06. EQUIPMENT GROUNDING

A. Comply with NEC 250, except where larger sizes or more conductors are indicated.

1. All electrical equipment shall be connected to the grounding system with an insulated, green, stranded or solid copper equipment-grounding conductor.

2. Terminate each end on suitable lug, bus, or bushing. The term "electrical equipment", as used in this article, shall include, but not be limited to, all enclosures containing electrical connections or bare conductors, except that individual devices, such as solenoids, pressure switches, and limit switches, shall be exempt from this requirement, unless the device requires grounding for proper operation.

3. Large equipment, such as metal-clad or metal-enclosed switchgear, will be furnished with a grounding bus that shall be connected to the grounding system.

4. Most other equipment will be furnished with grounding pads and/or grounding lugs which shall be connected to the grounding system. All ground connection surfaces shall be cleaned immediately prior to connection.

5. Contractor shall furnish all grounding material required, but not furnished with the equipment.

B. Install equipment grounding system such that all metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment and other conductive items in close proximity with electrical circuits will operate continuously at ground potential and provide a low impedance path for possible ground fault currents.

C. Where grounding system extension stingers are indicated on the drawings to be provided for connection to electrical equipment, the Contractor shall connect the bare grounding conductor to the equipment ground bus, pad, or lug. Except where otherwise indicated on the drawings, all equipment ground conductors that are not an integral part of a cable assembly, shall be sized in accordance with the requirements of NEC. All ground conductors installed in conduit shall be insulated.

D. Suitable grounding facilities, acceptable to the Owner’s Representative, shall be furnished on electrical equipment not so equipped. The grounding facilities shall consist of compression type terminal connectors bolted to the equipment frame or enclosure and providing a minimum of joint resistance.

E. The conduit system is not considered to be a grounding conductor, except for lighting fixtures. No grounding conductor shall be smaller in size than # 12 AWG, unless it is a part of an acceptable cable assembly.

3.07. GROUND SYSTEM RESISTANCE

A. All ground resistance measurements shall be made with a three-terminal "Megger" type ground tester which applies alternating current to the electrodes and which gives a reading in direct current ohms. Two reference ground probes shall be used, and all tests shall be made in accordance with the instrument manufacturer's instructions for ground resistance testing. Some of the acceptable instruments are as follows:

1. Megger Null Balance Earth Tester, James G. Biddle and Company.

2. Vibroground, Associated Research, Inc.

3. Ground-Ohmer, Herman H. Sticht Co., Inc.

B. Submit final certified test reports of all grounding tests.

3.08. ANCHORS, FASTENERS AND SUPPORT

A. Installation:

1. Locate and install anchors, fasteners, and supports in accordance with NECA “Standard of Installation”.

2. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

3. Do not use spring steel clips and clamps.

4. Do not use powder-actuated anchors.

5. Do not drill or cut structural members.

B. Supports:

1. Fabricate supports from structural steel or formed steel members. Rigidly weld members or install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.

2. Install surface-mounted cabinets and panel board with minimum of four anchors.

3. In wet and damp locations use steel channel supports to stand cabinets and panel boards 1 inch off wall.

4. Use sheet metal channel to bridge studs above and below cabinets and panel boards recessed in hollow partitions.

3.09. SEALING AND FIREPROOFING

A. Fire-Rated Surface:

1. Seal opening at floor and wall as follows:

a. Opening through a fire rated wall, floor, ceiling or roof, must be sealed.

b. Install galvanized sheet metal sleeves (minimum 12-gage) through opening and extending beyond minimum of 1 inch on each side of building element.

c. Size sleeve allowing minimum of 1-inch void between sleeve and building element.

d. Pack void with backing material.

e. Seal ends of sleeve with UL listed fire-resistive silicone compound to meet fire rating of structure penetrated.

2. Where conduit penetrates fire-rated surface, install fire-stopping product in accordance with manufacturer’s published instructions.

B. Non-Rated Surfaces:

1. Opening through a non-fire rated wall, floor, ceiling or roof must be sealed using an approved type of material.

2. Use galvanized sheet metal sleeves in hollow wall penetrations to provide a backing for the sealant. Grout area around sleeve in masonry construction.

3. Install escutcheons or floor/ceiling plates where raceway, penetrates non-fire rated surfaces in occupied spaces.

4. Install rubber links of mechanical seal tighten in place and sized for the pipe, in exterior wall openings below grade, in accordance with the manufacturer's instructions.

5. All pipe penetrations at interior partitions and/or walls, laboratory spaces, telephone, data and communication rooms and similar spaces where the room pressure or odor transmission must be controlled, shall be sealed. Sealant shall be applied to both sides of the penetration in such a manner that the annular space between the pipe sleeve and the pipe is completely filled.

3.10. ACCEPTANCE TESTING

A. Grounding and Bonding: Perform inspections and tests as outlined below (NETA ATS, Section 7.13 – Grounding Systems).

1. Visual and Mechanical Inspection

a. Inspect ground system for compliance with drawings and specifications.

b. Electrical Tests (Small Systems)

1) Perform ground-impedance measurements utilizing the fall-of-potential method per ANSI/IEEE Standard 81 "IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potential of a Ground System." Instrumentation utilized shall be as defined in section 12 of the above guide and shall be specifically designed for ground impedance testing. Provide sufficient spacing so that the plotted curves flatten in the 62% area of the distance between the item under test and the current electrode.

c. Electrical Tests (Large Systems)

1) When sufficient spacing of electrodes per Electrical Tests (Small Systems) is impractical, perform ground impedance measurements utilizing either the intersecting curves method or the slope method. (Ref. Nos. 40 and 41 in IEEE Std. 81).

d. Equipment Grounds

1) Utilize two-point method of IEEE Std. 81. Measure between equipment ground being tested and known low-impedance grounding electrode or system.

2. Test Values

a. The main ground electrode system impedance-to-ground shall be no greater than five (5) ohms for commercial or industrial systems and one (1) ohm or less for generating stations, transmission stations, and large industrial systems. Equipment grounds, depending on size and length of grounding conductor, should be only fractionally higher than system ground.

END OF SECTION

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SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

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

1.2 RELATED SECTIONS

A. Section 26 05 00: Basic Electrical Materials and Methods

B. Section 26 05 19: Low Voltage Electrical Power Conductors and Cables

C. Section 26 05 26: Grounding and Bonding for Electrical Systems

D. Section 26 05 53: Identification for Electrical Systems

1.3 REFERENCES - CODES AND STANDARDS

A. ANSI C80.1 Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3 Electrical Metallic Tubing, Zinc Coated.

C. ASTM A 48 Standard Specification for Grey Iron Castings.

D. NECA (National Electrical Contractors Association) – “Standard of Installation.”

E. NEMA FB 1 (National Electrical Manufacturers Association) – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

F. NEMA OS 1 (National Electrical Manufacturers Association) – Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

G. NEMA OS 2 (National Electrical Manufacturers Association) – Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.

H. NEMA RN 1 (National Electrical Manufacturers Association) – Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

I. NEMA TC 2 – Electrical Polyvinyl Chloride (PVC) Conduit.

J. NEMA TC 3 (National Electrical Manufacturers Association) – PVC Fittings for Use with Rigid PVC Conduit and Tubing.

K. NEMA TC 6 - Non-Metallic Conduit.

L. NEMA 250 (National Electrical Manufacturers Association) – Enclosures for Electrical Equipment (1,000 Volts Maximum).

M. NFPA 70 National Electrical Code (NEC). Latest approved edition

N. UL 1 Flexible Metal Conduit

O. UL 6 Rigid Metal Conduit

P. UL 514B Conduit, Tubing and Cable Fittings.

Q. UL 651 Rigid Non-Metallic Conduit

R. UL 797 Electrical Metallic Tubing

1.4 SYSTEM DESCRIPTION

A. Raceway, boxes and manholes located as indicated on drawings and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway, boxes and manholes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.

B. Underground more than 5 feet (1,500 mm) outside foundation wall: Provide Schedule 40 non-metallic conduit encased in concrete.

C. Underground within 5 feet from foundation wall: Provide rigid steel or Schedule 40 non-metallic conduit encased in concrete.

D. In or Under Slab on Grade: Provide Schedule 40 non-metallic conduit encased in concrete. Provide Galvanized with tape wrap rigid steel factory bends greater than 22.5 degrees and for stub-ups through concrete slabs.

E. Outdoor Locations, Above Grade: Provide rigid steel conduit. Provide cast metal outlet, pull, and junction boxes.

F. In Slab above Grade: Provide galvanized rigid steel conduit. Provide cast or concrete-tight sheet metal boxes.

G. Exposed Dry Locations: Provide galvanized rigid steel conduit. Provide cast boxes.

H. Concealed Dry Locations: Provide electrical metallic tubing for sizes less than 2-inches. Provide galvanized rigid steel conduit in sizes 2-inches or larger. Provide cast or sheet metal boxes.

1.5 DESIGN REQUIREMENTS

A. Minimum Raceway Size: 3/4 inch (19 mm) unless otherwise specified.

1.6 SUBMITTALS

A. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by product testing agency having jurisdiction. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

B. Submit detailed conduit routing plan, for review and approval, prior to installation as follows:
   1. Exposed and/or concealed in building walls for conduits larger than 2-inch outside diameter.
   2. All underground conduits (3/4-inch and larger) in duct bank; concealed in floor slabs, equipment pads and concrete slabs.

C. Product Data: Submit for the following:
   1. Rigid Steel Conduit.
   2. PVC Coated galvanized rigid steel conduit.
   3. Electrical Metallic Tubing (EMT).
   4. Flexible metal conduit.
   5. Liquid tight flexible metal conduit.
   6. Nonmetallic conduit.
   7. Raceway fittings.
   8. Conduit bodies.
   9. Surface raceway.
   10. Pull boxes, junction boxes.

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

1.7 CLOSEOUT SUBMITTALS

A. Project Record Documents:
   1. Record actual routing of conduits. Provide record (as-built) drawings marked in red to show actual routing of the underground raceway and cable when different from the original contract drawings. Prepare on new, clean set of contract drawings.
   2. Record actual locations and mounting heights of outlet, pull boxes, junction boxes and manholes.

1.8 DELIVERY, STORAGE, AND HANDLING

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

B. Protect PVC and PVC-coated metallic conduit from sunlight.

PART 2 PRODUCTS

2.1 CONDUIT

A. Galvanized Rigid Steel Conduit (GRSC or RGS), couplings and elbows shall be hot-dip galvanized, rigid mild steel in accordance with ANSI C80.1 and UL 6. The conduit interior and exterior surfaces shall have a continuous zinc coating with a transparent overcoat of enamel, lacquer, or zinc chromate. Conduit shall be formed with continuous welded seams with a uniform wall thickness, in minimum 10-foot lengths, with threaded ends.

B. Polyvinyl Chloride (PVC) coated galvanized rigid steel conduit shall be in accordance with NEMA RN 1. Coating shall be applied under controlled factory conditions. Prior to coating, conduit shall meet requirements of ANSI C80.1 and UL 6 or ANSI C80.6 and UL 1242 as appropriate. PVC coated conduits shall have ultra-violet (UV) inhibitor in the coating material.

C. Electrical Metallic Tubing (EMT). Electrical metallic tubing, including elbows and bends, shall be zinc coated, mild steel in accordance with the requirements of ANSI C80.3 and UL 797. The interior and exterior surfaces of the tubing shall have a continuous zinc coating. Conduit shall be formed with a continuous welded seam, with a uniform wall thickness, in minimum 10-foot lengths.

D. Flexible Metal Conduit shall be galvanized steel meeting the requirements of UL 1. Flexible aluminum conduit is not permitted.

E. Liquid-Tight Flexible Metal Conduit shall be plastic-jacketed, galvanized steel, "Sealtite" Type EF for general service areas or Type HC for high-temperature when used under raised floor or in air plenums. Conduit shall be UL listed.

F. Non-Metallic Conduit shall be as follows:
   1. Schedule 40: Conduit shall be 90 degree Celsius, polyvinyl chloride in conformance with NEMA TC-2 and UL 651 requirements.
   2. Spacers used in duct bank installations shall be high impact plastic, interlocking bases, and intermediate type spacers. Place spacers between 6 and 10 feet apart.

2.2 RACEWAY FITTINGS

A. Couplings and Thread Protectors. Each length of threaded conduit shall be provided complete from the manufacturer with a coupling on one end and a thread protector on the other. The thread protector shall have sufficient mechanical strength to protect the threads during normal handling and storage.

B. Metal Conduit Fittings shall conform to the requirements of UL 514B where this standard applies. Galvanized iron or galvanized steel fittings shall be used with steel conduit. Threaded fittings shall engage a minimum of five threads made up wrench-tight and be compatible with conduit.

C. EMT Conduit Fittings shall be set screw steel with insulated throat for indoor applications and compression type, UL approved for rain tight applications for outdoor use. Die-cast or indent style fittings are not acceptable.

D. Liquid-Tight Flexible Conduit Fittings shall be galvanized steel, T&B 53XX series insulated throat, and shall bear the UL label. Die-cast malleable fittings are not acceptable.

E. Liquid-Tight Flexible Metal Conduit Fittings shall be galvanized steel similar to T&B “Tite-Bite”.

F. Non-Metallic Conduit Fittings shall be of same material and strength characteristics as the conduit and shall be solvent welded as recommended by manufacturer. End bells shall be plastic, high impact, tapered to fit. Where conduit transition from non-metallic to metallic is required, provide non-metallic female “terminal” adapter. Non-metallic “male” adapters are not acceptable.

G. Bushings shall be provided for the termination of all conduits not terminated in hubs, couplings or insulated throat connectors. Grounding type insulated bushings with insulating inserts in metal housings shall be provided for conduit 1-1/4 inches and larger. Standard bushings shall be galvanized steel or malleable iron in all sizes.

H. Locknuts. One interior and one exterior locknut shall be provided for all conduit terminations not provided with threaded hubs and couplings. Locknuts shall be designed to securely bond with the conduit to the box when tightened. Locknuts shall be so constructed that they will not be loosened by vibration.

I. Unions. Watertight conduit unions shall be Appleton or Crouse-Hinds Type UNF or UNY, or approved equal.

J. Raintight conduit terminating hubs, where indicated on the drawings or required by these specifications, shall be Meyer’s rigid conduit hubs, or approved equal.

2.3 CONDUIT BODIES

A. Malleable iron conduit bodies shall be cast malleable iron with tensile strength meeting ASTM A 48, Class 30A requirements. Malleable conduit bodies shall be finished with an epoxy powder coating. Cover shall be malleable iron with captive screws.

B. All conduit bodies’ entrances shall be machined NPT threads with a smooth, rounded, internal conduit stop bushing.

C. All conduit bodies shall be equipped with a sealed and gasketed cover. Cover shall be secured using stainless steel machine screws.

2.4 CONDUIT SUPPORTS

A. Conduit supports shall be furnished and installed in accordance with other section of these specifications. Conduits shall be supported so that fittings are accessible. Support systems shall be limited to electrical conduits only.

B. Hanger rods shall be 3/8-inch diameter galvanized threaded steel rods, minimum. Conduit racks over 18-inch wide, over one level, or supporting 2-inch RSC or larger, shall be 1/2-inch diameter rod minimum.

C. Conduit Clamps. Conduits in single runs or groups of two shall be supported by steel clamps and clamp backs. They shall be galvanized malleable iron or approved equal cast ferrous metal for steel conduit or tubing.

D. Support Channels. Supports for banks of three of more conduits shall be constructed of formed steel support channels (Unistrut, Kindorf, Superstrut, B-Line or approved equal) with associated conduit or tubing clips. Support channels shall be steel, hot-dip galvanized after fabrication with galvanized steel clips for steel conduit or tubing.

E. Wall Penetrations. All conduits, raceways, cables and sleeve penetrations through fire rated and hazardous location walls, shafts, floor, ceilings, etc., shall be sealed with a UL-approved fire stopping system.

2.5 OUTLET BOXES AND SWITCH BOXES

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

B. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized flat rolled sheet steel outlet wiring boxes of types, shapes and sizes, including box depths, to suit each respective location and installation; construct with stamped knockouts in back and sides, and with threaded screw holes with corrosion-resistant screws for securing box covers and wiring devices.

C. Outlet boxes used in wet outdoor locations, surface mounted shall be cast metal (FS or FD type) with mounting lugs and gasketed covers.

D. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported, per NEC requirements.

E. Outlet Box Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and meeting requirements of individual wiring situations.

2.6 PULL BOXES, JUNCTION BOXES

A. Sheet Metal Boxes shall be NEMA OS 1, NEMA rating as indicated on drawings. Minimum 16 gauge galvanized steel construction with stainless steel hinged cover and neoprene gasket. Cover shall be secured to the body with a continuous, full length, piano type hinge and stainless steel pin on one side and captive screw on the other side. Door shall be equipped with padlock hasp with sealing hole provisions.
   1. Provide #10-32 tapped hole provisions for optional ground lug kit.
   2. Provide 0.375-16 collar studs for mounting optional panel.
   3. Provide external mounting feet for secure wall mounting.
   4. Finish: Wash and phosphate undercoat with ANSI 61 gray polyester power finish.

B. Surface-Mounted Cast Metal Box: NEMA 250, NEMA Type 3R or 4 as indicated, flat-flanged, surface- mounted junction box:
   1. Material: Cast Iron.
   2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 EXISTING WORK

A. Extend existing raceway and box installations using materials and methods compatible with existing electrical installations, or as specified.

B. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.3 INSTALLATION OF RACEWAYS

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

B. Moisture Pockets
   1. Moisture pockets shall be eliminated from conduits. If water cannot drain to the natural opening in the conduit system, a hole shall be drilled in the bottom of a pull box or a "C-type" conduit fitting provided in the low point of the conduit run.

C. Couplings and Unions
   1. Metal conduit shall be joined by threaded conduit couplings, with the conduit ends butted.
   2. The use of running threads, Erickson type couplings, split couplings or similar unions are not permitted.

D. Conduit Bodies
   1. Conduit bends shall meet the requirements of NEC, minimum bend radius of the cable installed or as indicated on the drawings, whichever is greater.
   2. Conduits or tubing deformed or crushed in any way shall be removed from the job site.

E. Bends and Offsets
   1. Changes in direction of conduits shall be made with fittings or bends.
   2. Conduit bends shall meet the requirements of NEC, minimum bend radius of the cable installed or as indicated on the drawings, whichever is greater.
   3. Bends shall be made using appropriate tools or mechanical equipment. The use of a pipe tee or vise for bending conduit or tubing will not be permitted.
   4. For non-metallic conduit or plastic coated steel, approved factory bends and offsets shall be used.
   5. Conduits or tubing deformed or crushed in any way shall be removed from the job site.
   6. Install no more than the equivalent of three 90 degree bends between boxes or outlets

F. Cutting and Threading
   1. The plane of all conduit ends shall be square with the centerline.
   2. Where threads are required, they shall be cut and cleaned prior to conduit reaming.
   3. The ends of all conduit and tubing shall be reamed to remove all rough edges and burrs.
   4. Cutting oil shall be used in threading operations; the dies shall be kept sharp, and provisions shall be made for chip clearance.
   5. Threads on conduits and fittings shall be lubricated with conducting and sealing compound.
   6. All steel conduits shall be coated after threading with cold-galvanized zinc coating. The Contractor shall supply this protective material and shall apply it in the field prior to installing conduit or fittings.

G. All steel conduit, exposed to weather or in contact with earth, shall be re-galvanized after threading with "Galvanizing Powder M-321" as manufactured by the American Solder and Flux Company of Philadelphia, Pennsylvania; "Zincilate

810" as manufactured by Industrial Metal Protectives, Inc., of Dayton, Ohio; "Zinc Rich" coating as manufactured by ZRC Chemical Products Company, Quincy, Massachusetts; or approved equal. The Contractor shall supply this protective material and shall apply it in the field.

H. Connections to Boxes and Cabinets
   1. Conduit shall be securely fastened to all boxes and cabinets.
   2. Threads on metallic conduit shall project through the wall of the box to allow the bushing to butt against the end of the conduit.
   3. The locknuts, both inside and outside, shall then be tightened sufficiently to bond the conduit securely to the box.
   4. Locknuts on connectors shall be tightened securely to bond the connectors.

I. All conduits entering enclosures outdoors or in wet areas shall enter through Meyer's hubs, or approved equal, or threaded openings.

J. Cleaning
   1. Precautions shall be taken to prevent the accumulation of water, dirt, or concrete in the conduit.
   2. Conduit in which water or other foreign materials have been permitted to accumulate shall be thoroughly cleaned or, where such accumulation cannot be removed by methods acceptable to the Owner /Owner's Representative, the conduit shall be replaced.
   3. For conduits sizes 3 inches and larger, draw a flexible testing mandrel approximately 12 inches long with a diameter less than the inside diameter of the conduit through the conduit. After which, draw a stiff bristle brush through until conduit is clear of particles of foreign materials. For conduits less than 3 inches, draw a stiff bristle brush through until conduit is clear of particles and foreign material.

K. Empty Conduit
   1. All conduits installed for future use shall have a polypropylene pull line with a minimum tensile strength of 200 lbs., Jet Line, Cat. No. 232, polyolefin, or approved equal. Pull line shall be secures at both ends to ensure future accessibility.

L. Rooftop Conduits
   1. Provide redwood sleepers on waterproof mastic base for all conduit runs exposed on roofs.

M. Identification
   1. All conduits shall be identified in accordance with other section of these specifications.

N. Grounding
   1. All conduits shall be grounded in accordance with specification Section 26 05 00 – Common Work Results for Electrical.
   2. A solid or stranded bare copper or green insulated copper solid or stranded ground wire shall be provided in all conduits and raceways.

O. Galvanized Rigid Steel Conduit
1. Galvanized rigid steel conduit shall be installed in areas exposed to weather, vehicle traffic, in hazardous classified areas, for penetrations through foundations, and 10 feet before transition from below grade to 8 feet above grade, unless otherwise noted on the drawings.
2. Steel conduit in contact with earth shall be protected by "Scotchwrap" 10 mil tape applied in double thickness using 50 percent lap turns to 6 inches above grade and 6 inches beyond transition.
3. Expansion joints shall be used where required.

P. Polyvinyl Chloride (PVC) Coated Galvanized Rigid Steel Conduits
1. PVC -coated, steel conduit and fittings shall be installed where highly corrosive conditions exist, indoors or outdoors.
2. The Contractor shall patch any damaged coating according to the manufacturer's instructions.

Q. Electrical Metallic Tubing
1. Electrical metallic tubing shall be installed for all circuits, indoors above concrete slab, where not subject to conditions outlined for rigid galvanized steel conduits.

R. Rigid Aluminum Conduit

1. Not acceptable on this project.

S. Flexible Metal Conduit
1. Flexible conduit inserts not greater than 30 inches in length, shall be installed in all conduit runs, which are supported by both building steel and by structures subject to vibration or thermal expansion. This shall include locations where conduit supported by building steel enters or becomes supported by isolated structures on separate foundations.
2. Flexible conduit shall be installed in conduit runs, which cross expansion joints.
3. Special areas, such as plant office control rooms in which external noise is to be minimized, shall have flexible conduit in conduit runs where the runs cross from the main building framing to the control room or office framing.
4. Flexible conduit shall be installed adjacent to all equipment and devices, which move in relation to the supply conduit due to vibration, normal operation of the mechanism, or thermal expansion.
5. Conduit shall be connected to pressure switches, thermocouples, solenoids, and similar devices with flexible conduit. Flexible conduit shall be installed adjacent to the motor terminal housing for motors requiring 4-inch and smaller conduit.
6. Flexible metal conduit inserts not greater than 6 feet in length shall be installed for light fixture tap conductors.

T. Liquid-Tight Flexible Metal Conduit
1. Liquid-tight flexible metal conduit shall be used in place of regular flexible conduit for connections to motors and transformers, in areas exposed to weather, moisture or oil, and under raised floors.

2. Liquid-tight flexible metal conduit may be used in place of flexible metal conduit where not otherwise required.

U. Non-Metallic Conduit

1. Schedule 40 shall be used for all power, signal feeders and branch circuits, in earth or enclosed in concrete, unless otherwise noted on the drawings. Conduits must be buried in earth in accordance with the NEC.

V. Conduit Support
1. Fasten conduit supports to building structures and surfaces in accordance with Section 16050 – Basic Electrical Materials and Methods.
2. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
3. Do not use wire, ceiling support wires or perforated pipe straps to support conduit. Remove any temporary installation support wire.

W. Spacing of Supports
1. All conduit runs shall be rigidly supported, except where buried in concrete.
2. Each conduit shall be supported within one (1) foot of junction boxes and fittings.
3. Spacers used in duct bank installations shall be placed no more than 6 to 10 feet apart.
4. Support spacing along conduit runs shall be as follows.

Conduit Size	Maximum Distance Between Supports
½ inch through 1-1/4 inch	5 feet
1-1/2 inch and larger	8 feet

X. Ground and bond raceway and boxes in accordance with Section 26 05 33 – Raceways and Boxes for Electrical Systems.

3.4 CABINET AND BOX INSTALLATION

A. Install electrical boxes as shown on drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

B. Locate boxes and conduit bodies so as to ensure ready accessibility of electrical wiring, maintain headroom and to present neat mechanical appearance.

C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only. In inaccessible ceiling areas, install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices with each other.

E. Use flush mounting outlet boxes in finished areas.
   1. Do not install flush mounting boxes back-to-back in walls.
   2. Provide minimum 6-inch separation between adjacent boxes.
   3. Provide minimum 24-inch separation in acoustic rated walls.
   4. Use stamped steel bridges to fasten flush mounting outlet box between studs.
   5. Secure flush mounting box to interior wall and partition studs.
   6. Accurately position to allow for surface finish thickness.
   7. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
   8. Use adjustable steel channel fasteners for hung ceiling outlet box.

F. Support boxes independently of conduits.

G. Use code sized gang box where more than one device is mounted together. Do not use sectional box. Use code sized gang box with plaster ring for single device outlets.

H. Use cast outlet box in exterior locations where exposed to the weather and wet locations (interior or exterior).

I. Coordinate installation of electrical boxes and fittings with cable and raceway installation work. Provide knockout closures to cap unused knockout holes where blanks have been removed.

J. Do not use round boxes where conduit must enter box through side of box, which would result in difficult and insecure connections where fastened with a locknut or bushing on rounded surface.

K. Fasten boxes rigidly to substrate or structural surfaces to which they are being mounted, or solidly embed electrical boxes in concrete or masonry as appropriate.

L. Except as prevented by the location of other work, all junction boxes and outlet boxes shall be centered on structures.

M. Conduit openings in boxes shall be made with a hole saw or shall be punched.

N. Cabinets and boxes shall be rigidly mounted.
   1. Mounting on concrete shall be secured by self-drilling anchors.
   2. Mounting on steel shall be by drilled and tapped screw holes, or by special support channels welded to the steel, or by both.
   3. Cabinets shall be leveled and fastened to the mounting surface with not less than ¼-inch air space between the enclosure and mounting surface.
   4. All mounting holes in the enclosure shall be used.

O. Large Pull Boxes - Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.
   1. Interior Dry Locations - Use hinged enclosure.
   2. Other Locations - Use surface mounted box of appropriate location classification.

3.5 ANCHORS

A. Where supports for raceways, boxes, and cabinets are mounted on concrete surfaces, they shall be fastened with self-drilling tubular expansion shell anchors with externally split expansion shells, single-cone expanders, and annular break-off grooved chucking cones. Anchors shall be Phillips "Red Head" or approved equal.

3.6 ADJUSTING

A. Install knockout closures in unused openings in boxes.

3.7 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

B. Clean exposed surfaces and restore manufacturer’s finish.

END OF SECTION

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SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. The extent of the electrical systems and equipment requiring identification is indicated, and the extent of identification required is specified herein and in individual sections of Work requiring identification. The types of electrical identification specified in this section include the following:
   1. Exposed conduit color banding.
   2. Buried cable warnings.
   3. Cable/conductor identification.
   4. Operational instructions and warnings.
   5. Danger signs.
   6. Equipment/system identification signs.

1.2 REFERENCES - CODES AND STANDARDS

A. ANSI Z535.1 - Safety Color Code.

B. APWA ULCC - Uniform Color Code for Buried Utilities.

C. NFPA 70 – NEC.

1.3 SYSTEM DESCRIPTION

A. Label the following electrical equipment with nameplates which clearly identify each item, the function or use of the item, and the circuit identification of the feed to the item:
   1. All transformers shall be identified by 1-inch high block letters cut in stencil and applied with yellow paint on a flat-black background. The transformer number, primary and secondary voltages, and the kVA shall be shown. The nameplate shall be located on the front of the transformer.
   2. All Metal-Clad Switchgear, Metal-Enclosed Switchgear, Switchboards, Distribution Panelboards, Power and Lighting Panels, Motor Control Centers, Local Control Panels, Terminal Cabinets and all electrical equipment enclosure shall be identified using laminated plastic nameplates. Show the equipment number, voltage rating, current rating, number of phases, connection type, short circuit interrupting rating, and circuit number
   3. Identify all receptacles and lighting switches, by the circuit number indicated using ¼-inch high white characters on ½-inch wide black stick-on tape placed on the device coverplate. Place the tape on the device enclosure if the device is not wall mounted.
   4. All motors, starters, disconnect switches, Time Switches, Special Function Pushbuttons and Switches, and miscellaneous control devices shall be identified by function and circuit number, with ¼-inch high white characters on a ½-inch wide black stick-on tape where installed indoors and engraved plastic nameplates where installed outdoors.

5. All underground raceway or cable shall be marked with buried warning tape along its entire length.
6. All exposed raceway longer than 10 feet in length shall be identified.
7. Panelboard Directories: Furnish all panelboards with a complete 8-1/2-inch by 11-inch typewritten directory mounted in the inner door under a clear plastic cover set in a metal frame.

B. Branch circuits and devices:
1. Label all individual receptacle outlets at the outlet faceplate to indicate the panelboard of origin and branch circuit number. Label modular furniture feeds at the power pole drop in a visible and consistent location. Labels shall be self adhesive, thermal machine printed type such as Brothers, Panduit, T&B, or Approved Equal and shall be clear plastic with black lettering.
2. All branch circuits in outlet boxes shall be identified with circuit number using wrap-around labels (T&B, BRADY, 3M, or Approved Equal).
3. As an alternative to separate nameplates, device plates may be engraved directly with lettering filled with black enamel.

1.4 SUBMITTALS

A. Product Data: nameplates, labels, and markers.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70 – NEC.

B. Furnish products listed and classified by UL, ETL, or other recognized, approved testing and listing agencies as suitable for the purpose specified and shown.

PART 2 - PRODUCTS

2.1 NAMEPLATES AND LABELS

A. Nameplates
1. Engraved, three layer laminated plastic, white letters on black background for normal power and white letters on red background for emergency power. Communications and control cabinets shall be labeled with white letters on green background.
2. Locations
   a. Each electrical distribution and control equipment enclosure.
   b. Communication cabinets.
   c. Motor control centers, including each combination module.
3. Letter Size
   a. Use 1/2-inch letters for identifying individual equipment and loads.
   b. Use ¼-inch letters for identifying grouped equipment, loads, panelboards, and transfer switch.

c. Use ½-inch letters for identifying the main switchboard, motor control centers, and large distribution switchboards.

B. Labels
1. Embossed adhesive tape, with 3/16-inch white letters on colored background to match color scheme of plastic laminate labels in 2.1.A. Use only for identification of individual wall switches and receptacles, control device stations, and multi-outlet devices.
2. Thickness.
a. 1/16-inch for units up to 20 square inches or 8-inch length; 1/8-inch for larger units.

2.2 WIRE MARKERS

A. Manufacturers
1. Brady.
2. Thomas & Betts.
3. 3-M Co.
4. Or Approved Equal.

B. Description: Tape, split sleeve, or tubing type wire markers, self-adhesive.

C. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, control panels, motor controllers and starters, and each load connection.

D. Legend
1. Power and Lighting Circuits: Branch circuit or feeder number indicated.
2. Control Circuits: Control wire number indicated on shop drawings.
3. Neutral Conductors: Clearly indicate the branch circuit or feeder number the neutral serves. In multi-wire circuits where the neutral is shared, mark the neutral with the circuit number of the “A” phase.

2.3 CONDUIT MARKERS

A. Provide manufacturer's standard preprinted, flexible or semi-rigid, permanent, plastic-sheet conduit markers, minimum of 3 mils thick and 1-1/2-inch wide extending 360 degrees around conduits; designed for self-adhesive attachment to conduit. Except as otherwise indicated, provide lettering that indicates the voltage of the conductor(s) in the conduit. Provide 8-inch minimum length for 2-inch and smaller conduit, 12-inch minimum length for larger conduit.

B. Identify conduits containing conductors above 600-volts with the following alternating markers
1. DANGER - HIGH VOLTAGE
2. The voltage, as applicable (i.e. – 12-kV, 4.16-kV, etc.).

C. Identify conduits containing conductors below 600-volts with the following markers.
1. The voltage, as applicable (i.e. 480-Volts, 240-Volts, etc.).

D. Location: Furnish markers for each conduit longer than 10 feet.

E. Spacing: 20 feet on center.

F. Color: Unless otherwise indicated or required by governing regulation, provide conduit tags in the following colors.
   1. Normal and Emergency Power Systems: Orange w/black letters.
   2. Fire Alarm System: Red w/black letters.
   3. Telephone System: Green w/yellow letters.
   4. Data/Communication. System: White w/black letters.

G. Legend:
   1. 480 Volt System: Normal 480Y/277-volts.
   2. 208 Volt System: Normal 208Y/120-volts.
   3. Fire Alarm System: Fire alarm.
   4. Telephone System: Telephone.
   5. Data/Communication System: Data/Communications.

2.4 FASTENERS

A. Secure all labels and nameplates with self-tapping stainless steel screws. Use contact type permanent adhesive where screws cannot or should not penetrate the substrate.

2.5 BAKED ENAMEL DANGER SIGNS

A. Provide manufacturer's standard "DANGER" signs of baked enamel finish on 20 gage steel; of standard red, black and white graphics; 14-inch by 10-inch size except where 10-inch by 7-inch is the largest size which can be applied where needed, and except where larger size is needed for adequate vision; with recognized standard explanation wording (e.g. HIGH VOLTAGE, KEEP AWAY, BURIED CABLE, DO NOT TOUCH SWITCH).
   1. At each entry doors of Electrical Rooms: “DANGER HIGH VOLTAGE – KEEP OUT, AUTHORIZED PERSONNEL ONLY”.

2.6 LETTERING AND GRAPHICS

A. Coordinate names, abbreviations and other designations used in the electrical identification Work, with the corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of the electrical systems and equipment.

2.7 UNDERGROUND WARNING TAPE

A. Three-inch minimum width, 5 mil thickness, foil bonded polyethylene tape, detectable type, with suitable continuous warning legend describing buried electrical lines. Tape color shall conform to APWA uniform color code using ANSI Z535.1 safety colors. Text shall be black, 2-inch minimum letters.

PART 3 - EXECUTION

3.1 PREPARATION

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

B. Coordination: Where identification is to be applied to surfaces that require finish, install identification after completion of painting.

C. Regulations: Comply with governing regulations and the requests of governing authorities for the identification of electrical Work.

3.2 APPLICATION

A. Install nameplate and label parallel to equipment lines.

B. Secure nameplate to equipment front using screws, rivets, or adhesive.

C. Secure nameplate to outside moveable surface of door on panelboard.

D. Conduit Identification:
   1. Where electrical conduit is exposed in spaces with exposed mechanical piping, which is identified by a color-coded method, apply color-coded identification on the electrical conduit in a manner similar to the piping identification. Except as otherwise indicated, use orange as the coded color for conduit.
   2. Paint red band or provide red tape on each fire alarm conduit longer than 10 feet, minimum 20 feet on center.

E. Cable/Conductor Identification:
   1. Apply cable/conductor identification on each cable and conductor in each box/enclosure/cabinet where the wires of more than one circuit or communication/signal system are present, except where another form of identification (such as color-coded conductors) is provided.
   2. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project electrical Work.

F. Operational Identification and Warnings
   1. Wherever reasonably required to ensure safe and efficient operation and maintenance of the electrical systems, and electrically connected mechanical systems and general systems and equipment, including the prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices and covers of electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for the intended purposes.

G. Danger Signs
   1. In addition to the installation of danger signs required by governing regulations and authorities, install appropriate danger signs at the locations indicated and at

locations subsequently identified by the Installer of electrical Work as constituting similar dangers for persons in or about the project.

2. High Voltage
   a. Install danger signs wherever it is possible, under any circumstances, for persons to come into contact with electrical power of voltages higher than 110-120 volts.
   b. Critical Switches/Controls
   c. Install danger signs on switches and similar controls, regardless of whether concealed or locked up, where untimely or inadvertent operation (by anyone) could result in significant danger to persons, or damage to or loss of property.

H. Equipment/System Identification Signs
   1. Install an engraved plastic-laminate sign on each major unit of electrical equipment in the building; including the central or master unit of each electrical system and the communication/signal systems, unless the unit is specified with its own self-explanatory identification or signal system.
   2. Except as otherwise indicated or specified, provide single line of test, ½-inch high lettering on 1-1/2-inch high sign (2-inch high where two lines are required), white lettering in black field.
   3. Provide text matching terminology and numbering of the shop drawings.
   4. Provide signs for each unit of the following categories of electrical Work.
      a. Major electrical switchboard.
      b. Electrical substation.
      c. Motor control center.
      d. Fire alarm control panel and annunciators.
      e. Data / communications.

I. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrata with fasteners, except use adhesive where fasteners should not or cannot penetrate the substrata.

J. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches below finished grade.

END OF SECTION

SECTION 31 23 30

SHORING AND TRENCH SAFETY

PART 1 – GENERAL

1.1 SUMMARY

A. Principle items specified herein are:

1. Shoring required for general safety, worker protection and protection of adjacent property from the hazards of caving ground.

2. Trench excavations

3. Structural excavations

1.2 MEASUREMENT AND PAYMENT

A. Measurement and payment for shoring and trench safety shall be included in the bid item to which it relates. No additional measurement or payment will be included for the requirements of this section.

1.3 RELATED SECTIONS

A. Related work specified in other sections:

1. Section 31 23 33 – Trenching and Backfilling.

1.4 REFERENCED CODES AND SPECIFICATIONS

A. The following standards apply:

1. Cal/OSHA, State of California Administrative Code, Title 8; Industrial Relations, Chapter 4, Subchapter 4, Construction Safety Orders.

2. Occupational Safety and Health Administration (OSHA) Regulations, 29 CPR Part 1926 Subpart P - Excavations.

1.5 CONTRACTOR'S RESPONSIBILITIES FOR SAFETY

A. The Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons (including employees) and property during performance of the Work. This requirement shall apply continuously and not be limited to normal working hours.

B. The duty of the Engineer to conduct construction review of the Contractor's performance is not intended to include a review or approval of the adequacy of the Contractor's safety supervisor, the safety program, or any safety measures taken in, on, or near the construction site.

C. The Engineer will review the submittal of the Contractor's proposed shoring system to verify the general scope of the Work, to determine that qualified professional engineering services are used and to determine that appropriate construction techniques are proposed for use. This review shall not in any way be construed to relieve the Contractor from sole responsibility for the design and safety of such shoring.

D. The Contractor shall appoint a supervisory employee who shall be responsible for determining which of the engineered shoring systems (if alternates are provided) shall be used depending on local soil type, water table, etc.

1.6 PERMIT

A. For trenches or excavations five (5) - feet or more in depth, obtain from the State Division of Industrial Safety a permit for such excavation; submit a copy of the permit to the Engineer, prior to initiating any Work requiring said permit.

1.7 SAFETY ORDERS

A. The Contractor shall have at the Work site, copies or suitable extracts of the Construction Safety Orders of Cal-OSHA.

B. All Work shall comply with the provisions of these and all other applicable laws, ordinances and regulations.

1.8 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – “Submittal Procedures”:

1. Trench Safety Plan:

a. For trenches or excavations five feet or more in depth, the Contractor shall submit to the Engineer a detailed plan design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazards of caving ground. The design shall be coordinated with the dewatering plan (Section 31 23 19). Such plans shall be submitted at least 10 working days before the Contractor intends to begin trenching or excavation work. Submittal shall be for trench work and work at vaults, and other cuts 5 feet or more in depth. NOTE: Water table and moisture content will vary with rainfall and cause varying soil strength.

b. Groundwater may be present in trench backfill of existing utilities. Contractor shall design shoring and dewatering systems to mitigate against washout of materials from existing utility trenches. Reconstruction of the structural section of the road, if required, will be completed at the Contractor’s expense.

c. The trench safety plans shall be prepared, stamped and signed by a civil or structural engineer registered in California. Stamped and sealed copies of calculations necessary to obtain approval of the systems shall be submitted also. These plans shall be posted on the job site.

d. Nothing herein shall be deemed to allow the use of a shoring, sloping, or protective system less effective than that required by the Construction Safety Orders of the Division of Industrial Safety.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 REMOVAL OF SHORING

A. Removal of shoring shall not damage pipes or structures, cause settlement or heave the ground surface, or produce vibrations that could damage adjacent pipe or structures.

B. Minimum compaction requirements must be met after shoring is removed.

PART 4 TESTING (NOT USED)

END OF SECTION

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SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Compacted fill from top of utility bedding to subgrade elevations.
2. Backfilling and compaction.
3. Backfilling site structures to subgrade elevations.
4. Fill under paving.
5. Fill for over-excavation.

1.2 MEASUREMENT AND PAYMENT

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

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 10-lb Rammer and a 18-in. Drop.

B. ASTM International:

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3).
2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3).
4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
5. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.4 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit or cable.

1.5 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with Caltrans Standard Plans

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.8 COORDINATION

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

B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Per Typical Trench Detail in the Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

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

B. Verify subdrainage, damp-proofing, or waterproofing installation has been inspected.

C. Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.

1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.3 PREPARATION

A. Trenching:

1. Notify affected utility companies not less than three working days before performing Work.

a. Request underground utilities to be located and marked within and surrounding construction areas. Conduct additional utility locating including ground penetrating radar, potholing and other means.

2. Identify required lines, levels, contours, and datum locations.

3. Protect plant life, lawns, and other features remaining as portion of final landscaping.

4. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

5. Maintain and protect above and below grade utilities indicated to remain.

6. Establish temporary traffic control when trenching is performed in public right-of-way. Relocate controls as required during progress of Work.

B. Backfill:

1. Compact subgrade to density requirements for subsequent backfill materials.

2. Cut out soft areas of subgrade not capable of compaction in place. Backfill with select fill and compact to density equal to or greater than requirements for subsequent fill material.

3. Scarify subgrade surface to depth of 6 inches.

4. Proof roll / compact to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.4 TRENCHING

A. Excavate subsoil required for utilities to utility service.

B. Remove lumped subsoil, boulders, and rock.

C. Perform excavation within 24 inches of existing utility service in accordance with utility's requirements.

D. Do not advance open trench more than 200 feet ahead of installed pipe. Access to all open trenches to be controlled by contractor. Open trenches shall be covered with plates when not directly monitored.

E. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.

F. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe.

G. Do not interfere with 45 degree bearing splay of foundations.

H. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Engineer until suitable material is encountered.

I. Cut out soft areas of subgrade not capable of compaction in place. Backfill with coarse aggregate and compact to density equal to or greater than requirements for subsequent backfill material.

J. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

K. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.

L. Remove excess subsoil not intended for reuse from site.

M. Stockpile subsoil in area designated on site to depth not exceeding 8 feet and protect from erosion.

3.5 WIDTH OF TRENCH

A. Except where otherwise specifically permitted, sides of trenches shall be vertical, shored as required, and shall be of uniform width from top to bottom. Trenches shall be of a width as shown on the detail sheets in the Contract Drawings. In no case shall the free working space on each side of the pipe be less than 6-inches.

B. The maximum width of trench measured at the top of the pipe shall be kept to a minimum and not exceed the outside diameter of pipe plus 12 inches.

C. If trench widths exceed those shown on the plans, install all additional stabilization material, bedding and cover, backfill, base and paving in conformance with these specifications at no additional cost to the District.

3.6 SHEETING AND SHORING

A. Contractor’s attention is directed to General Conditions, Section B-52 – Safety.

B. Contractor’s attention is directed to Section 31 23 30 – Shoring and Trench Safety.

C. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

D. Support trenches more than 5 feet deep. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

E. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

3.7 BACKFILLING

A. Backfill areas to contours and elevations with fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, or spongy subgrade surfaces.

C. Place material in continuous layers as follows:

1. Subsoil Fill: Select Fill, maximum 8 inches loose depth.

2. Structural Fill: Coarse Aggregate Base, maximum 6 inches loose depth.

3. Granular Fill: Coarse Aggregate Subbase, maximum 6 inches loose depth.

D. Employ placement method that does not disturb or damage utilities in trench.

E. Maintain optimum moisture content of backfill materials to attain required compaction density.

F. Do not leave more than 50 feet of trench open at end of working day. Any trenches left open at the end of the working day are to be covered by plates.

G. Protect open trench to prevent danger to the public.

H. Make gradual grade changes. Blend slope into level areas.

I. Remove surplus backfill materials from site.

J. Leave fill material stockpile areas free of excess fill materials.

3.8 TOLERANCES

A. Top Surface of Backfilling Under Paved Areas: Plus or minus 1/4 inch from required elevations.

B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.9 FIELD QUALITY CONTROL

A. Perform laboratory material tests in accordance with ASTM D698.

B. Perform in place compaction tests in accordance with the following:

1. Density Tests: ASTM D1557 and ASTM D6938.

2. Moisture Tests: ASTM D6938.

C. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

D. Frequency of Tests: Minimum of one test in each 1 foot of backfill, for every 100 feet of trench.

E. Proof roll compacted fill surfaces under paving.

3.10 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic.

3.11 SCHEDULE

A. Fill Under Grass and Landscaped Areas:

1. Select Fill, to 6 inches below finish grade, compact uniformly to 80 percent of maximum density.

B. Fill Under Asphalt and Concrete Paving:

1. Compact subsoil to 95 percent of its maximum dry density.

2. Coarse Aggregate Subbase Fill, to 6 inches below bottom paving elevation, compact uniformly to 95 percent of maximum density.

3. Coarse Aggregate Base Fill, to bottom paving elevation, compact uniformly to 95 percent of maximum density.

C. Fill to Correct Over-excavation:

1. Select Fill, flush to required elevation, compact uniformly to 95 percent of maximum density.

END OF SECTION

SECTION 31 25 13

HYDROSEEDING AND REVEGETATION

PART 1 GENERAL

1.1 WORK

A. The work consists of sowing seed, placing mulch, and anchoring mulch in designated areas as specified.

B. The Contractor shall obtain seed and actively seed and mulch areas with a Native Seed Mix where earthwork and/or grading and ground disturbance has occurred and reseed any disturbed areas or areas where active seeding did not germinate within the Three-Month Seed Establishment Warranty Period.
   1. All areas where the Contractor's grading operation, trucks, and other equipment have significantly reduced or harmed the existing grass, weed, brush, or other plant cover shall be considered to have been disturbed and shall require seeding.

C. Cover all sloped areas steeper than 4 (horizontal):1 (vertical) which are disturbed by the Contractor's operations with straw and excelsior blankets after hydroseeding as specified herein.

D. The Contractor *is not* responsible for seed maintenance beyond the Three-Month Seed Establishment and Warranty Period unless the minimum percent survivability has not been achieved (see Seed Establishment and Warranty Period section).

E. After active seeding commences, Contractor shall guarantee work for a minimum duration of three (3) months with minimum 70% survivability or greater of seed species used in the seeding application.

F. Contractor shall provide all material, labor, and equipment necessary to satisfy all work as shown on the Drawings and specified herein. The work of this section includes but is not limited to:
   1. Flag Revegetation Areas
   2. Active Seeding
   3. Inspection
   4. Supplemental Seeding
   5. Clean-up

1.2 MEASUREMENT AND PAYMENT

A. Measurement and Payment for the requirements of this section shall be paid for under the Erosion and Sediment Control item. No separate measurement or payment will be made for the requirements of this Section.

1.3 RELATED SECTIONS

A. Section 01 57 13 – Erosion Control

B. Section 01 74 00 - Site and Area Cleanup

C. Section 02 01 00 - Site Conditions

1.4 REFERENCES

A. Seed material standards: "American Standard for Nursery Stock," 2004-edition; American Association of Nurserymen.

1.5 DEFINITIONS

A. Mulch: Certified weed free imported wood chips or certified weed free rice straw.

1.6 QUALITY ASSURANCE

A. Seed shall be delivered to the site tagged and labeled in accordance with the California Agricultural Code and shall be acceptable to the County Agricultural commissioner. Bag tag figures shall be evidence of purity and germination. Time since date of seed test shall not exceed nine (9) months.

B. Seed shall be free of pathogens, invasive seeds, and non-native insects. Seed shall comply with federal and state laws requiring inspection for seed diseases and infestations inspection certificates, as required by law, shall accompany each shipment of seeds and shall be submitted to the Engineer.

C. In the event that the Contractor chooses to retain a seed supplier, an experienced seed supplier shall be able to provide local genotypes of seed species at the minimum recommended quantities for restoration. Potential seed suppliers include, but are not limited to:

North Coast Native Nursery
P.O. Box 744
Petaluma, CA 94953
(707) 769-1213

Humboldt Fish Action Council
4701 W End Rd
Arcata, CA 95521
(707) 822-3834

Pacific Coast Seed, Inc.
6144 A Industrial Way
Livermore, CA 94550
(925) 373-4417

Freshwater Farms
5851 Myrtle Ave
Eureka, CA 95503
(707) 444 8261

Oaktown Native Seed Nursery
P.O. Box 634
Alameda, CA 94501
(510) 534-2552 or (510) 387-9744

Yerba Buena Nursery
19500 Skyline Blvd.
Woodside, CA 94062
(650) 851-1668

Samara Restoration
5260 Dow's Prairie Rd
McKinleyville, CA 95519
(707) 357-3493

Sunmark Seeds International, Inc.
PO Box 1210
Fairview, OR 97024
(503) 241-7333

1.7 SUBMITTALS

A. The Contractor is responsible for supplying and obtaining the seed stock at the recommended minimum quantities. The Contractor shall submit a signed certification from each source of supply for all materials indicating that the material meets the Specification requirements. All seed and seed material shall be native seed from within the northwest coastal ecoregion of California or southwest Oregon.

B. A letter, signed certification or appropriate lot tag, from propagule provider stating scientific name, common name, quantity and origin of seed material to confirm that it meets the requirements described in this Seed Application Specification.

C. Manufacturer's receipt that describes the provenance and constituents of mulch and certifies that it meets the specification described in this Section. Receipt shall certify that mulch does not contain noxious weeds or originate from a Sudden Oak Death host seed species derived from a quarantined county.

D. Manufacturer's specification sheets shall be provided for all erosion matting or blankets.

1.8 TIMING AND COORDINATION

A. The Contractor shall provide all equipment, labor, and materials required to perform the required maintenance as described in this specification during the Three-Month Seed Establishment and Warranty Period.

B. The Contractor shall inform the Engineer ten (10) working days prior to implementation of this Specification Section.

C. Contractor shall be responsible for the proper storage, handling, and protection of seed materials once they are delivered to Project site. Contractor shall maintain seed stock in a healthy condition at all times.

D. Order and Timing of Work: The following approximate order of work and timeframes are assumed for the work.
   1. Layout of seeding areas.
   2. All disturbed areas shall be hydroseeded. Timing of seed application shall be in accordance with Part 3 of this Specification.

E. After completion of active seeding, the Contractor shall request an inspection and approval to begin the Three-Month Seed Establishment and Warranty Period. The Three-Month Seed Establishment and Warranty Period shall begin upon written notice of acceptance by the Engineer and continue for a minimum of three (3) months.

F. Completion of Three-Month Seed Establishment and Warranty Period shall be confirmed in writing by the Engineer.

PART 2 PRODUCTS

2.1 GENERAL

A. Materials not conforming to these Specifications and requirements shall remain the property of Contractor and shall be removed from Project site at no additional cost to the Owner.

2.2 MATERIALS

A. All products shall be in conformance with the specifications listed below. Any changes to products to be used shall be approved, in writing, by the Engineer prior to job site delivery.

B. Seed: Each seed bag shall be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. In addition, the container shall be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained.
   1. All seed shall be in conformance with the California State Seed Law of the Department of Agriculture. Seed shall be of a quality that weed seed shall not exceed 0.5 percent of the aggregate of Pure Live Seed (percent germination x percent purity) and other material.
   2. Seed shall be minimum seventy-six (76) percent Pure Live Seed (PLS = percent purity x percent germination).
   3. Prior to seeding at the request of the Engineer, the contractor shall provide a letter of certification, original Association of Official Seed Analysts (AOSA) seed test results and calculations.
   4. Legume seed shall be inoculated with inoculate specific to its needs within two (2) hours prior to seeding. Inoculants shall not be used later than the date indicated on the container or as otherwise specified. All inoculated seed shall be labeled to show weight of seed, date of inoculation, and the weight and source of inoculated materials. All legume seed shall be pellet-inoculated. Inoculant sources shall be species specific and shall be applied at a rate of two (2) pounds of inoculant per one hundred (100) pounds of seed.
   5. The Contractor shall retain supplemental seed in anticipation of incidental seeding for non-performing areas.

C. Fiber: Hydroseed mix fiber material shall be wood cellulose fiber containing no growth or germination-inhibiting factors. Natural wood cellulose fiber shall have the property of dispersing readily in water and shall have no toxic effect when combined with seed or other material. The homogenous slurry or mixture shall be capable of application with power spray equipment. A green colored dye which is non-injurious to seed growth shall be used. Wood cellulose fiber shall be packaged in new label containers marked by the manufacturer to show the air-dry weight content. The fibrous mulch in its air-dry state shall contain no more than 15% by weight of water.

D. Stabilizing Emulsion/Tackifier: Stabilizing emulsion shall be an organic substance supplied in powder form and shall be psilium-based and packed in clearly marked bags stating the contents of each package. The film shall be nonflammable and shall have an effective life of at least one (1) year. Stabilizing emulsion shall be nontoxic to

seed or animal life. In the cured state, the stabilizing emulsion shall not be re-emulsified. The material shall be registered with and licensed by the State of California, Department of Food and Agriculture, as an “Auxiliary Soil Chemical.” Stabilizing emulsion shall be miscible with water at the time of mixing an application. Stabilizing emulsion shall not be applied during rainy weather or when soil temperatures are below forty (40) degrees Fahrenheit.

E. Mycorrhizal Inoculum: Endo (arbuscular) mycorrhizal inoculum shall be registered by the California Department of Food and Agriculture and consist of spores, mycelium and mycorrhizal root fragments in a solid carrier suitable for handling by hydro-seeding.
   1. The carrier shall be the material in which the inoculum was originally produced, and may include organic materials, vermiculite, perlite, calcined clay, or other approved materials consistent with mechanical application and with good plant growth.
   2. Each endomycorrhizal inoculum shall carry a supplier's guarantee of eighty thousand (80,000) propagules minimum per kilogram. The minimum propagule count shall be shown on each label provided. If more than one (1) fungal species is claimed by the supplier, the label shall include a guarantee for each species of mycorrhizal fungus claimed.
   3. Endomycorrhizal fungal species shall be suitable for the pH of the soil at the planting site. If the inoculum consists of a mixture of species, no more than 20% of the claimed propagule count shall consist of fungal species known to be unsuitable for the pH of the soil at the planting site.
   4. A sample of approximately twenty-eight (28) grams (one ounce) of inoculum will be taken from each inoculum container by the Contractor. The number of propagules will be determined by laboratory testing. Propagules shall include live spores, mycelial fragments and viable mycorrhizal root fragments.
   5. Endomycorrhizal inoculum shall be stored, transported and applied at temperatures of less than 32° C (90° F).

F. Mulch: Mulch shall be derived from certified weed-free rice straw or approved imported weed free wood chips. Material shall be free of salt, foreign and deleterious materials.
   1. Materials for imported wood mulch shall not contain noxious weeds or originate from a Sudden Oak Death host seed species derived from a quarantined county. Imported wood mulch shall not be produced from tree trimmings that contain leaves, seeds, inflorescences, or small twigs.

G. Rice Straw: Shall be three (3) to eight (8) inches in length. The contractor shall furnish evidence that clearance has been obtained from the County Agricultural Commissioner, as required by law, before straw from outside the county in which it is to be used is delivered to the site of the work. Straw that has been used for animal/livestock bedding is prohibited.

H. Weed mat: No use of plastic monofilament for erosion control that wildlife may become entrapped in is allowed. Erosion control blankets or matting shall consist of a wood machined mat of curled wood excelsior of 80% six (6) inch or longer fiber length, or a combination of agricultural straw and coconut fiber matrix, stitch bonded with biodegradable thread to a standard photodegradable polypropylene netting. Blankets shall have a consistent thickness, with the fibers evenly distributed over the

entire area of the blanket. The blanket materials shall not contain any chemical additives.

1. Erosion control blankets or matting shall consist of rolls either four (4) feet wide or eight (8) feet wide and shall be Curlex Blankets as manufactured by American Excelsior Company, SC150 Extended-Term Blanket as manufactured by North American Green, or approved equal.

I. Water: Water shall be clean, and free of deleterious material. Water shall be suitable for agricultural use and shall be free of harmful substances and salts that would adversely affect seed growth or vigor.

J. Seed Quantities: Seed quantities are listed in Table 1:

Table 1: Seed Mix

Common Name	Scientific Name	Pure Live Seed (pounds/acre)
small fescue	*Vulpia microstachys*	4.00
California fescue	*Festuca californica*	1.00
California brome	*Bromus carinatus*	9.00
blue wild rye	*Elymus glaucus*	8.00
red fescue	*Festuca rubra*	10.5
Yarrow	*Achillea millefolium*	0.50
meadow barley	*Hordeum brachyantherum*	3.00
tufted hairgrass*	*Deschampsia cespitosa*	4.00

PART 3 – EXECUTION

3.1 SEEDING

A. No seeding or container planting shall take place until the Engineer has approved the subsoil and topsoil grading and preparation.
   1. On slope areas, no straw or erosion control blankets shall be installed until the Engineer has first approved the hydroseeding where the blankets are to be placed.

B. Seeding Methods: Hydroseeding, Broadcast, cultipaker/ringroller over broadcast seed, may be employed.

C. Soil Preparation: levels, profiles and contours shall be maintained. All dirt clods shall be removed by rolling or other means. The minimum thickness of topsoil after grading shall be six (6) inches. Changes in grade shall be made gradual. Slopes shall be blended into level areas. Foreign materials, weeds, undesirable plants and their roots shall be removed from the subsoil prior to placement of the topsoil.

D. Broadcast seeding with a Cyclone Type Seeder: Seed shall be broadcast using manually operated cyclone-type spreaders or by hand. After seedbed preparation has

been completed, seeds shall be applied over disturbed areas by uniformly broadcast seeding the seed mix at the specified seeding rate.

E. Hydroseeding: Mixture shall be prepared on site. Slurry shall consist of a homogenous mixture of fiber, stabilizing emulsion, and water (used as the mixing agent); add seed immediately before hydroseeding. Agitate the mixture for 3-15 minutes to allow for uniform mixing of the specified ingredients and applied immediately and emptied from tank within one-half (1/2) hour after addition of the seed to the mix. The slurry shall be colored with a nontoxic water soluble dye to aide in identification of treated areas and to ensure uniform application. No mixture shall be left in the seeder for more than eight (8) hours. Application shall not occur when rainfall is expected within twenty-four (24) hours.
   1. Material shall be as follows (Table 2):

Table 2 Hydroseeding Materials: Three Step Hydraulic Straw Treatment

Material	**Per Acre (Slope Measurement)**
Fiber	1,000 pounds (unless otherwise specified by manufacturer based on site conditions)
Stabilizing Emulsion	As specified by manufacturer based on site conditions
Seed	Species specified herein; 40/bs/acre
Fertilizer	1200 BioSol natural fertilizer or approved equal
Water	As needed for application

Step 1:

1) The application shall be applied at a rate of one-thousand (1000) pounds of 100% wood fiber per acre and the specified quantity of seed per acre, plus tackifier.
2) If tackifying straw is used during hydroseeding, fiber in the hydromulch slurry can be reduced to seven-hundred fifty (750) pounds per acre. Straw shall be applied at one-thousand (1,000) pounds per acre. If using Hydrostraw with a tacking agent, then the tackifier is not necessary.
3) The mixture shall be applied so that no gaps exist between the hydromulch matrix and the soil, and no holes greater than fifty (50) millimeters in the matrix. Apply specified slurry in a sweeping motion to form a uniform application.

3.2 MULCH

A. Placed to prevent erosion and allow for seed germination.

B. Mulch treatments shall be uniformly spread in areas where broadcast seeding implementation method has been used. Broadcast seeding, performed immediately after crimped straw installation, is allowed.

C. Where specified for areas that will be seeded, the following amounts of approved weed free wood chips or rice straw mulch.

% Slope	Pounds per Acre
0 – 10%	500
10 – 20%	1,000

20 – 30%	1,500
>30%	2,000

D. Contractor shall spread mulch uniformly over the area. If a mulch blower is used, the strands shall not be shredded less than eight (8) inches in length to allow anchoring. Anchor mulch immediately after placing to minimize loss by wind and water. Use a mulch anchoring tool that is a series of straight notched disks specifically designed for the purpose, to crimp the mulch to a depth of two (2) to three (3) inches. To maintain proper seed depth, a regular farm disc shall not be used to crimp mulch.

E. Application rate for straw shall not be less than two hundred (200) pounds of straw per one-thousand (1,000) square feet.

F. Under suitable conditions (where it cannot be anchored by rollers or crimping equipment and where approved by Engineer) rice straw shall be uniformly spread at the specified rates. The straw may be pneumatically applied as long as the resulting straw in predominately three (3) to six (6) inches in length. The straw shall be treated with tackifier before it can blow or float off the site but in no case shall straw be left untreated for more than two (2) hours.

G. Contractor shall not use binders that can damage shoes and/or clothing. Contractor shall apply tackifier at rates recommended by the manufacturer for the mulch anchoring.

H. The contractor shall clean up areas of straw which are blown from the site, and the areas shall be retreated at no additional expense.

3.3 FIELD QUALITY CONTROL

A. Contractor shall inspect project site and become familiar with any access requirements, access restrictions, and any other site conditions.

B. Preparation: Contractor shall only commence revegetation work once a notice to proceed has been received from the Engineer.

C. Contractor shall coordinate with the Engineer to confirm the locations of each seeding area prior to implementation.
   1. Each revegetation area shall be flagged by Contractor at the direction of the Engineer and constitute the limits of that seeding area

D. Contractor shall not commence Three-Month Seed Establishment and Warranty Period work until approval has been received from Engineer.

E. Contractor shall notify Engineer a minimum of ten (10) working days prior to the following inspections, unless otherwise noted herein:
   1. Inspections.
   2. Installation of supplemental seeding.

F. Progress inspections: Periodic progress inspections may be made by Engineer.

3.4 IRRIGATION

A. All areas shall be irrigated after the initial installation, unless directed otherwise by the District or Engineer.

B. Methods: Water may be provided by hand spraying water from a water truck or other water system, sprinklers are not recommended. Water may be sourced from surface and/or groundwater sources that are available (and permitted) and approved by the District. No high-pressure or fire hoses may be used for irrigation.

C. Maintain adequate moisture depth in soil to ensure vigorous growth; hand water as required.

D. Frequency and Duration: Watering shall occur once every ten (10) to fourteen (14) days, during the dry season (May-October) and/or a prolonged period of late rain in the fall.

E. Contractor shall inspect seeded areas for signs of water stress and water accordingly during the Three-Month Seed Establishment and Warranty Period and only under the direction of Engineer.

3.5 INSPECTIONS

A. The Contractor shall conduct bi-weekly (two 2) times per month for a total of six (6) inspections) on-site inspections during the Seed Establishment and Warranty Period. Inspection shall include, at a minimum, assessment of damaged, injured, or non-performing seeded areas, need for supplemental seeding, non-native invasive and competitive weed removal to be performed by the HBMWD, need for additional mulch or irrigation, potential repairs to erosion controls. An inspection report including data collected and assessment of the seed establishment as described herein shall be provided to the Engineer within five (5) working days of each inspection.

B. Contractor shall be required to correct any deficiencies to Engineer’s satisfaction by reseeding areas that fail to grow by the end of the Three-Month Establishment and Warranty Period if a minimum of seventy (70) percent vegetative establishment of the actively seeded species is not achieved.

3.6 SUPPLEMENTAL REVEGETATION

A. Replacement seeding shall occur in areas of bare soil in accordance to these specifications. Seeds must be of the same quality as specified in section 2 of this Specification and installed per section 3.1-Seeding.

B. After seeding, mulch mixture shall be lightly compacted into the soil surface to help ensure good soil/seed contact.

C. Supplemental revegetation areas shall be marked on the Record Drawings.

3.7 NONNATIVE INVASIVE AND COMPETITIVE WEED CONTROL

A. The Contractor is not responsible for weeding, maintenance, or invasive species control. The Engineer shall coordinate with the HBMWD if nonnative invasive and competitive seed or weed species persist or become established within the seeding or planted areas to determine the appropriate removal timing and method.

3.8 CLEAN-UP

A. Establish cleaning areas for vehicles and equipment moving between known infested and uninfested weed areas. Inspect and clean vehicles and equipment, prior to moving between known infested sites and uninfested areas, to help reduce the spread of weeds and invasive species.

3.9 REVEGETATION ESTABLISHMENT AND WARRANTY

A. A. Revegetation Establishment Period: Contractor shall notify Engineer at least one (1) week prior to completion of all seeding and planting related work for the initial inspection. The approval shall signify that the live material has been satisfactorily installed and the “Three-Month Revegetation Establishment and Warranty Period” may begin.
   1. If the inspection reveals deficiencies in the revegetation areas, Engineer shall give the Contractor a list of deficiencies to be corrected by the Contractor.

   2. If the inspection reveals deficiencies in the revegetation areas before the end of Three-Month Revegetation Establishment and Warranty Period, Engineer shall give the Contractor a list of deficiencies to be corrected by the Contractor.

B. Protect revegetation areas against damage during Three-Month Revegetation Establishment and Warranty Period until Final approval. If any seeded area becomes damaged or injured, remedy or replace immediately as directed by Engineer at no additional cost to District.

C. Guarantee and Replacement:
   1. Guarantee all revegetation areas to be in good health and in thriving condition until the end of the maintenance period or until active growth is evident for three (3) months from date of acceptance.
   2. Replace any seeded areas, which fail to establish normal healthy growth or are missing during the first three (3) months. Additionally, replace seeding stock based on the success criteria within Three-Month Revegetation Establishment and Warranty Period at no additional cost to District.

D. Replenish mulch (if applicable) and maintain adequate soil moisture at all times during Three-Month Revegetation Establishment and Warranty Period.

E. At the conclusion of Three-Month Revegetation Establishment and Warranty Period, the seeded areas shall be compared to the “Three-Month Revegetation Establishment and Warranty Period Success Criteria” below. These success criteria

must be met for sign-off of completion of the Revegetation Establishment and Warranty Period and to relieve Contractor of maintenance requirements.

Three-Month Establishment and Warranty Success Criteria

Seeded Areas	Minimum of 70% survivability of seeded grass species and/or native and naturalized grass species known from the project area. No more than five percent relative cover of target invasive* seeds. No large un-vegetated bare spots or erosional areas greater than 100 square feet.
* Invasive species are defined as those listed by the California Invasive Species Council (Cal-IPC) or HWMA with a rating of high or moderate	

F. Final Inspection and Acceptance: Final inspection will be conducted upon completion of maintenance replacements, and corrective work. Five (5) working days' notice shall be given. If project improvements, corrective work, and maintenance have not been performed as specified and to the satisfaction of Engineer, maintenance shall continue at the Contractor's expense until such time and work has been successfully completed.

END OF SECTION

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SECTION 32 12 16

ASPHALT PAVING

PART 1 GENERAL

1.01. SUMMARY

A. Section Includes:

1. Asphalt materials.
2. Aggregate materials.
3. Aggregate subbase.
4. Asphalt paving base course, binder course, and wearing course.
5. Surface slurry.

1.02. REFERENCE STANDARDS

A. State Specification:

1. Caltrans Standard Plans.
2. Caltrans Standard Specifications.

B. 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 M320 - Standard Specification for Performance-Graded Asphalt Binder.
5. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
6. AASHTO MP1a - Standard Specification for Performance-Graded Asphalt Binder.

C. 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.

D. ASTM International:

1. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.

2. ASTM D977 - Standard Specification for Emulsified Asphalt.

3. ASTM D1188 - Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples

4. ASTM D2726 - Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.

5. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.

6. ASTM D3381 - Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.

7. ASTM D3549 - Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.

8. ASTM D3910 - Standard Practices for Design, Testing, and Construction of Slurry Seal.

9. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

1.03. SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit product information for asphalt and aggregate materials.

2. Submit mix design with laboratory test results supporting design.

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

1.04. QUALITY ASSURANCE

A. Obtain materials from same source throughout.

1.05. QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with minimum 5 years documented experience.

1.06. AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.

B. Do not place asphalt mixture when surface is wet.

C. Place asphalt mixture when temperature is between 225 and 300 degrees F.

PART 2 PRODUCTS

2.01. ASPHALT PAVING

A. Performance / Design Criteria: meet requirements Caltrans encroachment permit.

B. Asphalt Materials:

1. Asphalt Cement: meet requirements of Caltrans encroachment permit.

2. Tack Coat: In accordance with Caltrans encroachment permit.

3. Reclaimed Asphalt Pavement (RAP): Processed material obtained by milling or full depth removal of existing asphalt paving.

4. Oil: In accordance with Caltrans standards.

C. Aggregate Materials:

1. Coarse Aggregate: In accordance with Section 31 05 16 Coarse Aggregate Base.

2. Fine Aggregate: In accordance with Section 31 05 16 Fine Aggregate.

D. Aggregate Subbase: Specified in Section 32 11 23.

2.02. MIXES

A. Use dry material to avoid foaming. Mix uniformly.

B. Asphalt Paving Mixtures: Designed in accordance with Caltrans standards.

C. Surface Slurry: not used for this project.

2.03. SOURCE QUALITY CONTROL

A. Submit proposed mix design for review prior to beginning of Work.

B. Test samples in accordance with Caltrans standards.

PART 3 EXECUTION

3.01. EXAMINATION

A. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.

B. Verify compacted subbase is dry and ready to support paving and imposed loads.

1. Proof roll subbase with fully loaded 10 yard dump truck in minimum two perpendicular passes to identify soft spots.

2. Remove soft subbase and replace with compacted fill.

C. Verify gradients and elevations of base are correct.

D. Verify gutter drainage grilles and frames, manhole frames, and cleanout and valve covers are installed in correct position and elevation.

3.02. PREPARATION

A. Prepare subbase in accordance with Drawings.

3.03. DEMOLITION

A. Saw cut and notch existing paving.

B. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.

3.04. INSTALLATION

A. Subbase:

1. Aggregate Subbase

B. Primer:

1. Apply primer in accordance with Caltrans encroachment permit.

C. Tack Coat:

1. Apply tack coat on asphalt and concrete surfaces at uniform rate in accordance with Caltrans encroachment permit.

2. Apply tack coat to contact surfaces of curbs, gutters and slabs.

3. Coat surfaces of manhole and catch basin frames with oil to prevent bond with asphalt paving. Do not tack coat these surfaces.

D. Single Course Asphalt Paving:

1. Place asphalt within 24 hours of applying primer or tack coat.

2. Place asphalt wearing course to thickness indicated on Drawings.

3. Compact paving by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.

4. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.05. TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation from Indicated Elevation: Within 1/2 inch.

3.06. FIELD QUALITY CONTROL

A. Take samples and perform tests in accordance with Caltrans standards.

B. Asphalt Paving Mix Temperature: Measure temperature at time of placement.

C. Asphalt Paving Thickness: ASTM D3549; test one core sample from every 1000 square yards compacted paving.

D. Asphalt Paving Density: ASTM D2950 nuclear method; test one location for every 1000 square yards compacted paving.

3.07. PROTECTION

A. Immediately after placement, protect paving from mechanical injury for 6 hours or until surface temperature is less than 140 degrees F.

END OF SECTION

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PART 5
APPENDICES

APPENDIX A – PSI EQUIPMENT AND P&ID DRAWINGS

APPENDIX B – SODIUM HYPOCHLORITE BATCH TANK CUT SHEET

APPENDIX C – BRINE STORAGE TANK CUT SHEET

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APPENDIX A – PSI EQUIPMENT AND P&ID DRAWINGS

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SECTION 8.0

EQUIPMENT

8.1	Electrolytic Cell Skid	
8.2	Hydrogen Dilution Blowers	
~~8.3~~	~~Hypochlorite Dosing Pump Components~~	Available upon request
~~8.4~~	~~Acid Cleaning Cart~~	

SECTION 8.1

ELECTROLYTIC CELL SKID

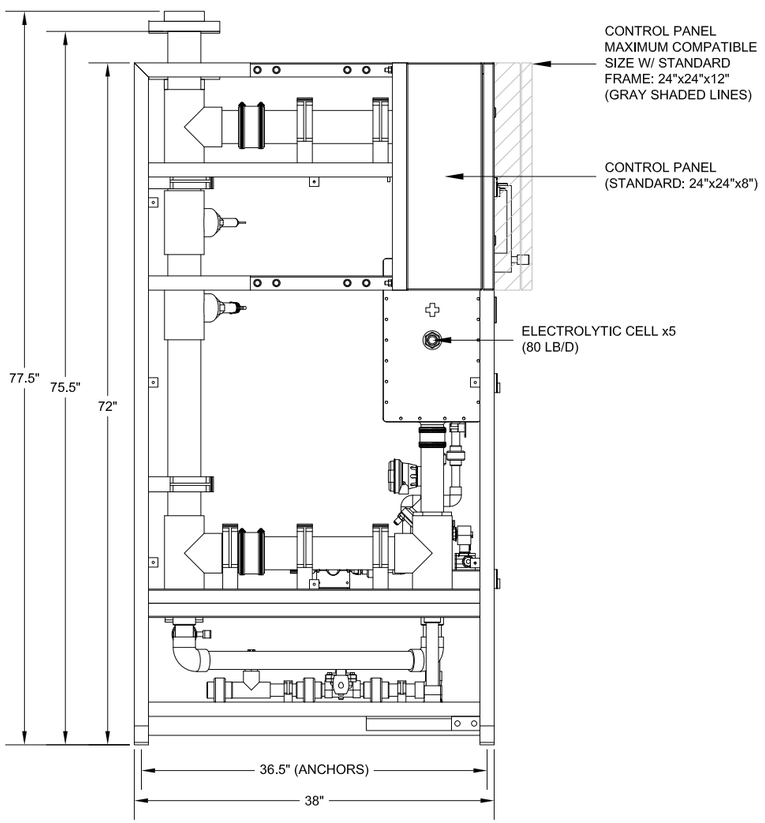
8.1.1 Electrolytic Cell Skid Outline and Utility Drawing

~~8.1.2 Electrolytic Cell Skid Product Data Sheets~~ Available upon request

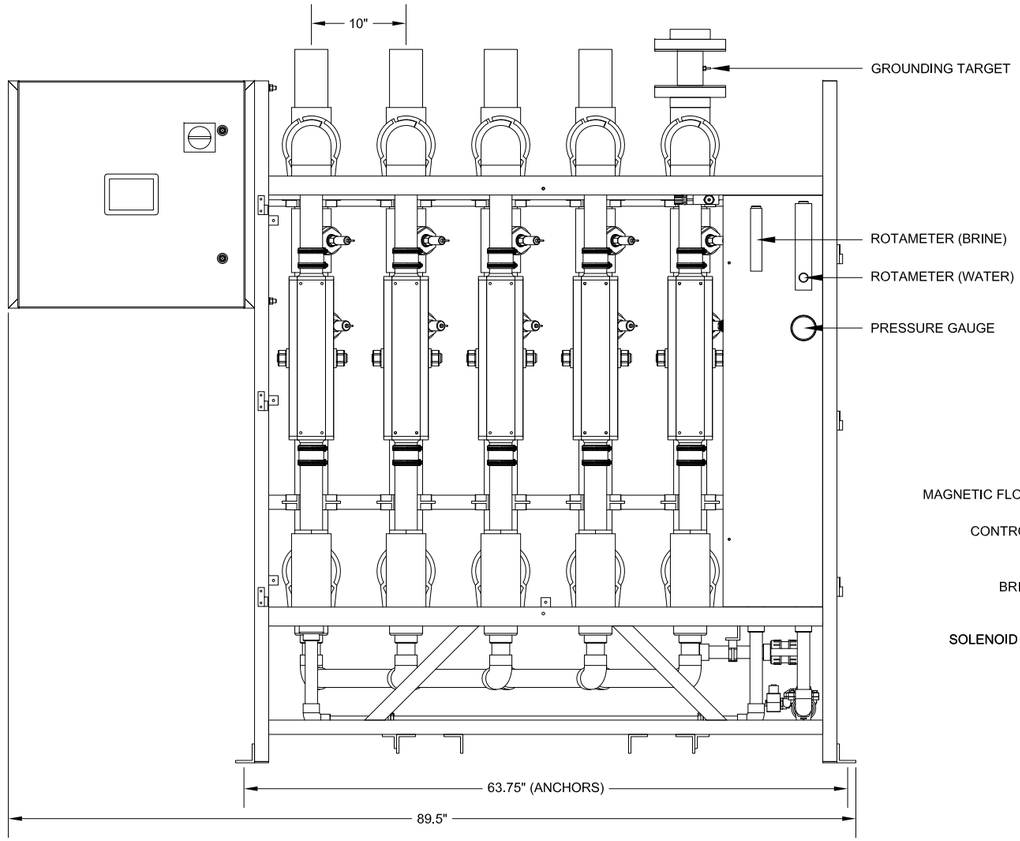
NOTES

1. WEIGHT
   - A. MICROCLOR SKID: 1,140 LB
   - B. TRANSFORMER/RECTIFIER: 700 LB
2. INLETS AND OUTLETS
   - A. WATER INLET FEED SIZE/MATERIAL: 1" PVC SCH80
   - B. BRINE INLET FEED SIZE/MATERIAL: 1/2" PE TUBE
   - C. VALVE VENT SIZE/MATERIAL: 1/4" PE TUBE
   - D. HYDROGEN VENT RISERS SIZE/MATERIAL: 4" PVC SCH80 (INSTALLED IN FIELD)
   - E. HYDROGEN HEADER SIZE/MATERIAL: 4" PVC SCH80 (INSTALLED IN FIELD)
   - F. HYPO OUTLET (ON RISERS) SIZE/MATERIAL: 3" PVC SCH80 (INSTALLED IN FIELD)
3. FRAME BASE DIMENSIONS: 5'-5.5"W x 3'-2"D
4. RECTIFIER BASE DIMENSIONS: 3'-7"W x 2'-8.5"D
5. RECTIFIER ELECTRICAL REQUIREMENTS: 480VAC, 3Ø, 80A SERVICE
6. CELL ELECTRICAL REQUIREMENTS: 38.4KVA, 300VDC, 128ADC
7. CONTROL PANEL ELECTRICAL REQUIREMENTS: REFER TO CONTROL PANEL DRAWINGS

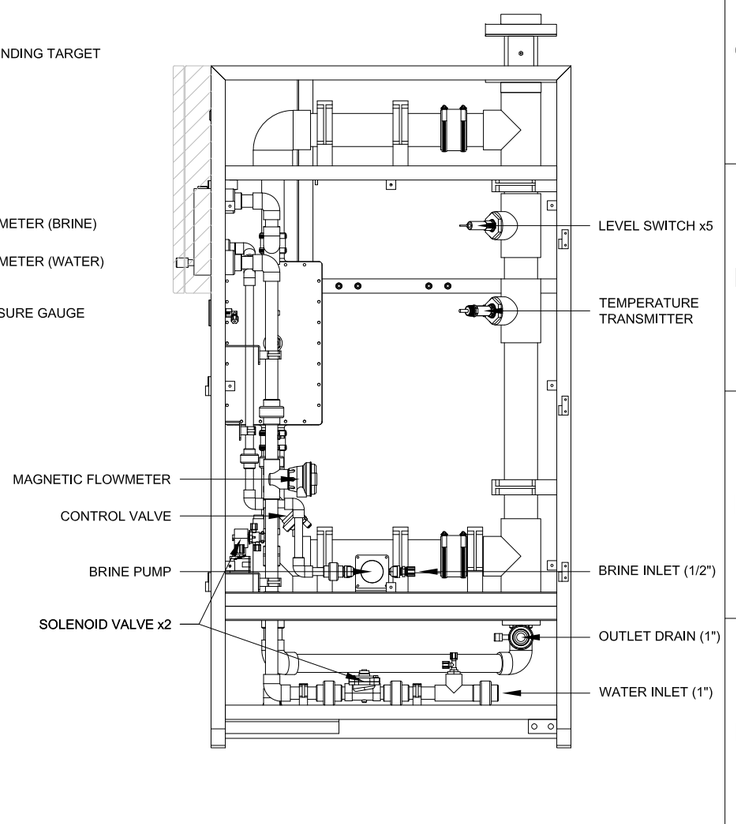
LEFT ELEVATION



FRONT ELEVATION



RIGHT ELEVATION



REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
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B	09/23/20	MK	ADDED CONTROL PANEL OPTIONS	△			
C	10/23/20	MK	UPDATED CELL ELECTRICAL REQUIREMENTS	△			
△				△			

PSI Water Technologies
A UGSI SOLUTIONS COMPANY

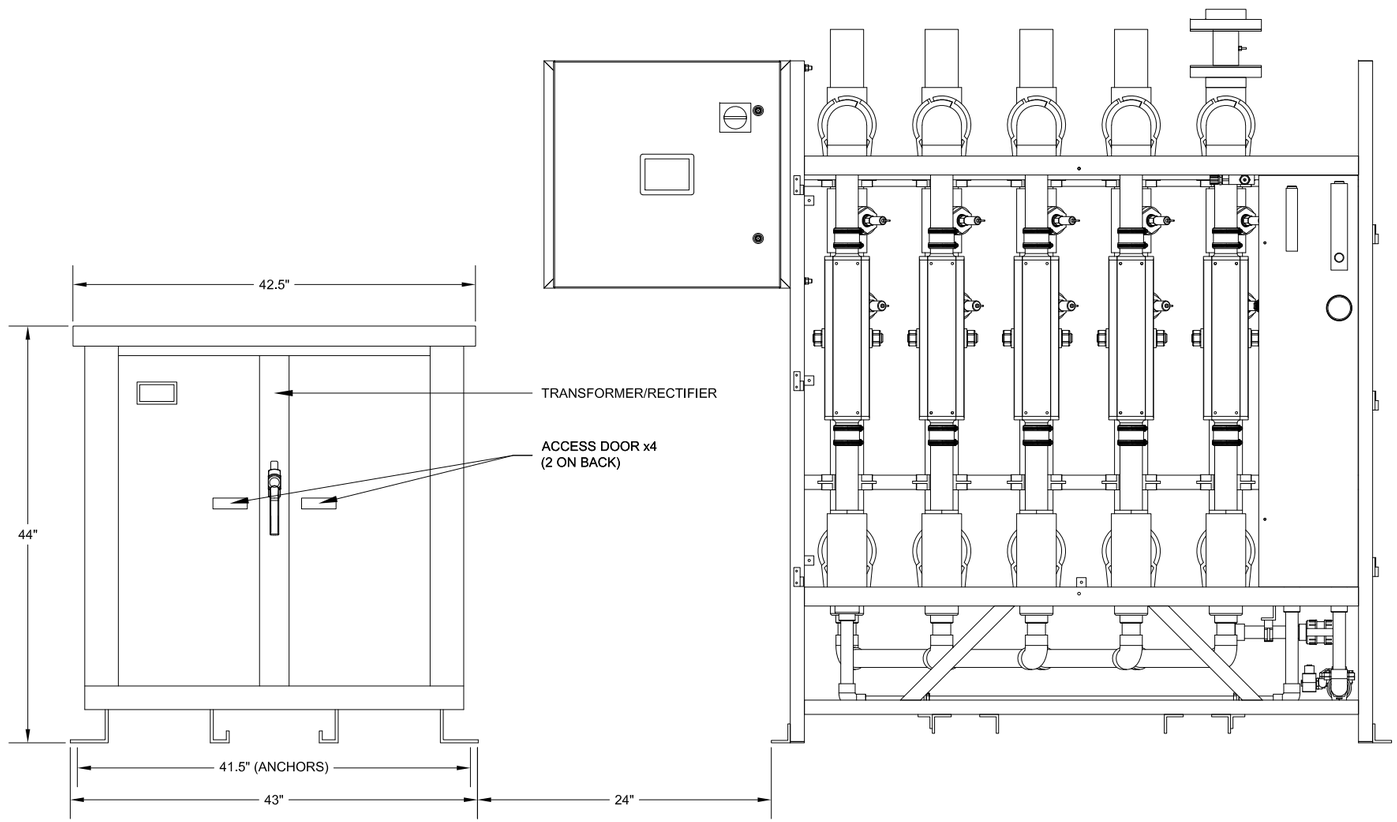
DRAWN BY: C. STOTHERS	DATE: 08/22/2018
CHECKED BY: M. KUSHMAN	DATE: 08/22/2018
SCALE: 1-1/2"=1'-0"	SIZE: D

PROJECT:
PSI WATER TECHNOLOGIES, INC.
STANDARD DRAWING

SUBJECT:
MICROCLOR
MC-400
OUTLINE & UTILITY DRAWING

DWG #: 000000-MC9040-OU | SHEET 1 OF 3 | REV. C

FRONT ELEVATION (GENERATION SKID & TRANSFORMER/RECTIFIER)



REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
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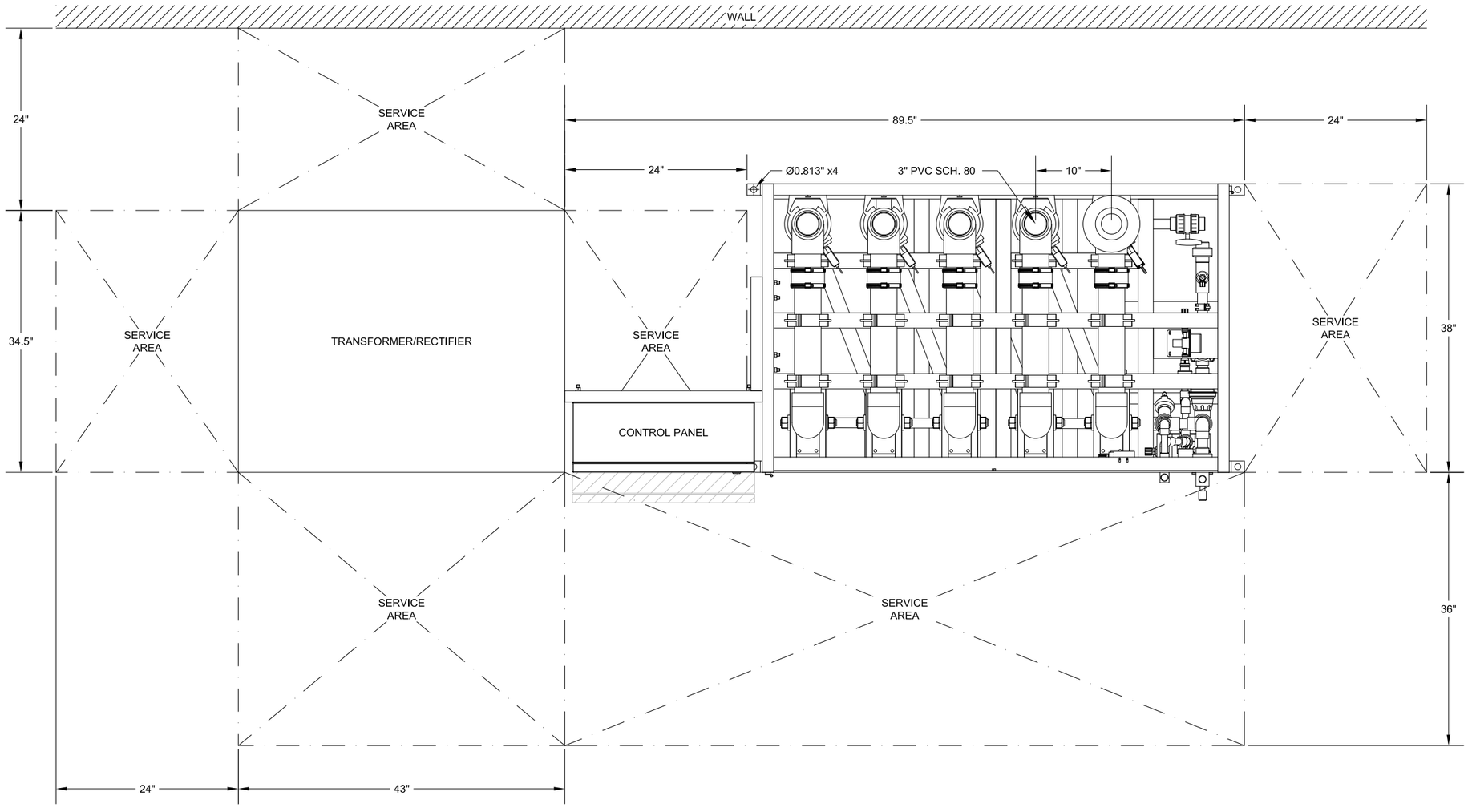
B	09/23/20	MK	ADDED CONTROL PANEL OPTIONS				
C	10/23/20	MK	UPDATED CELL ELECTRICAL REQUIREMENTS				

PSI Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: C. STOTHERS	DATE: 08/22/2018	PROJECT: PSI WATER TECHNOLOGIES, INC. STANDARD DRAWING
CHECKED BY: M. KUSHMAN	DATE: 08/22/2018	SUBJECT: MICROCLOR MC-400 OUTLINE & UTILITY DRAWING
SCALE: 1-1/2"=1'-0"	SIZE: D	DWG #: 000000-MC9040-OU | SHEET 2 OF 3 | REV. C

PLAN VIEW



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B	09/23/20	MK	ADDED CONTROL PANEL OPTIONS				
C	10/23/20	MK	UPDATED CELL ELECTRICAL REQUIREMENTS				

PSI Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: C. STOTHERS	DATE: 08/22/2018
CHECKED BY: M. KUSHMAN	DATE: 08/22/2018
SCALE: 1-1/2"=1'-0"	SIZE: D

PROJECT:
PSI WATER TECHNOLOGIES, INC.
STANDARD DRAWING

SUBJECT:
MICROCLOR
MC-400
OUTLINE & UTILITY DRAWING

DWG #: 000000-MC9040-OU | SHEET 3 OF 3 | REV. C

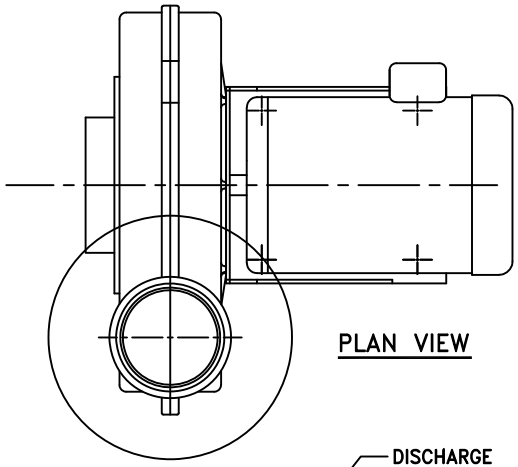
SECTION 8.2

HYDROGEN DILUTION BLOWER

~~8.2.1~~	~~Hydrogen Dilution Blower Specification Sheet~~
~~8.2.2~~	~~Hydrogen Dilution Blower Performance Curve~~
~~8.2.3~~	~~Hydrogen Dilution Blower Sound Data~~
~~8.2.4~~	~~Hydrogen Dilution Blower Product Data Sheet~~
8.2.5	Hydrogen Dilution Blower Dimensional Drawings
~~8.2.6~~	~~Hydrogen Dilution Blower Motor Specification Sheet~~
~~8.2.7~~	~~Hydrogen Dilution Blower Motor Nameplate Data Sheet~~
~~8.2.8~~	~~Hydrogen Dilution Blower Motor Performance Data and Curve~~
~~8.2.9~~	~~Hydrogen Dilution Blower Motor Dimensional Drawing~~
~~8.2.10~~	~~Hydrogen Dilution Blower Motor Wiring Diagram~~

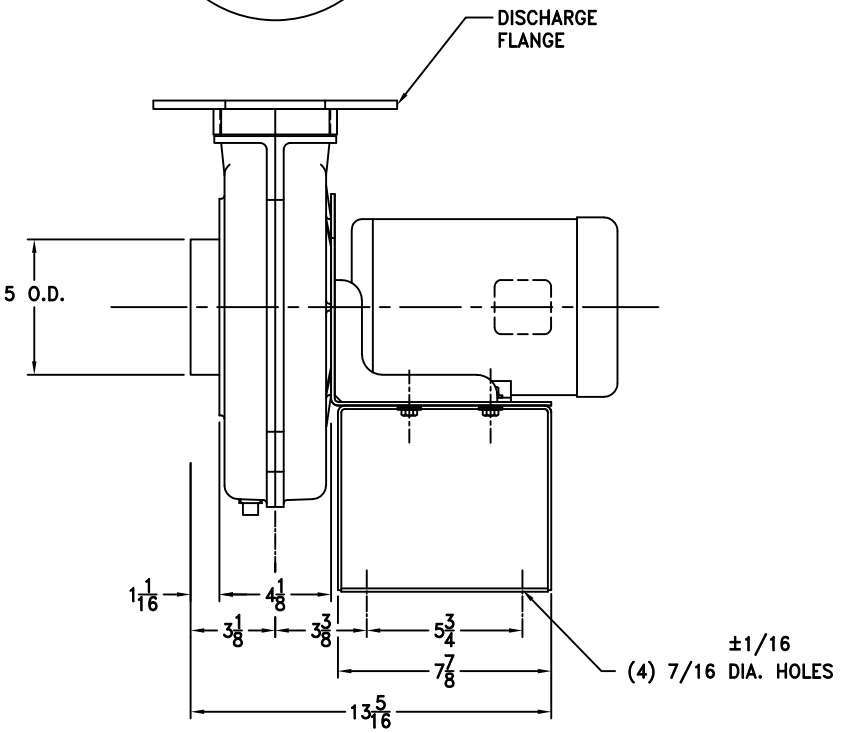
Available upon request

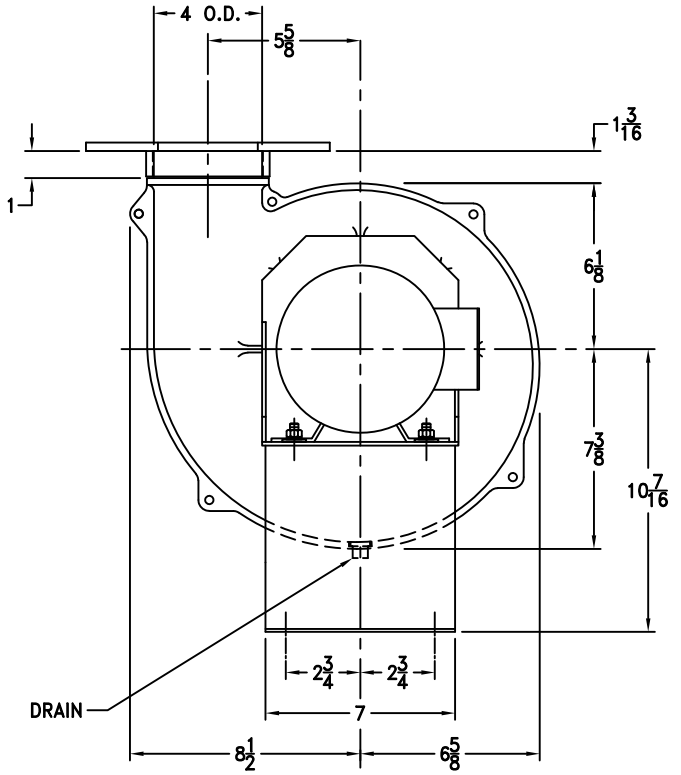
A	PB94



PLAN VIEW

NOTES:
1. 56 FRAME FOOT MOUNT MOTOR SHOWN.
2. SEE DRAWING A-27062 FOR OPTIONAL FLANGES.
3. SEE DRAWING FGSGD FOR SLIDE GATE DAMPER.





CW UP BLAST DISCHARGE SHOWN

NO.	DESCRIPTION	DATE	INITIALS
5	REVISED MOTOR BASE	6/23/15	LG
4	ADDED SLIDE GATE DAMPER & DRAIN	9/22/08	ADR
3	ADDED TOP VIEW	6/14/05	YRJ
2	UPDATED HOUSING DIMENSION	9/15/03	DKB
1	WAS B-SIZE BORDER; REVISED NOTES	11/06/01	DKB
	REVISIONS		

SUPERSEDES:

SIMILAR TO:

TOLERANCES:
FRACTIONS ±1/8
ANGLES: ± 1°
DECIMALS: X.XXX = ±0.005
X.XX = ±0.060
X.X = ±0.120
ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED

SCALE: FULL IN CAD
DATE: 8/24/00
DR. BY: DF
CHK. BY:

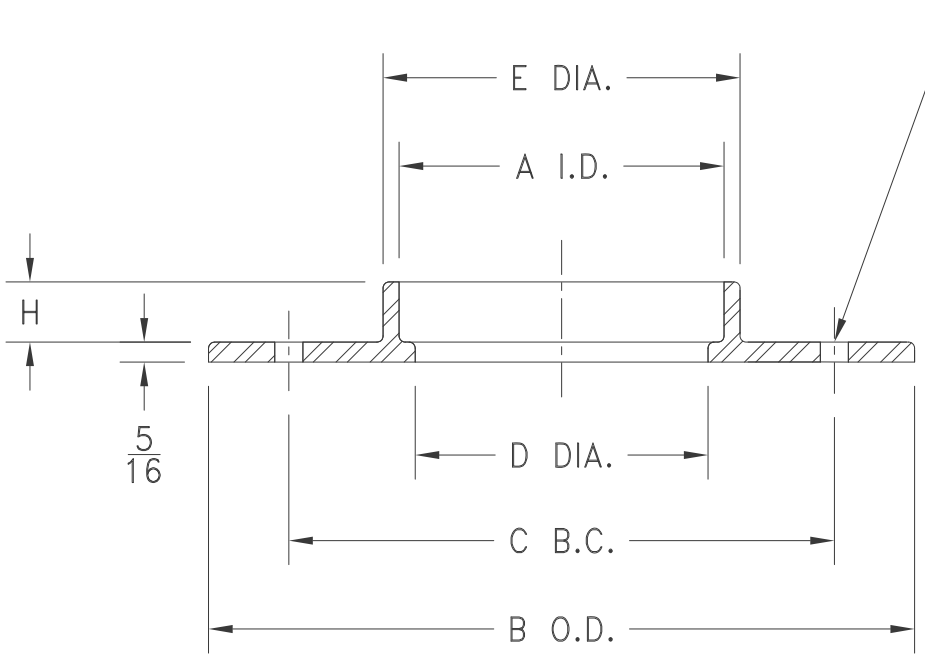
cincinnati fan
7697 SNIDER ROAD MASON, OHIO 45040

TITLE
PB-9 ARR. 4 CW UB

MATERIAL:

ASSEMBLY

A	DRAWING NO. PB94	SHEET 3 of __	REV. 5



	A I.D.	B O.D.	C B.C.	D DIA.	E DIA.	H	G QTY.
	$4\frac{1}{16}$	9	$7\frac{1}{2}$	$3\frac{11}{16}$	$4\frac{9}{16}$	$\frac{15}{16}$	4
	$5\frac{1}{16}$	11	$8\frac{1}{2}$	$4\frac{9}{16}$	$5\frac{9}{16}$	$\frac{15}{16}$	4
	$6\frac{1}{16}$	11	$9\frac{1}{2}$	$5\frac{1}{2}$	$6\frac{9}{16}$	$1\frac{1}{16}$	4
	$7\frac{1}{16}$	11	9	$6\frac{7}{16}$	$7\frac{11}{16}$	$\frac{15}{16}$	8
	$8\frac{1}{16}$	$13\frac{1}{2}$	$11\frac{3}{4}$	$7\frac{1}{2}$	$8\frac{5}{8}$	1	8
	$10\frac{1}{16}$	16	$14\frac{1}{4}$	$9\frac{11}{16}$	$10\frac{9}{16}$	1	8

NOTES:

STANDARD FLANGES PROVIDED WITHOUT HOLES.

OPTIONS:

☐ HOLES PROVIDED, ON VERTICAL CENTERLINE (CFV STANDARD LOCATION)

☐ HOLES PROVIDED, STRADDLING CENTERLINE

TOLERANCES:

CAST DIMENSIONS (A, B, D, E, H) ±3/32

MACHINED DIMENSIONS (C, FLANGE HOLE DIA.) ±1/16

SECTION 9.0

INSTRUMENTATION AND CONTROLS

CONTROL PHILOSOPHY

GENERAL

The onsite hypochlorite system consists of one (1) Microclor® Hypochlorite Generation System with a local control panel. The local control panel contains a programmable logic controller (PLC) to monitor and control all equipment pertaining to the generation and storage of hypochlorite product, including the brine tank level, the sodium hypochlorite storage tank level, and hydrogen dilution blowers. System status and key performance indicators are displayed at the local HMI and made available via data registers for SCADA communication.

The OSHG control panel features an Allen-Bradley MicroLogix 1400 PLC to control hypochlorite production. A batch process is utilized where generation is initiated upon the hypochlorite storage tank level reaching the hypochlorite storage tank level start setpoint and terminated once the level reaches the stop setpoint. System capacity is not variable. System operation commences at the OSHG output rating and continues operating until the storage tank stop level setpoint is reached.

Sodium hypochlorite production begins with brine tank control. Brine tank salt level is maintained by a manual fill process by the operator, whereas the brine tank water level is maintained by an automatically-controlled brine fill solenoid valve. The brine level control assembly features a float-type level switch and water fill inlet connected to the brine fill solenoid valve to ensure a constant water level is maintained throughout production. Hypochlorite production is accomplished by feeding the electrolytic cells a mixture of brine and conditioned supply water. The supply water and brine mixing is closed-loop controlled speed modulation of the brine pump to maintain electrolytic cell amperage at the system amperage setpoint. The electrolytic cells must always be fully submerged in brine, thus consequently electrolyte level is monitored at each cell via an optical level switch in a normally closed configuration. Cell temperature is monitored at the cell loop outlet by a temperature sensor. If any system values exceed alarm setpoints, the system will first attempt to correct itself and upon not being able to rectify the alarm condition will shut down.

LOOP DESCRIPTIONS

Digital Inputs

- Brine tank brine level switch
- (5) Cell level switch
- (4) Cell temperature switch
- Rectifier high temperature switch
- Dilution air flow switch
- Dilution blower current switch
- Emergency stop pressed
- (3) Hypochlorite pump run status
- (3) Hypochlorite pump fault
- (3) Well pump run status

Discrete Outputs

- Open brine tank water solenoid
- Open skid water solenoid/three-way control valve
- Brine pump run
- Rectifier primary contactor
- Rectifier soft start contactor
- Rectifier bypass contactor
- (2) Dilution blower run signal
- (3) Hypochlorite pump run
- (3) Hypochlorite pump run status
- (3) Hypochlorite pump fault

Analog Inputs

- Cell flow
- Cell temperature
- Cell DC amperage
- Sodium hypochlorite tank level

Analog Outputs

- Brine pump speed
- (3) Hypochlorite pump speed

LOOP COMMENTS

Discrete inputs to the PLC-containing control panel are self-explanatory and consist of inputs switched between field device normally closed contacts while in operation. Inputs directly connected to the control panel are 24 VDC. Any open circuit indicates a fault and the PLC logic shuts down operation and attempts to restart the system up to four times at which point the process shuts down and signals a shutdown alarm.

Discrete outputs are also self-explanatory and consist of 24 VDC PLC outputs that energize interposing control relays. The interposing control relays are configured as dry contacts or are wetted with 120 VAC as appropriate per the detailed ladder logic diagrams.

All analog inputs are 4-20 mA devices. The rectifier current sensor and hydrogen monitor are sourcing while the balance of the inputs is loop-powered from the panel per detailed PLC panel drawings.

All analog outputs are sourcing 4-20 mA outputs.

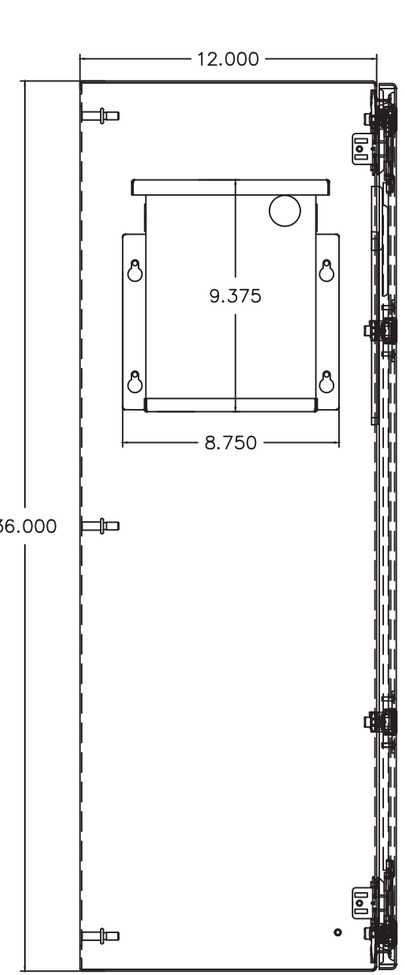
SYSTEM SET POINTS

The Microclor® On-site Sodium Hypochlorite Generation System is controlled through the human-machine interface (HMI) which provides system control in addition to key systems performance indicators and overview. The HMI provides momentary virtual switches for alarm reset, system start, and system enable/disable. Password protected system setpoints can be adjusted for the following parameters:

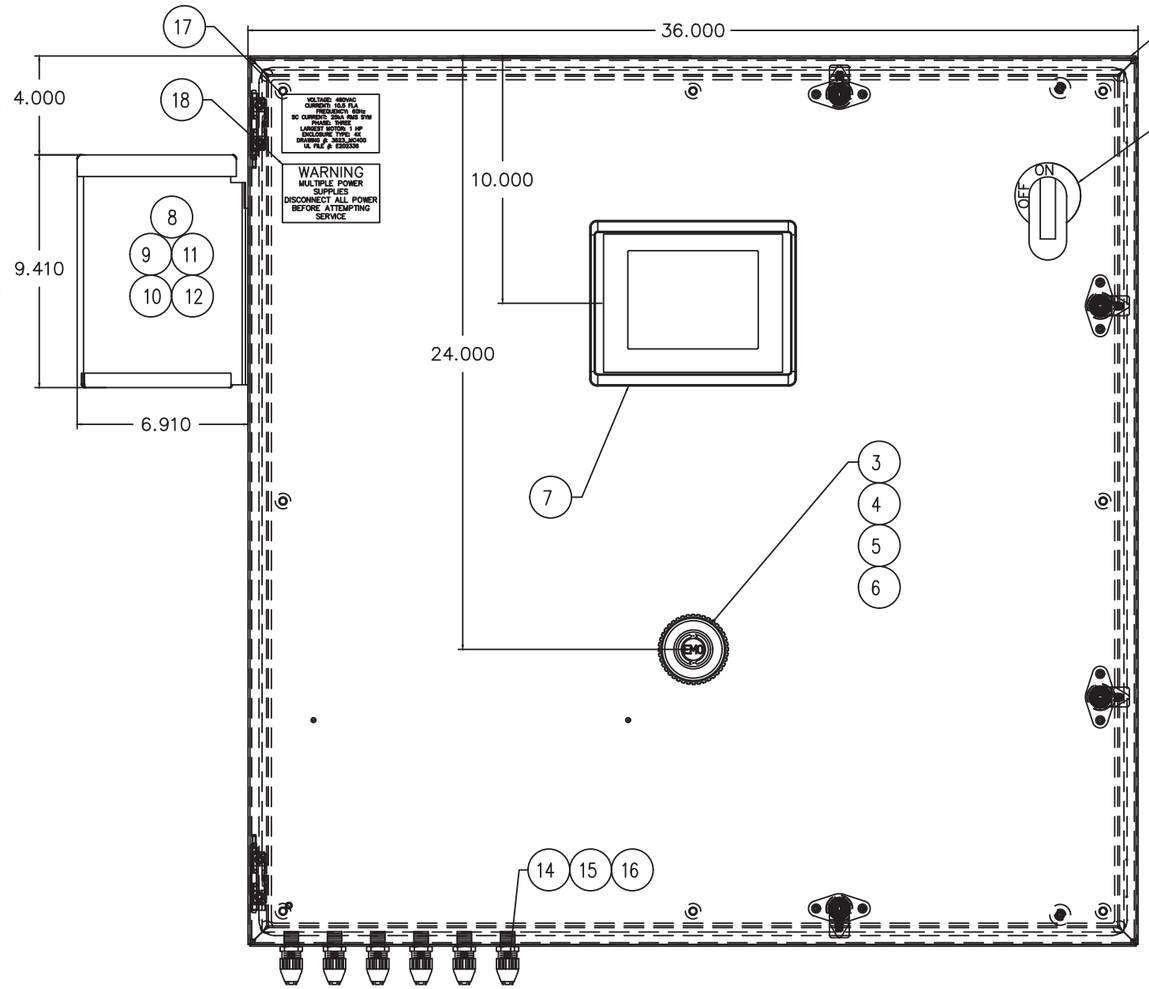
- Hypochlorite generation start, 0-100% hypochlorite storage tank level
- Hypochlorite generation stop, 0-100% hypochlorite storage tank level
- Electrolytic cell amperage
- Cell high amperage alarm
- Cell low amperage alarm
- Brine low flow alarm
- Brine high flow alarm
- Brine high speed clamp
- Brine low speed clamp
- Sodium hypochlorite storage tank high and high-high level alarm
- Sodium hypochlorite storage tank low and low-low level alarm

SECTION 9.2

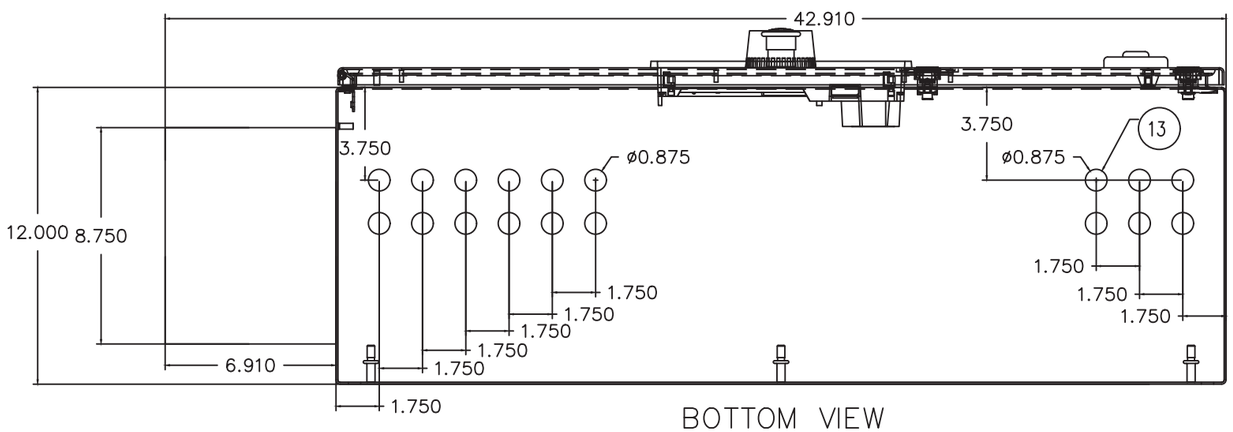
ELECTRICAL CONTROL PANEL



LEFT VIEW



FRONT VIEW



BOTTOM VIEW

ITEM	REF	DESCRIPTION	MFG	PART#	QTY
1	ENCL	ENCLOSURE 36X36X12 NEMA 4X 304SS	HOFFMAN	CSD363612SS	1
2	DS1	DISCONNECT HANDLE	ABB CONTROLS	OHY65L10B	1
3	EMO	EMERGENCY OFF PUSH/PULL MUSHROOM HEAD 40MM	SCHNEIDER ELECTRIC	ZB4BS84430	1
4	EMO	EMERGENCY OFF NC CONTACT BLOCK	SCHNEIDER ELECTRIC	ZBE102	2
5	EMO	EMERGENCY OFF MOUNTING BASE	SCHNEIDER ELECTRIC	ZB4BZ009	1
6	EMO	EMERGENCY OFF FINGER GUARD	SCHNEIDER ELECTRIC	ZB4BZ1905	1
7	HMI	PANELVIEW PLUS 7 7" HMI	ALLEN BRADLEY	2711P-T7C22D9P	1
8	T1	EXTERNAL TRANSFORMER 2KVA NEMA 3R	HAMMOND	Q002LEKF7	1
9	T1	3/4"X2" NIPPLE	T&B	CONDUIT 3/4X2-GALV-NIP	1
10	T1	3/4" SEALING RING	T&B	5263	2
11	T1	3/4" LOCK NUT	T&B	142-TB	2
12	T1	3/4" BUSHING	T&B	223-TB	2
13	PLUGS	1/2" KNOCKOUT PLUGS STAINLESS STEEL NEMA 4X	HOFFMAN	AS050SS	6
14	CORD	1/2" CORD CONNECTORS	OLFLEX	S1212	12
15	CORD	1/2" STEEL LOCKNUT	T&B	141	12
16	CORD	1/2" NEOPRENE GASKET WITH STAINLESS STEEL RETAINER	T&B	5262	12
17	LBL	CUSTOM NAMEPLATE LABEL	PHOENIX CONTACT	0828807	1
18	LBL	CUSTOM WARNING LABEL	PHOENIX CONTACT	0828909	1

NOTE 1: Ambient temperature must not exceed 88 degrees F.

TO MAINTAIN UL508A RATING, INCOMING POWER WIRES MUST BE COPPER AND BE RATED AT A MINIMUM OF 60 DEG. C. IF SERVICE IS GREATER THAN 100A WIRES MUST BE RATED AT A MINIMUM OF 75 DEG. C. TO MAINTAIN THE ENVIRONMENTAL RATING OF THIS ENCLOSURE, IN OPENINGS INSTALL ONLY LISTED OR RECOGNIZED CONTROL DEVICES WITH THE SAME ENVIRONMENTAL RATING AS THE ENCLOSURE

NAME PLATE

VOLTAGE: 480VAC
CURRENT: 10.5 FLA
FREQUENCY: 60Hz
SC CURRENT: 25kA RMS SYM
PHASE: THREE
LARGEST MOTOR: 1 HP
ENCLOSURE TYPE: 4X
DRAWING #: 3623_MC400
UL FILE #: E202336

WARNING

WARNING
MULTIPLE POWER SUPPLIES
DISCONNECT ALL POWER BEFORE ATTEMPTING SERVICE

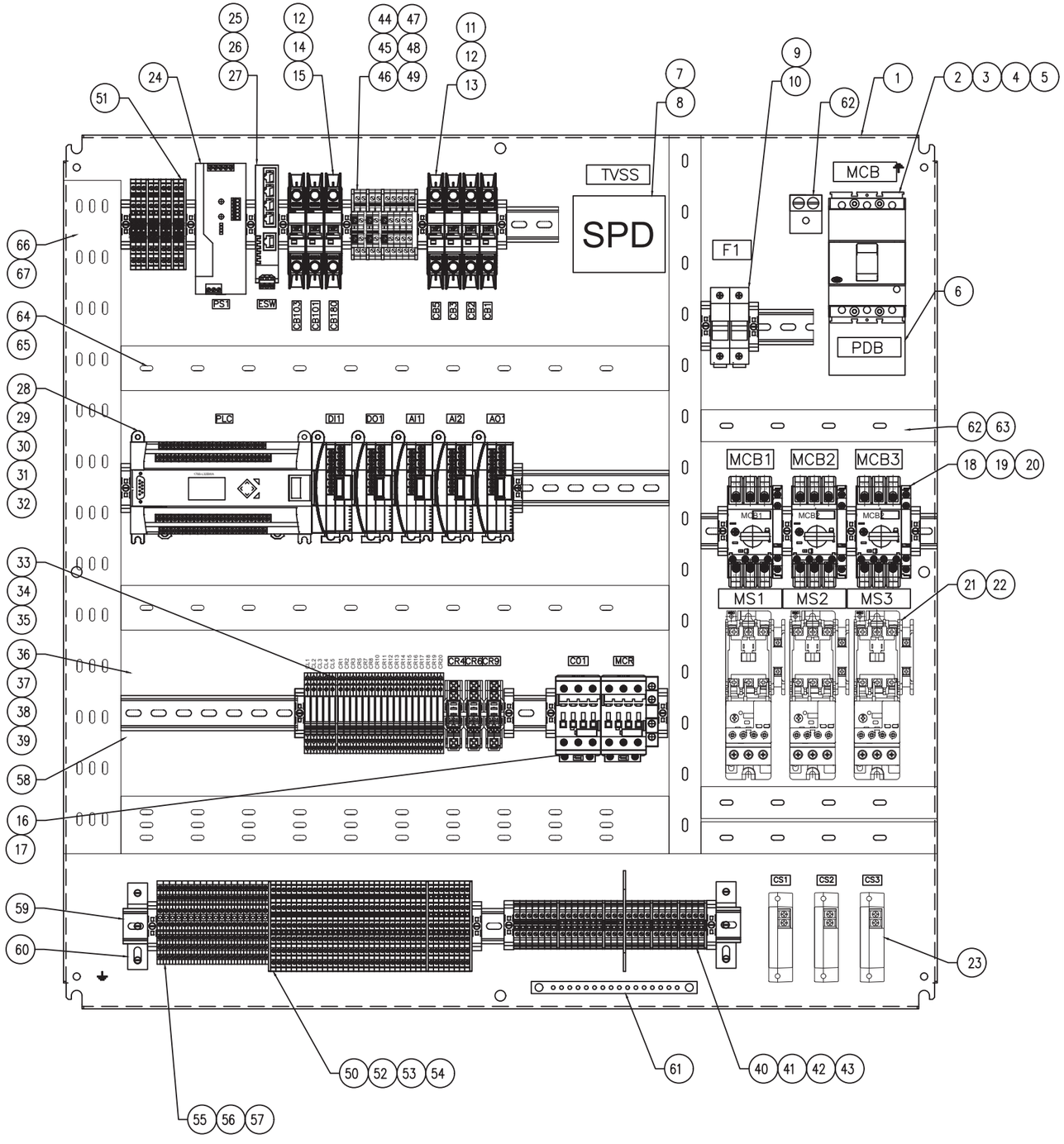
ICSONLINE
441 DOAK BLVD.,RIPON, CALIFORNIA 95366
TELEPHONE No: (209) 599-9775
FAX No: (209) 599-1793
E-MAIL:
WEB SITE: www.icsonlineinc.com

HUMBOLDT BAY MUNICIPAL WATER DISTRICT
WATER TREATMENT PLANT
HUMBOLDT, CA
PSI WATER TECHNOLOGIES INC.
550 SYCAMORE DRIVE
MILPITAS, CA

MICROCLOR ON-SITE HYPOCHLORITE GENERATION SYSTEM MC400
MICROCLOR PLC CONTROL PANEL
ENCLOSURE LAYOUT

SIZE:	REV:
B	B

ICS JOB No: 3623
DWG No: 3623_MC400_100
SCALE: N/A
SHEET: 1 OF 1



ITEM	REF	DESCRIPTION	MFG	PART#	QTY
1	PNL	BACK PANEL 36x36	HOFFMAN	CP3636	1
2	MCB	DISCONNECT 3-POLE 20A MOLDED CASE CIRCUIT BREAKER 25kA @480VAC	ABB CONTROLS	XT1NU3020AFF000XXX	1
3	MCB	DISCONNECT SADDLE CLAMPS	ABB CONTROLS	KXT1CU-3PC	1
4	MCB	DISCONNECT OPERATING MECHANISM	ABB CONTROLS	KXTBRHEBFP	1
5	MCB	DISCONNECT SHAFT	ABB CONTROLS	OXP10X500	1
6	PDB	CIRCUIT BREAKER POWER DISTRIBUTION LUG KIT CU 6 X 12-2 AWG	ABB CONTROLS	KXT1MC-3PC	1
7	TVSS	TRANSIENT SURGE PROTECTOR 480VAC	SCHNEIDER ELECTRIC	SDSA3650	1
8	TVSS	TRANSIENT SURGE PROTECTOR BRACKET	SCHNEIDER ELECTRIC	QOSAMK	1
9	F1	FUSE HOLDER FINGER-SAFE 2-POLE	LITTELFUSE	LPSC002ID	1
10	FU1-2	FUSE CLASS CC 15A	LITTELFUSE	CCMR015	2
11	CB1	CIRCUIT BREAKER 1-POLE 20A UL489, IC=10KA	ABB CONTROLS	SU201M-K20	1
12	CB2,101	CIRCUIT BREAKER 1-POLE 10A UL489, IC=10KA	ABB CONTROLS	SU201M-K10	2
13	CB3,5	CIRCUIT BREAKER 1-POLE 5A UL489, IC=10KA	ABB CONTROLS	SU201M-K5	2
14	CB180	CIRCUIT BREAKER 1-POLE 4A UL489, IC=10KA	ABB CONTROLS	SU201M-K5	1
15	CB103	CIRCUIT BREAKER 1-POLE 3A UL489, IC=10KA	ABB CONTROLS	SU201M-K3	1
16	MCR, CO1	CONTACTOR 3-POLE 16A 120V COIL	ABB CONTROLS	AF16-30-10-13	2
17	MCR-AUX	AUXILIARY CONTACT	ABB CONTROLS	CAL4-11	1
18	MCB1-3	UL POWER ENTRY FOR MOTOR PROTECTION CIRCUIT BREAKER	EATON	XTPAXT	3
19	MCB1-3	MOTOR PROTECTION CIRCUIT BREAKER 1.6-2.5A, 18KIAC @ 480VAC	EATON	XTPB2P5BC1	3
20	MCB1-3-AUX	AUXILIARY CONTACTS FOR XTP CIRCUIT BREAKER SIDE MNT 1 NO/1 NC	EATON	XTPAXSA11	3
21	MS1-3	NEMA STARTER, SIZE 00, 2HP, COIL120VAC WITH 1-5A O/L	EATON	AN19AN0A5E005	3
22	MS1-3-AUX	NEMA STARTER, SIZE 00, AUXILIARY CONTACT 2 FORM A CONTACTS 1 NC, 1 NO 9A@120VAC	EATON	C320KGS3	3
23	CS1-3	CURRENT SENSOR	NK TECHNOLOGIES	AS1-NOU-FT-GO	3
24	PS1	POWER SUPPLY 24VDC 10A UL508 115/230 VAC	PHOENIX CONTACT	2904601	1
25	ESW	ETHERNET SWITCH 5-PORT UNMANAGED	PHOENIX CONTACT	1085039	1
26	ENT1	ETHERNET PATCH CABLE CAT 5E 7' WHITE	PANDUIT	NK5EPC7Y	1
27	ENT2	ETHERNET PATCH CABLE CAT 5E 3' WHITE	PANDUIT	NK5EPC3Y	1
28	PLC	MICROLOGIX 1400 120VAC (20DI,12RO,4AI,2AO) W/ETHERNET	ALLEN BRADLEY	1766-L32BWAA	1
29	PLC	MICROLOGIX DIGITAL INPUT 16-POINT	ALLEN BRADLEY	1762-IQ16	1
30	PLC	MICROLOGIX DIGITAL OUTPUT 8-POINT	ALLEN BRADLEY	1762-OW8	1
31	PLC	MICROLOGIX ANALOG INPUT 4-POINT	ALLEN BRADLEY	1762-IF4	2
32	PLC	MICROLOGIX ANALOG OUTPUT 4-POINT	ALLEN BRADLEY	1762-OF4	1
33	CR4,6,9	RELAY 1-POLE COIL 1.1W @ 24VDC CONTACTS 15A	SCHNEIDER ELECTRIC	RPM12BD	3
34	CR4,6,9	RELAY 1-POLE BASE	SCHNEIDER ELECTRIC	RPZF1	3
35	CR4,6,9	RELAY 1-POLE BASE CLAMP	SCHNEIDER ELECTRIC	RPZR235	3
36	CL1-5,CR1-3,5,7-8,10-20	RELAY 1-POLE COIL 9mA @ 24VDC CONTACTS 6A	PHOENIX CONTACT	2966171	22
37	CL1-5,CR1-3,5,7-8,10-20	RELAY PARTITION PLATE	PHOENIX CONTACT	2966841	1
38	CL1-5,CR1-3,5,7-8,10-20	RELAY JUMPER	PHOENIX CONTACT	2966692	1
39	CL1-5,CR1-3,5,7-8,10-20	RELAY LABEL	PHOENIX CONTACT	0828736	1
40	TB1	SINGLE TIER TERMINAL	PHOENIX CONTACT	3044102	29
41	TB1	SINGLE TIER TERMINAL END SECTION	PHOENIX CONTACT	3047028	6
42	TB1	SINGLE TIER TERMINAL 10-POLE RED JUMPER	PHOENIX CONTACT	3030271	1
43	TB1	SINGLE TIER TERMINAL LABELS	PHOENIX CONTACT	0828736	1
44	TB1	DOUBLE TIER TERMINAL	PHOENIX CONTACT	3044814	6
45	TB1	DOUBLE TIER TERMINAL INTERNALLY JUMPERED	PHOENIX CONTACT	3044733	3
46	TB1	DOUBLE TIER TERMINAL SPACER	PHOENIX CONTACT	3047303	1
47	TB1	DOUBLE TIER TERMINAL END SECTION	PHOENIX CONTACT	3047293	3
48	TB1	DOUBLE TIER TERMINAL 50-POLE RED JUMPER	PHOENIX CONTACT	3032224	1
49	TB1	DOUBLE TIER TERMINAL LABELS	PHOENIX CONTACT	0828736	1
50	TB1	TRIPLE TIER TERMINAL	PHOENIX CONTACT	3214259	38
51	TB1	TRIPLE TIER INTERNALLY JUMPERED TERMINAL	PHOENIX CONTACT	3214262	9
52	TB1	TRIPLE TIER TERMINAL END SECTION	PHOENIX CONTACT	3214314	7
53	TB1	TRIPLE TIER TERMINAL 50-POLE RED JUMPER	PHOENIX CONTACT	3038930	1
54	TB1	TRIPLE TIER TERMINAL LABELS	PHOENIX CONTACT	0828734	1
55	TB1	TRIPLE TIER TERMINAL WITH GROUND	PHOENIX CONTACT	2718206	18
56	TB1	TRIPLE TIER TERMINAL WITH GROUND 10-POLE GRAY JUMPER	PHOENIX CONTACT	2715937	2
57	TB1	TRIPLE TIER TERMINAL WITH GROUND LABELS	PHOENIX CONTACT	0830768	1
58	TB1	END STOP	PHOENIX CONTACT	0800886	14
59	TB1	DIN RAIL (2 METERS OR 6.5') PRE-PUNCHED 35MM	PHOENIX CONTACT	0801733	1
60	TB1	BRACKET ANGLE SUPPORT	PHOENIX CONTACT	1201099	3
61	GND	GROUND BAR 14-CIRCUIT	CUTLER-HAMMER	GBK14	1
62	WIREWAY	WIRE DUCT 1"X4"X12"	PANDUIT	F1X4LG6	6
63	WIREWAY	WIRE DUCT COVER 1"X12"	PANDUIT	C1LG6	6
64	WIREWAY	WIRE DUCT 1.5"X4"X12"	PANDUIT	F1.5X4LG6	12
65	WIREWAY	WIRE DUCT COVER 1.5"X12"	PANDUIT	C1.5LG6	12
66	WIREWAY	WIRE DUCT 2"X4"X12"	PANDUIT	F2X4LG6	18
67	WIREWAY	WIRE DUCT COVER 2"X12"	PANDUIT	C2LG6	18
64	MISC	MISC ITEMS - WIRE, MARKERS, FERRULES, HARDWARE	ICS	MISC	1

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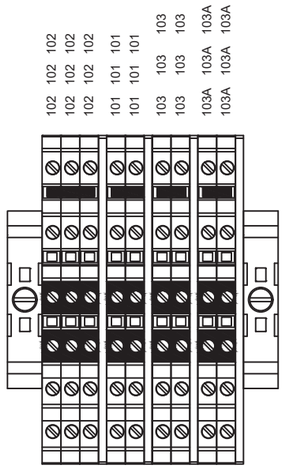
441 DOAK BLVD.,RIPON, CALIFORNIA 95366
TELEPHONE No: (209) 599-9775
FAX No: (209) 599-1793
E-MAIL:
WEB SITE: www.icsonlineinc.com

HUMBOLDT BAY MUNICIPAL WATER DISTRICT
WATER TREATMENT PLANT
HUMBOLDT, CA
PSI WATER TECHNOLOGIES INC.
550 SYCAMORE DRIVE
MILPITAS, CA

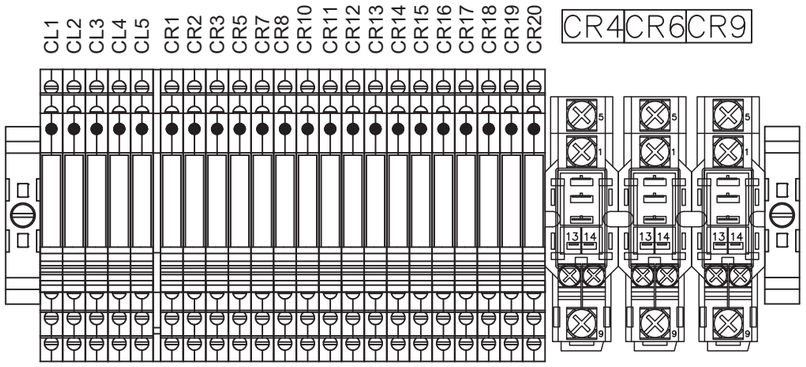
MICROCLOR ON-SITE HYPOCHLORITE GENERATION SYSTEM MC400
MICROCLOR PLC CONTROL PANEL
BACK PANEL LAYOUT

SIZE:	B
REV:	B
ICS JOB No:	3623
DWG No:	3623_MC400_150
SCALE:	N/A
SHEET:	1 OF 2

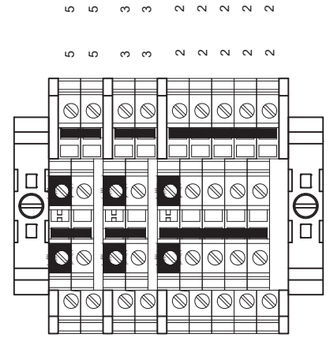
DC POWER DISTRIBUTION TERMINALS 24VDC



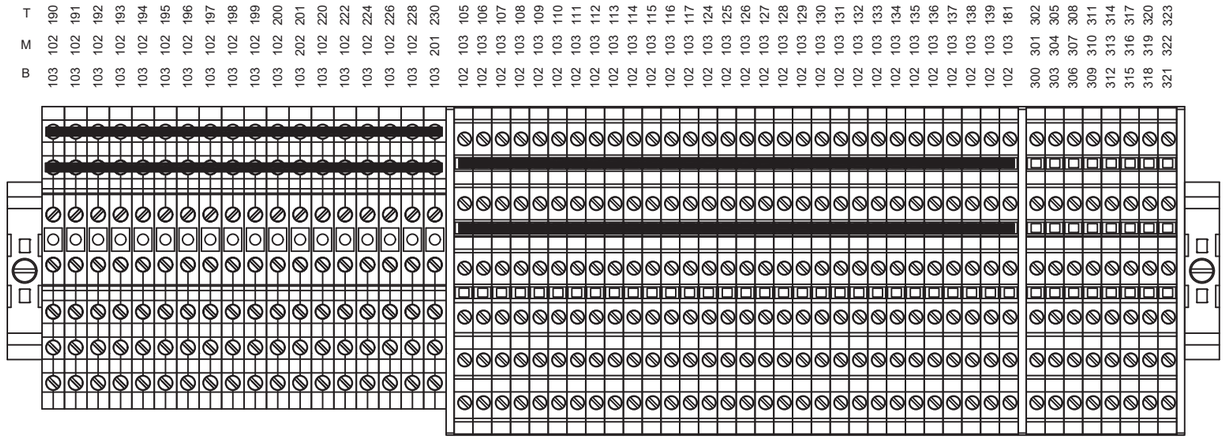
CONTROL RELAYS SINGLE POLE 24VDC COIL



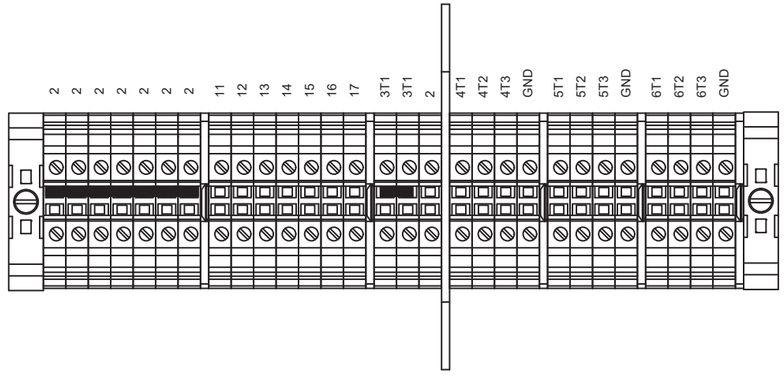
AC POWER DISTRIBUTION TERMINALS 120VAC



SAFETY AND PLC I/O 24VDC



REMOTE INTERFACE CONTROL AND STATUS 120VAC/480VAC



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441 DOAK BLVD.,RIPON, CALIFORNIA 95366
TELEPHONE No: (209) 599-9775 E-MAIL:
FAX No: (209) 599-1793 WEB SITE: www.icsonlineinc.com

HUMBOLDT BAY MUNICIPAL WATER DISTRICT
WATER TREATMENT PLANT
HUMBOLDT, CA
PSI WATER TECHNOLOGIES INC.
550 SYCAMORE DRIVE
MILPITAS, CA

MICROCLOR ON-SITE HYPOCHLORITE GENERATION SYSTEM MC400
MICROCLOR PLC CONTROL PANEL
TERMINAL STRIP LAYOUT

SIZE: B	REV: B
ICS JOB No:	3623
DWG No:	3623_MC400_150
SCALE:	N/A
SHEET:	2 OF 2

480VAC , 20A, 3PH, 10.5 FLA, MAX MOTOR LOAD 3 HP, MAX SHORT CIRCUIT CURRENT = 25kAIC

MCB DS1 — L1 L2 L3 — 20A

PDB

TVSS 480VAC

GND #12 GRN

GND — #12GRN/YEL — GROUND BAR — #12GRN/YEL — #12GRN/YEL

ENCLOSURE WALL STUD

ENCLOSURE DOOR STUD

T1 #12 BLK — T2 #12 BLK — T3 #12 BLK

F1 — T1 #12 BRN — T2 #12 ORG

FU1-2 — LPSC002ID

F1T1 #12 BRN — F1T2 #12 ORG

480VAC — T1 — 2KVA — 120VAC

GND #12 GRN/YEL

X1(H) #12 BLK — 2(N) #12 WHT

CB1 UL489 10kAIC — 20A — 1H #12 BLK

CB2 UL489 10kAIC — 10A — 1H #12 BLK

FRONT PANEL — HS EMO

3 #16 RED — 3 #16 RED — 3A #16 RED — A1 MCR A2 — 2 #16 WHT

3 #16 RED — TO SHEET 2 RUNG 051 — 2 #16 WHT

3 #16 RED — CR17 11 14 — 7 #16 RED — A1 MS1 A2 — 7N #16 WHT — OL1 95 — 2 #16 WHT

3 #16 RED — CR18 11 14 — 8 #16 RED — A1 MS2 A2 — 8N #16 WHT — OL2 95 — 2 #16 WHT

3 #16 RED — CR19 11 14 — 9 #16 RED — A1 MS3 A2 — 9N #16 WHT — OL3 95 — 2 #16 WHT

3 #16 RED — MCR L3 T3 — 5A #16 RED

CB5 UL489 10kAIC — 5A — 5 #16 RED

5 #16 RED — CR2 11 14 — 10 #16 RED — A1 CO1 A2 — 2 #16 WHT

5 #16 RED — CR5 11 14 — 11 #16 RED — 11

5 #16 RED — CR8 11 14 — 12 #16 RED — 12

5 #16 RED — CR1 11 14 — 13 #16 RED — 13

5 #16 RED — CR3 11 14 — 14 #16 RED — 14

5 END

120 VAC

2 #12 WHT

CB1 UL 489 CIRCUIT BREAKER 1 POLE DIN RAIL MOUNT 10kAIC 250VAC/90DC @ 20A ABB SU201M-K20

CB2 UL 489 CIRCUIT BREAKER 1 POLE DIN RAIL MOUNT 10kAIC 250VAC/90DC @ 10A ABB SU201M-K10

HS-EMO EMERGENCY OFF PUSH/PULL MUSHROOM HEAD 40mm SQUARE D ZB4BS84430 NC CONTACT BLOCK SQUARE D ZBE102

MS1/CO2 BLOWER BLR-101 CONTACTOR

MS2/CO3 BLOWER BLR-201 CONTACTOR

MS3/CO4 BLOWER BLR-202 CONTACTOR

MCR MASTER CONTROL RELAY 3 POLE CONTACTOR WITH AUX 18A AC-3 / 30A AC-1 @ 480VAC COIL .42/0.2A @ 120VAC ABB AF16-30-10-13 WITH SIDE MOUNT AUX NO/NC ABB CAL4-11

CB5 UL 489 CIRCUIT BREAKER 1 POLE DIN RAIL MOUNT 10kAIC 250VAC/90DC @ 5A ABB SU201M-K5

CO1 RECTIFIER TR-111 CONTACTOR

SV104 BRINE FLUSH SOLENOID 0.21A @ 120VAC ASCO 8210G004

SV001 BRINE FILL SOLENOID 0.21A @ 120VAC ASCO 8210G004

SV102 WATER SOLENOID 0.21A @ 120VAC ASCO 8210G004

SV103 3-WAY SOLENOID 0.21A @ 120VAC ASCO 8360G071

2 END

PANEL FIELD

MCR — 1H #12 BLK — L1 T1 — 2H #12 BLK

CB3 UL489 10kAIC — 5A — 3H #16 BLK — 2 #16 WHT

CO1 — L1 T1 — 3T1 #16 BLK

11 14 CR12 FANS — 17 #16 BLK

11 14 CR9 BYPASS — 16 #16 BLK

11 14 CR4 SOFT START — 15 #16 BLK

14 — 21 — 11 — 9 — N — GND

TR-111 RECTIFIER

120VAC

MCB1 — T1 #12 BRN — T2 #12 ORN — T3 #12 YEL — 1.6-2.5A — 4L1 #12 BRN — 4L2 #12 ORN — 4L3 #12 YEL

MS1 CO2 — L1 L2 L3 — T1 T2 T3 — OL1 ADJ. 1-5 — 4T1 #12 BRN — 4T2 #12 ORN — 4T3 #12 YEL

IS-101 — CS1 — 4T1 4T2 4T3 GND — GND #14 GRN/YEL

MTR1

H2 DILUTION BLOWER BLR-101 1 HP, 2.1 FLA @ 480VAC 3PH

MCB2 — T1 #12 BRN — T2 #12 ORN — T3 #12 YEL — 1.6-2.5A — 5L1 #12 BRN — 5L2 #12 ORN — 5L3 #12 YEL

MS2 CO3 — L1 L2 L3 — T1 T2 T3 — OL2 ADJ. 1-5 — 5T1 #12 BRN — 5T2 #12 ORN — 5T3 #12 YEL

IS-201 — CS2 — 5T1 5T2 5T3 GND — GND #14 GRN/YEL

MTR2

H2 DILUTION BLOWER BLR-201 1 HP, 2.1 FLA @ 480VAC 3PH

MCB3 — T1 #12 BRN — T2 #12 ORN — T3 #12 YEL — 1.6-2.5A — 6L1 #12 BRN — 6L2 #12 ORN — 6L3 #12 YEL

MS3 CO4 — L1 L2 L3 — T1 T2 T3 — OL3 ADJ. 1-5 — 6T1 #12 BRN — 6T2 #12 ORN — 6T3 #12 YEL

IS-202 — CS3 — 6T1 6T2 6T3 GND — GND #14 GRN/YEL

MTR3

H2 DILUTION BLOWER BLR-202 1 HP, 2.1 FLA @ 480VAC 3PH

480VAC

PANEL FIELD

MCB/DS1
MOLDED CASE CIRCUIT BREAKER
3-POLE 20A TRIP /125A, UL 600VAC
25kAIC @ 480VAC
ABB XT1NU3020AFF000XXX

PDB
POWER DISTRIBUTION BLOCK
3-POLE X 6 LUG 125A, UL 600VAC
25kAIC @ 480VAC
ABB KXT1MC-3PC

TVSS
480VAC TVSS
SQUARE D SDSA3650 W/
MOUNTING BRACKET

F1
UL, 2 POLE, DIN RAIL MT.
CLASS CC 30A @ 600VA
LITTEL FUSE LPSC002ID

FU1,2 CLASS CC 15A @ 600VAC
LITTEL FUSE CCMR015

T1
EXTERNAL TRANSFORMER
2KVA 480/120VAC NEMA 4X
UL1604
HAMMOND Q002LEKF7

CB3
UL 489 CIRCUIT BREAKER
1 POLE DIN RAIL MOUNT 10kAIC
250VAC/90DC @ 5A
ABB SU201M-K5

MCB1-3
MOTOR CIRCUIT BREAKER
3-POLE 1.6-2.5A ADJUST. TRIP
UL LISTED 18kAIC @ 480VAC, 2.5A MAX
EATON XTPB2P5BC1
W/ EATON XTPAIT
W/ AUXILIARY CONTACTS 1 N.O./1 N.C.
EATON XTPAXSA11

MS1-MS3
MOTOR STARTER NEMA 00 2HP
3P 460V 9A 120VAC COIL (CO)
W/ SOLID STATE OVERLOAD
ADJUSTABLE TRIP 1-5A(OL)
W/ AUXILIARY CONTACTS 1 N.O./1 N.C.
EATON AN19AN0A5E005

CO1
3 POLE CONTACTOR WITH AUX
16A AC-3 / 30A AC-1 @ 480VAC
COIL .42/0.2A @ 120VAC
ABB AF16-30-10-13

IS-101,201,202 / CS1-3
CURRENT SENSOR
NK TECHNOLOGIES AS1-NOU-FT-GO

ICSONLINE
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550 SYCAMORE DRIVE
MILPITAS, CA

MICROCLOR ON-SITE HYPOCHLORITE GENERATION SYSTEM MC400
MICROCLOR PLC CONTROL PANEL
AC POWER DISTRIBUTION

SIZE: B	REV: B
ICS JOB No:	3623
DWG No:	3623_MC400_500
SCALE:	N/A
SHEET:	1 OF 7

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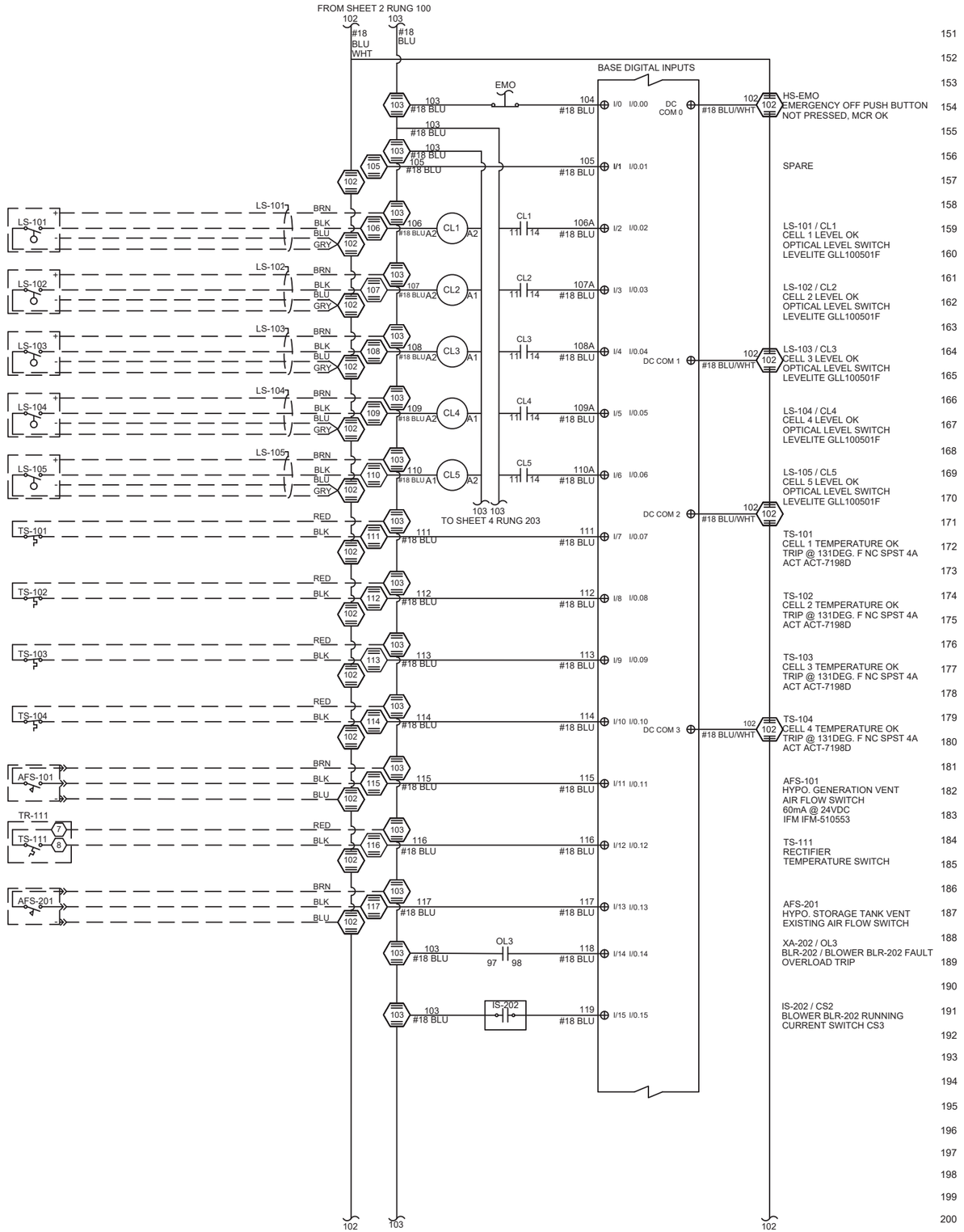
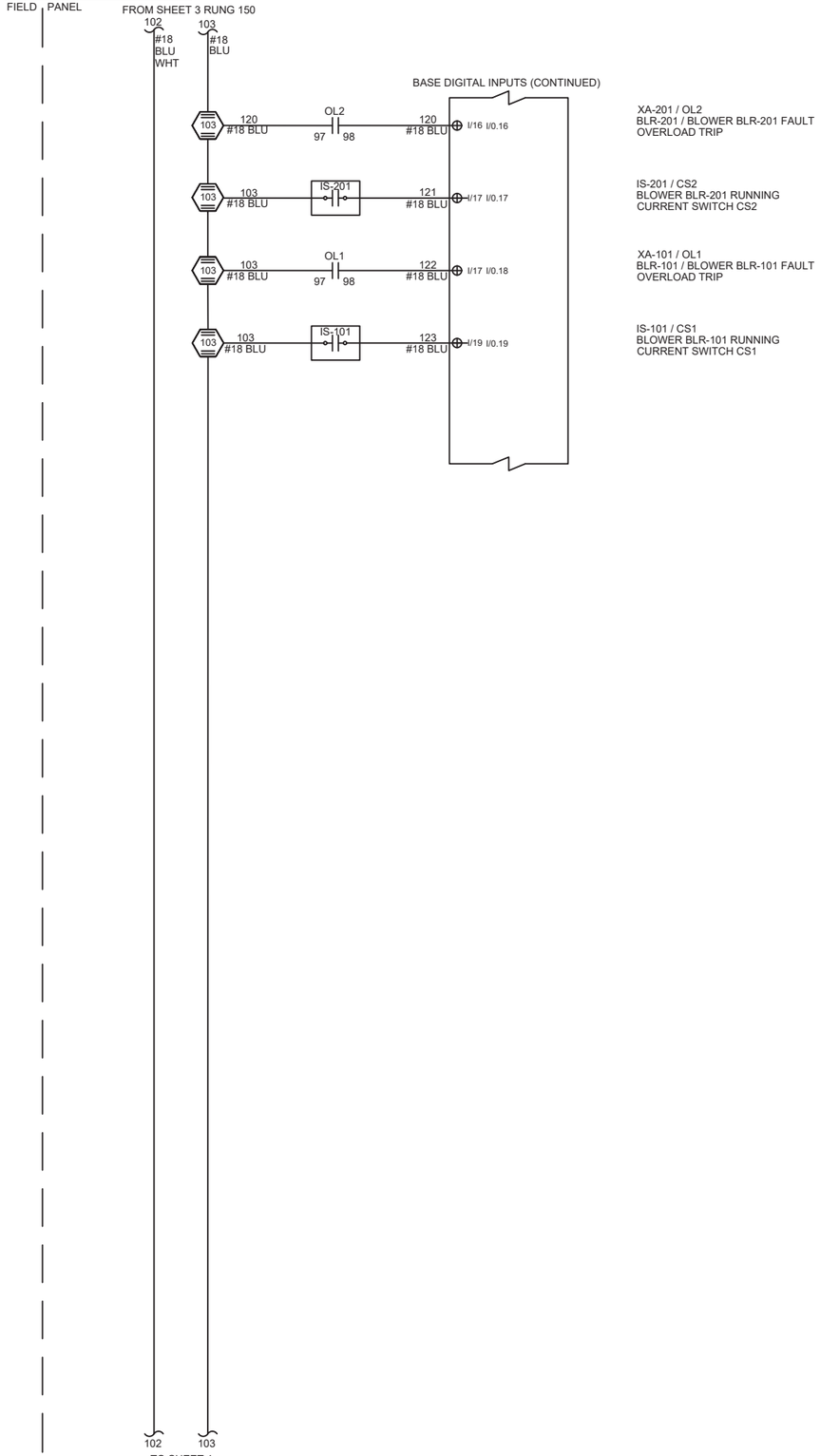
MICROCLOR ON-SITE HYPOCHLORITE
GENERATION SYSTEM MC400
MICROCLOR PLC CONTROL PANEL
DC POWER DISTRIBUTION

SIZE: B	REV: B
ICS JOB No:	3623
DWG No:	3623_MC400_500
SCALE:	N/A
SHEET:	2 OF 7

DISCRETE INPUTS



DISCRETE INPUTS



ICSONLINE
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TELEPHONE No: (209) 599-9775
FAX No: (209) 599-1793
E-MAIL:
WEB SITE: www.icsonlineinc.com

HUMBOLDT BAY MUNICIPAL WATER DISTRICT
WATER TREATMENT PLANT
HUMBOLDT, CA
PSI WATER TECHNOLOGIES INC.
550 SYCAMORE DRIVE
MILPITAS, CA

MICROCLOR ON-SITE HYPOCHLORITE
GENERATION SYSTEM MC400
MICROCLOR PLC CONTROL PANEL
DISCRETE INPUTS

SIZE: B	REV: B
ICS JOB No:	3623
DWG No:	3623_MC400_500
SCALE:	N/A
SHEET:	3 OF 7

DISCRETE INPUTS

FIELD PANEL

FROM SHEET 3 RUNG 200

102 #18 BLU /WHT

103 #18 BLU

MODULE 1
DIGITAL INPUTS
1762-IQ16

FROM SHEET 3 RUNG 150

102

124	#18 BLU	IN 0	I:1/0	SPARE	
125	#18 BLU	IN 1	I:1/1	SPARE	
126	#18 BLU	IN 2	I:1/2	SPARE	
127	#18 BLU	IN 3	I:1/3	SPARE	
128	#18 BLU	IN 4	I:1/4	SPARE	
129	#18 BLU	IN 5	I:1/5	SPARE	
130	#18 BLU	IN 6	I:1/6	SPARE	
131	#18 BLU	IN 7	I:1/7	SPARE	
		DC COM 0		102 #18 BLU/WHT	
132	#18 BLU	IN 8	I:1/8	SPARE	
133	#18 BLU	IN 9	I:1/9	SPARE	
134	#18 BLU	IN 10	I:1/10	SPARE	
135	#18 BLU	IN 11	I:1/11	SPARE	
136	#18 BLU	IN 12	I:1/12	SPARE	
137	#18 BLU	IN 13	I:1/13	SPARE	
138	#18 BLU	IN 14	I:1/14	SPARE	
139	#18 BLU	IN 15	I:1/15	SPARE	
		DC COM 1		102 #18 BLU/WHT	

102 TO SHEET 6 RUNG 401

103 TO SHEET 5 RUNG 351

24 VDC

ICSONLINE
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PSI WATER TECHNOLOGIES INC.
550 SYCAMORE DRIVE
MILPITAS, CA

MICROCLOR ON-SITE HYPOCHLORITE
GENERATION SYSTEM MC400
MICROCLOR PLC CONTROL PANEL
DISCRETE INPUTS

SIZE: B	REV: B
ICS JOB No:	3623
DWG No:	3623_MC400_500
SCALE:	N/A
SHEET:	4 OF 7

DISCRETE OUTPUT

FROM SHEET 2 RUNG 097 103A

BASE DIGITAL OUTPUTS

103A #18 BLU	VAC/DC 0	O/0	150 #18 BLU	CR1 A1	A2	102 #18 BLU/WHT	CR1/ YS-SV102 SV-102 WATER INLET SOLENOID ENABLE SPDT
103A #18 BLU	VAC/DC 1	0/1	151 #18 BLU	CR2 A1	A2	102 #18 BLU/WHT	CR2 / YS-TR111P TR-101 RECTIFIER PRIMARY CONTACTOR SPDT
103A #18 BLU	VAC/DC 2	O/2	152 #18 BLU	CR3 A1	A2	102 #18 BLU/WHT	CR3 / YS-SV103 SV-103 3-WAY SOLENOID ENABLE SPDT
103A #18 BLU	VAC/DC 3	O/3	153 #18 BLU	CR4 A1	A2	102 #18 BLU/WHT	CR4 / YS-TR111S TR-101 RECTIFIER SOFT START SPDT(16A)
103A #18 BLU	VAC/DC 4	O/4	154 #18 BLU	CR5 A1	A2	102 #18 BLU/WHT	CR5 / YS-SV104 SV-104 BRINE FLUSH SOLENOID ENABLE SPDT
	VAC/DC 5	O/5	155 #18 BLU	CR6 A1	A2	102 #18 BLU/WHT	CR6 / YS-P101 P-101 BRINE PUMP ENABLE SPDT(16A)
		O/6	156 #18 BLU	CR7 A1	A2	102 #18 BLU/WHT	CR7 SYSTEM OKAY SPDT
		O/7	157 #18 BLU	CR8 A1	A2	102 #18 BLU/WHT	CR8 / YS-SV001 SV-001 BRINE FILL SOLENOID ENABLE SPDT
103A #18 BLU	VAC/DC 6	O/8	158 #18 BLU	CR9 A1	A2	102 #18 BLU/WHT	CR9 / YS-TR111B TR-101 RECTIFIER BYPASS SPDT(16A)
		O/9	159 #18 BLU	CR10 A1	A2	102 #18 BLU/WHT	CR10 SPARE SPDT
		O/10	160 #18 BLU	CR11 A1	A2	102 #18 BLU/WHT	CR11 SPARE SPDT
		O/11	161 #18 BLU	CR12 A1	A2	102 #18 BLU/WHT	CR12/YS-TR111F RECTIFIER FAN SPDT

FROM SHEET 2 RUNG 097 102

#18 BLU/WHT

PANEL | FIELD

CR7 11 14 12 — 300 #16 YEL, 301 #16 YEL, 302 #16 YEL	SYSTEM OKAY
CR10 11 14 12 — 303 #16 YEL, 304 #16 YEL, 305 #16 YEL	SPARE
CR11 11 14 12 — 306 #16 YEL, 307 #16 YEL, 308 #16 YEL	SPARE

103A TO SHEET 5 RUNG 352

24 VDC

102 TO SHEET 5 RUNG 351

DISCRETE OUTPUT

FROM SHEET 4 RUNG 250 103

FROM SHEET 5 RUNG 350 103A

MODULE 2 DIGITAL OUTPUTS 1762-OW8

103A #18 BLU	VAC/DC 0	O:2/0	OUT 0	162 #18 BLU	CR13 A1	A2	102 #18 BLU/WHT	CR13 SPARE SPDT
		O:2/1	OUT 1	163 #18 BLU	CR14 A1	A2	102 #18 BLU/WHT	CR14 SPARE SPDT
		O:2/2	OUT 2	164 #18 BLU	CR15 A1	A2	102 #18 BLU/WHT	CR15 SPARE SPDT
		O:2/3	OUT 3	165 #18 BLU	CR16 A1	A2	102 #18 BLU/WHT	CR16 SPARE SPDT
103 #18 BLU	VAC/DC 1	O:2/4	OUT 4	166 #18 BLU	CR17 A1	A2	102 #18 BLU/WHT	CR17 / YS-BLR101 BLR-101 H2 DILUTION BLOWER ENABLE SPDT
		O:2/5	OUT 5	167 #18 BLU	CR18 A1	A2	102 #18 BLU/WHT	CR18 / YS-BLR201 BLR-201 H2 DILUTION BLOWER ENABLE SPDT
		O:2/6	OUT 6	168 #18 BLU	CR19 A1	A2	102 #18 BLU/WHT	CR19 / YS-BLR202 BLR-202 H2 DILUTION BLOWER ENABLE SPDT
		O:2/7	OUT 7	169 #18 BLU	CR20 A1	A2	102 #18 BLU/WHT	CR20 SPARE SPDT

FROM SHEET 5 RUNG 350 102

#18 BLU/WHT

PANEL | FIELD

CR13 11 14 12 — 309 #16 YEL, 310 #16 YEL, 311 #16 YEL	SPARE
CR14 11 14 12 — 312 #16 YEL, 313 #16 YEL, 314 #16 YEL	SPARE
CR15 11 14 12 — 315 #16 YEL, 316 #16 YEL, 317 #16 YEL	SPARE
CR16 11 14 12 — 318 #16 YEL, 319 #16 YEL, 320 #16 YEL	SPARE
CR20 11 14 12 — 321 #16 YEL, 322 #16 YEL, 323 #16 YEL	SPARE

103 TO SHEET 6 RUNG 401

24 VDC

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FAX No: (209) 599-1793
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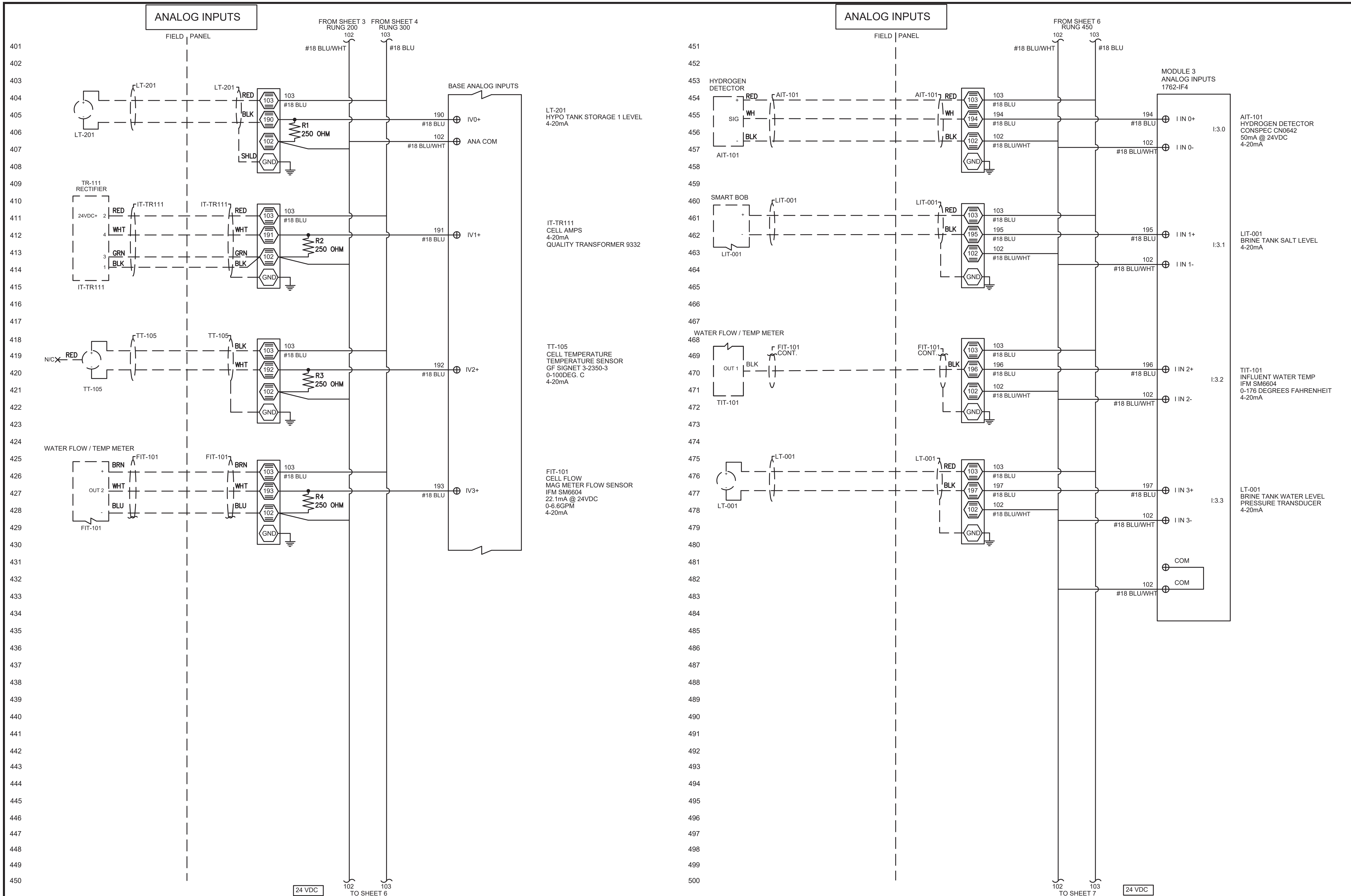
WATER TREATMENT PLANT
HUMBOLDT, CA
PSI WATER TECHNOLOGIES INC.
550 SYCAMORE DRIVE
MILPITAS, CA

MICROCLOR ON-SITE HYPOCHLORITE GENERATION SYSTEM MC400
MICROCLOR PLC CONTROL PANEL
DISCRETE OUTPUTS

SIZE: B	REV: B
ICS JOB No: 3623	
DWG No: 3623_MC400_500	
SCALE: N/A	
SHEET: 5 OF 7	


ANALOG INPUTS
FIELD | PANEL
FROM SHEET 3 RUNG 200
FROM SHEET 4 RUNG 300
102 #18 BLU/WHT
103 #18 BLU
BASE ANALOG INPUTS
LT-201
RED
BLK
SHLD
103
190
102
GND
R1 250 OHM
190 #18 BLU IV0+
102 #18 BLU/WHT ANA COM
LT-201 HYPO TANK STORAGE 1 LEVEL 4-20mA
TR-111 RECTIFIER
24VDC+
IT-TR111
RED
WHT
GRN
BLK
191
R2 250 OHM
191 #18 BLU IV1+
IT-TR111 CELL AMPS 4-20mA QUALITY TRANSFORMER 9332
TT-105
N/C
RED
BLK
WHT
192
R3 250 OHM
192 #18 BLU IV2+
TT-105 CELL TEMPERATURE TEMPERATURE SENSOR GF SIGNET 3-2350-3 0-100DEG. C 4-20mA
WATER FLOW / TEMP METER
FIT-101
BRN
WHT
BLU
OUT 2
193
R4 250 OHM
193 #18 BLU IV3+
FIT-101 CELL FLOW MAG METER FLOW SENSOR IFM SM6604 22.1mA @ 24VDC 0-6.6GPM 4-20mA
24 VDC
102 103 TO SHEET 6 RUNG 451
ANALOG INPUTS
FIELD | PANEL
FROM SHEET 6 RUNG 450
MODULE 3 ANALOG INPUTS 1762-IF4
HYDROGEN DETECTOR
AIT-101
SIG
RED
WH
BLK
194
194 #18 BLU I IN 0+
102 #18 BLU/WHT I IN 0-
I:3.0
AIT-101 HYDROGEN DETECTOR CONSPEC CN0642 50mA @ 24VDC 4-20mA
SMART BOB
LIT-001
195
195 #18 BLU I IN 1+
102 #18 BLU/WHT I IN 1-
I:3.1
LIT-001 BRINE TANK SALT LEVEL 4-20mA
WATER FLOW / TEMP METER
FIT-101 CONT.
OUT 1
TIT-101
196
196 #18 BLU I IN 2+
102 #18 BLU/WHT I IN 2-
I:3.2
TIT-101 INFLUENT WATER TEMP IFM SM6604 0-176 DEGREES FAHRENHEIT 4-20mA
LT-001
197
197 #18 BLU I IN 3+
102 #18 BLU/WHT I IN 3-
I:3.3
LT-001 BRINE TANK WATER LEVEL PRESSURE TRANSDUCER 4-20mA
COM
102 #18 BLU/WHT COM
102 103 TO SHEET 7 RUNG 501
24 VDC

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TELEPHONE No: (209) 599-9775
FAX No: (209) 599-1793
E-MAIL:
WEB SITE: www.icsonlineinc.com

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WATER TREATMENT PLANT
HUMBOLDT, CA
PSI WATER TECHNOLOGIES INC.
550 SYCAMORE DRIVE
MILPITAS, CA

MICROCLOR ON-SITE HYPOCHLORITE
GENERATION SYSTEM MC400
MICROCLOR PLC CONTROL PANEL
ANALOG INPUTS

SIZE: B	REV: B
ICS JOB No: 3623	
DWG No: 3623_MC400_500	
SCALE: N/A	
SHEET: 6 OF 7	

ANALOG INPUTS

FIELD | PANEL

FROM SHEET 6
RUNG 500

102 #18 BLU/WHT
103 #18 BLU

MODULE 4
ANALOG INPUTS
1762-IF4

LT-202
HYPO TANK STORAGE 2 LEVEL
ULTRASONIC LEVEL TRANSMITTER
4-20mA

LT-202 — RED, BLK, SHLD
103 #18 BLU
198 #18 BLU
102 #18 BLU/WHT
GND
198 #18 BLU — I IN 0+ — I:4.0
102 #18 BLU/WHT — I IN 0-

LT-203
HYPO TANK STORAGE 2 LEVEL
ULTRASONIC LEVEL TRANSMITTER
4-20mA

LT-203 — RED, BLK, SHLD
103 #18 BLU
199 #18 BLU
102 #18 BLU/WHT
GND
199 #18 BLU — I IN 1+ — I:4.1
102 #18 BLU/WHT — I IN 1-

SPARE
4-20mA

103 #18 BLU
200 #18 BLU
102 #18 BLU/WHT
GND
200 #18 BLU — I IN 2+ — I:4.2
102 #18 BLU/WHT — I IN 2-

SPARE
4-20mA

103 #18 BLU
201 #18 BLU
102 #18 BLU/WHT
GND
201 #18 BLU — I IN 3+ — I:4.3
102 #18 BLU/WHT — I IN 3-

COM
COM
102 #18 BLU/WHT

102 103
TO SHEET 7
RUNG 551

24 VDC

ANALOG OUTPUTS

FROM SHEET 7
RUNG 550

102 #18 BLU/WHT
103 #18 BLU

FROM SHEET 2
RUNG 089
181 #18 BLU

PANEL | FIELD

BASE ANALOG OUTPUTS

OV0+ (0-10VDC) 220 #18 BLU
ANA COM 102 #18 BLU/WHT
OV1+ (0-10VDC) 222 #18 BLU

181
103 #18 BLU
220 #18 BLU
102 #18 BLU/WHT
GND
RED, WHT, BLK — Y-101 — Y-101 — BRINE PUMP (EN, SC+, SC- / P-101)

P-101
BRINE PUMP
TUTHILL DGS.38EEEV2NN15000

YS-P101
ENABLE
3.4A @ 24VDC

SY-P101
SPEED REFERENCE
0-5 VDC / 0-60Hz

103 #18 BLU
222 #18 BLU
102 #18 BLU/WHT
GND

SPARE
0-10VDC

MODULE 5
ANALOG OUTPUT
1762-OF4

I OUT 0 224 #18 BLU
V OUT 0
COM 102 #18 BLU/WHT
O:5.0

178 #18 BLU
I OUT 1 226 #18 BLU
V OUT 1
COM
O:5.1

I OUT 2 228 #18 BLU
(mA)
V OUT 2
O:5.2

I OUT 3 230 #18 BLU
(mA)
V OUT 3
O:5.3

103 #18 BLU
224 #18 BLU
102 #18 BLU/WHT
GND

SPARE
4-20mA

103 #18 BLU
226 #18 BLU
102 #18 BLU/WHT
GND

SPARE
4-20mA

103 #18 BLU
228 #18 BLU
102 #18 BLU/WHT
GND

SPARE
4-20mA

103 #18 BLU
230 #18 BLU
102 #18 BLU/WHT
GND

SPARE
4-20mA

24 VDC

102 END
103 END

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WATER TREATMENT PLANT
HUMBOLDT, CA
PSI WATER TECHNOLOGIES INC.
550 SYCAMORE DRIVE
MILPITAS, CA

MICROCLOR ON-SITE HYPOCHLORITE
GENERATION SYSTEM MC400
MICROCLOR PLC CONTROL PANEL
ANALOG INPUTS / ANALOG OUTPUTS

SIZE:	REV:
B	B

ICS JOB No: 3623
DWG No: 3623_MC400_500
SCALE: N/A
SHEET: 7 OF 7

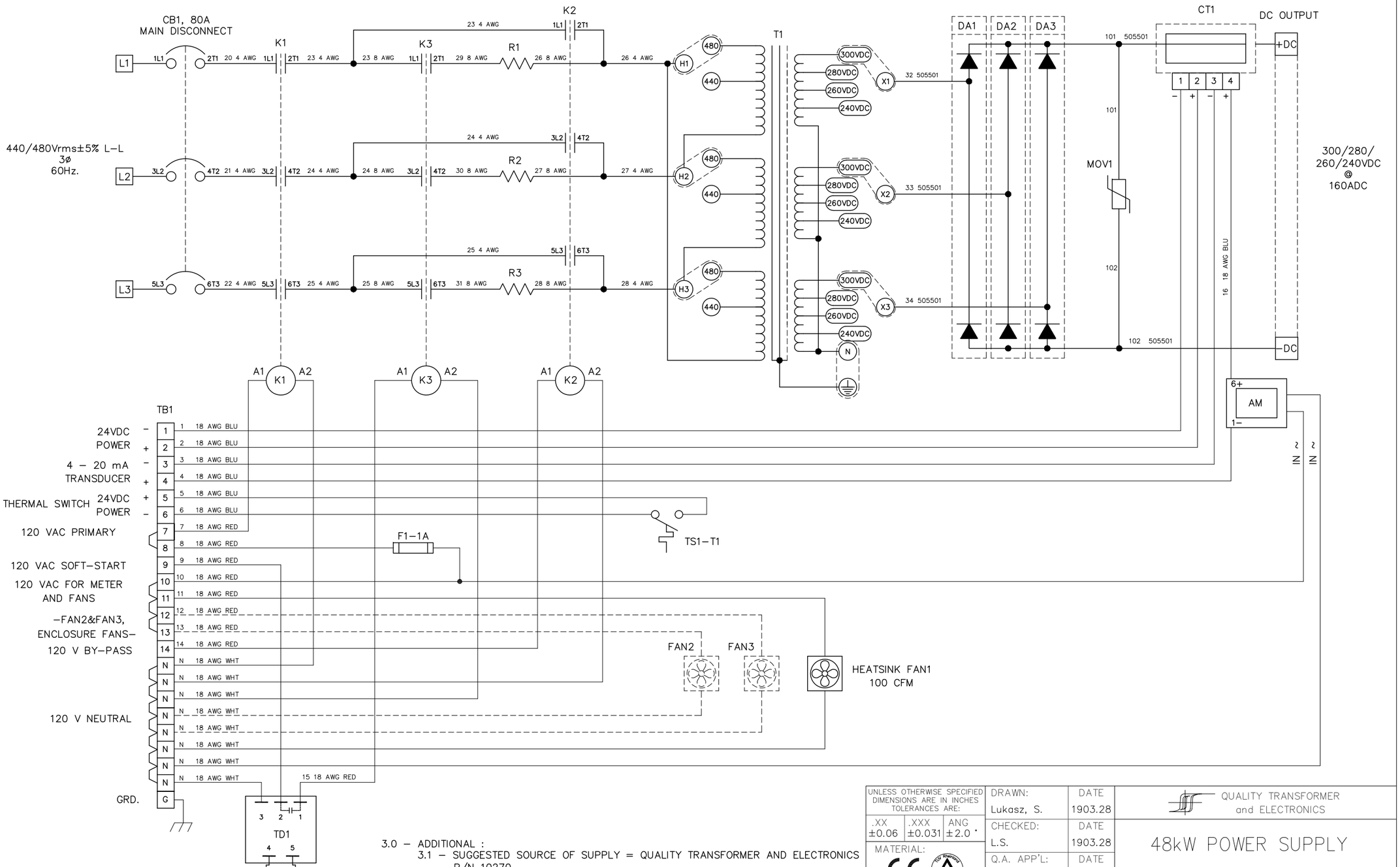
SECTION 9.3

TRANSFORMER RECTIFIER

NOTES: 1.0 – ELECTRICAL:
- 1.1 – RATED POWER = 48 kW.
- 1.2 – INPUT VOLTAGE = 480/440Vrms L–L.
- 1.3 – NUMBER OF PHASES = THREE.
- 1.4 – FREQUENCY = 60 Hz.
- 1.5 – DIELECTRIC WITHSTANDING VOLTAGE:
  - 1.5.1 – PRIMARY WINDING = 4.0 kVrms.
  - 1.5.2 – SECONDARY WINDING = 2.5 kVrms.
- 1.6 – SCHEMATIC DIAGRAM:

2.0 – MECHANICAL:
- 2.1 – ESTIMATED WEIGHT = 600 LBS.
- 2.2 – TRANSFORMER SHALL BE VACUUM IMPREGNATED IN EPOXY RESIN AND BAKED AFTER ASSEMBLY.
- 2.3 – FINISH:
  - 2.3.1 – TRANSFORMER = BLACK PAINT.
- 2.4 – MARKING:
  - 2.4.1 – TERMINAL DESIGNATIONS IN WHITE INK AS SHOWN.
  - 2.4.2 – SILKSCREEN IN BLACK INK PER 10270–850.

APPLICATION		REVISIONS			
NEXT ASSY	USED ON	REV	DESCRIPTION	DATE	APP'D
	QT&E 10270	00	ORIGINAL RELEASE – PROTOTYPE	1903.28	L.S.
		01	ADDED 440V TAP TO THE PRIMARY WINDING.	1902.14	L.S.

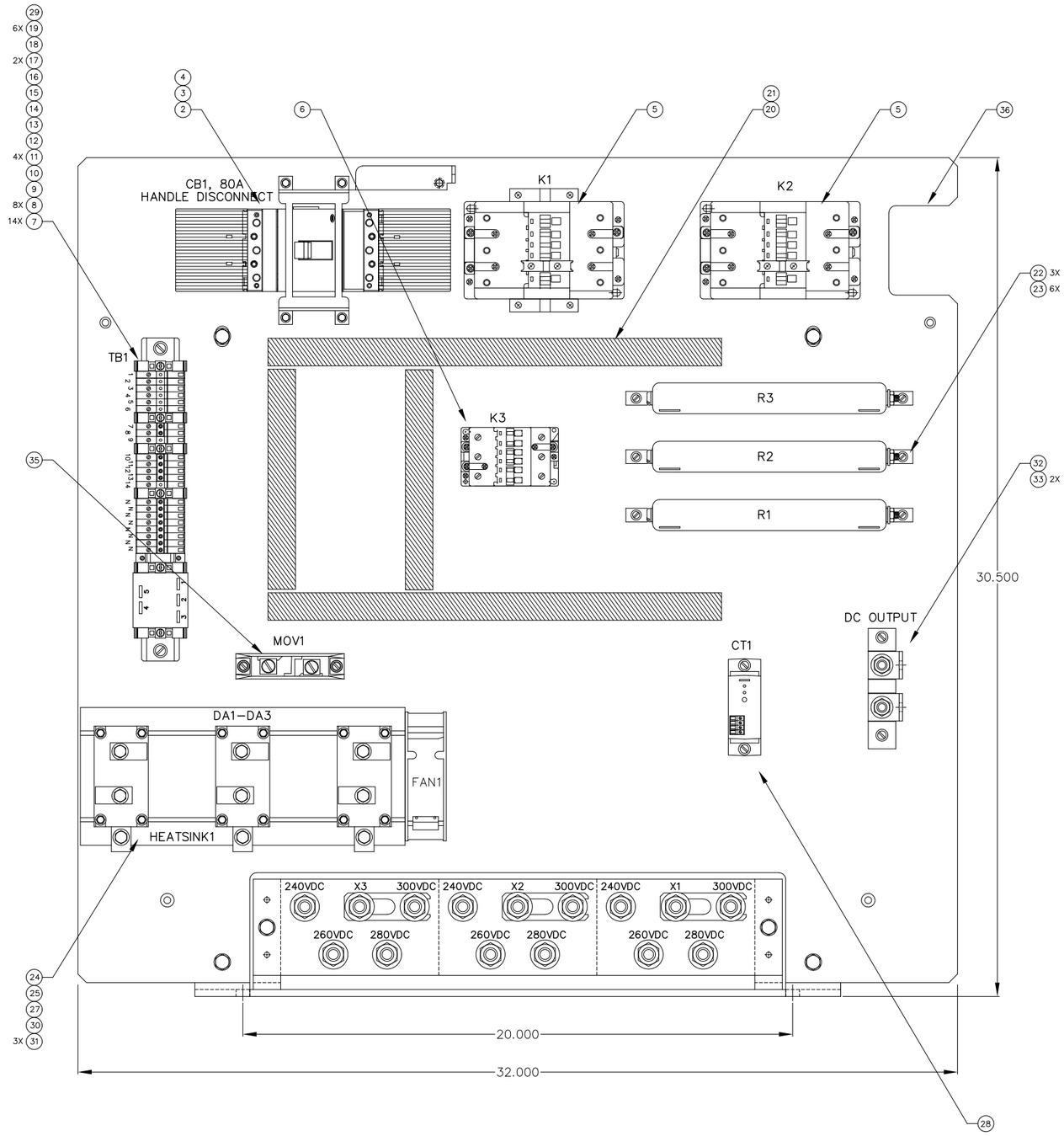


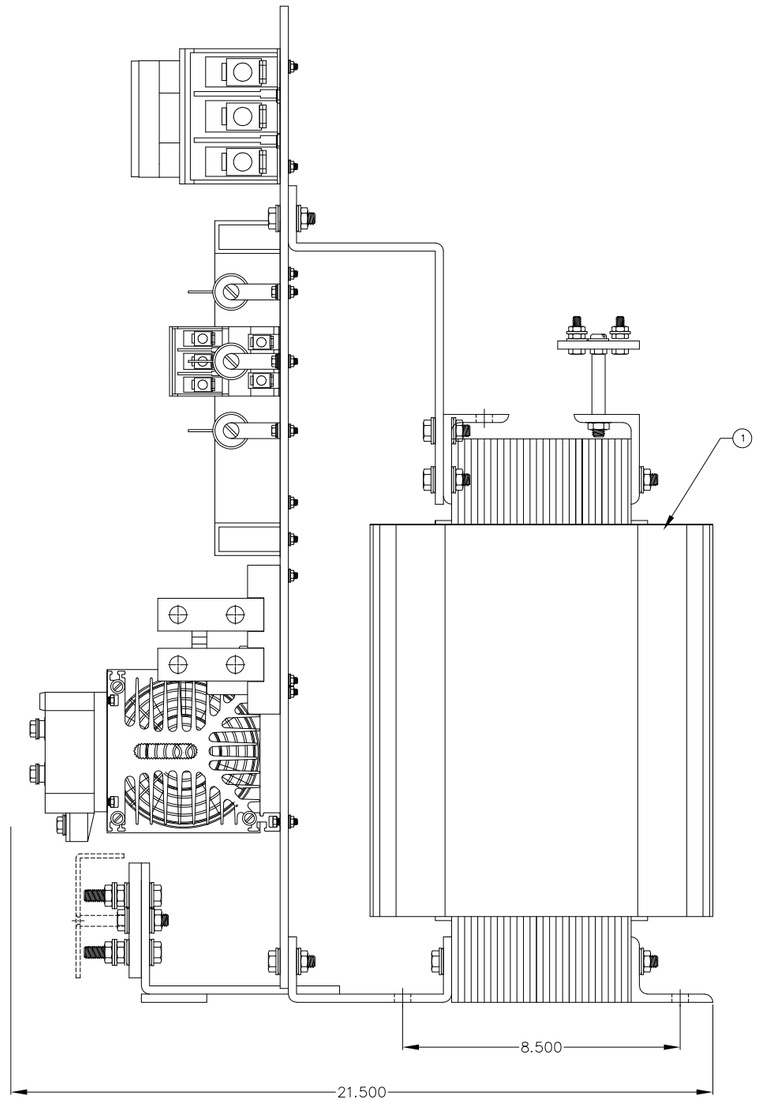
3.0 – ADDITIONAL :
- 3.1 – SUGGESTED SOURCE OF SUPPLY = QUALITY TRANSFORMER AND ELECTRONICS P/N 10270.
- 3.2 – TRANSFORMER SHALL BE MANUFACTURED AND TESTED IN ACCORDANCE WITH TUV RHEINLAND LICENSE NUMBER T72140712 01.
- 3.3 – NRTL LISTED TO UL 1561.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:			DRAWN: Lukasz, S.
.XX ±0.06	.XXX ±0.031	ANG ±2.0 °	CHECKED: L.S.
MATERIAL:			Q.A. APP'L:
			DESIGN ENGR

DRAWN: Lukasz, S.	DATE 1903.28	QUALITY TRANSFORMER and ELECTRONICS
CHECKED: L.S.	DATE 1903.28	48kW POWER SUPPLY
Q.A. APP'L:	DATE	SIZE C | DRAWING NO 10270–400 | REV 01
DESIGN ENGR	DATE	SCALE = NONE | SHEET 1 OF 2

NOTES: 1.0 – SHIP THE FOLLOWING ITEMS WITH THE UNIT:
(26) 1.1 – 1 EA NMB, FAN, #5915PC–12T–D30–A00
(25) 1.2 – 1 EA NMB. FAN, #4715FS–12T–B50–D00
(27) 1.3 – 3 EA NMB, FAN POWER CORD, #432000
(34) 1.4 – 1 EA OMEGA, DIGITAL METER, #DPI8
(4) 1.5 – 1 EA ABB CONTROL, CABLE KIT, #KXT1NXFLHDL6
(37) 1.6 – 1 EA NAMEPLATE



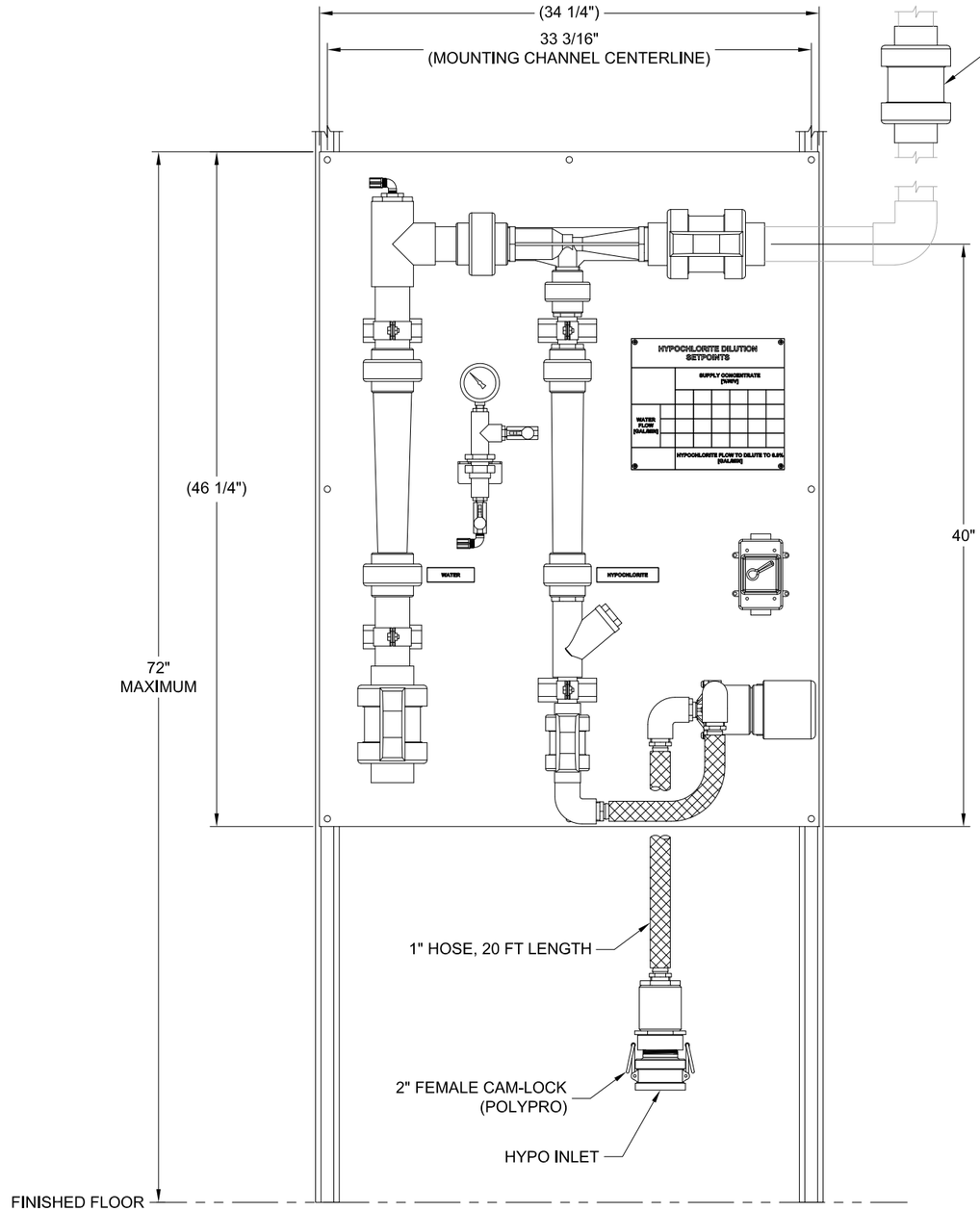


QUALITY TRANSFORMER and ELECTRONICS

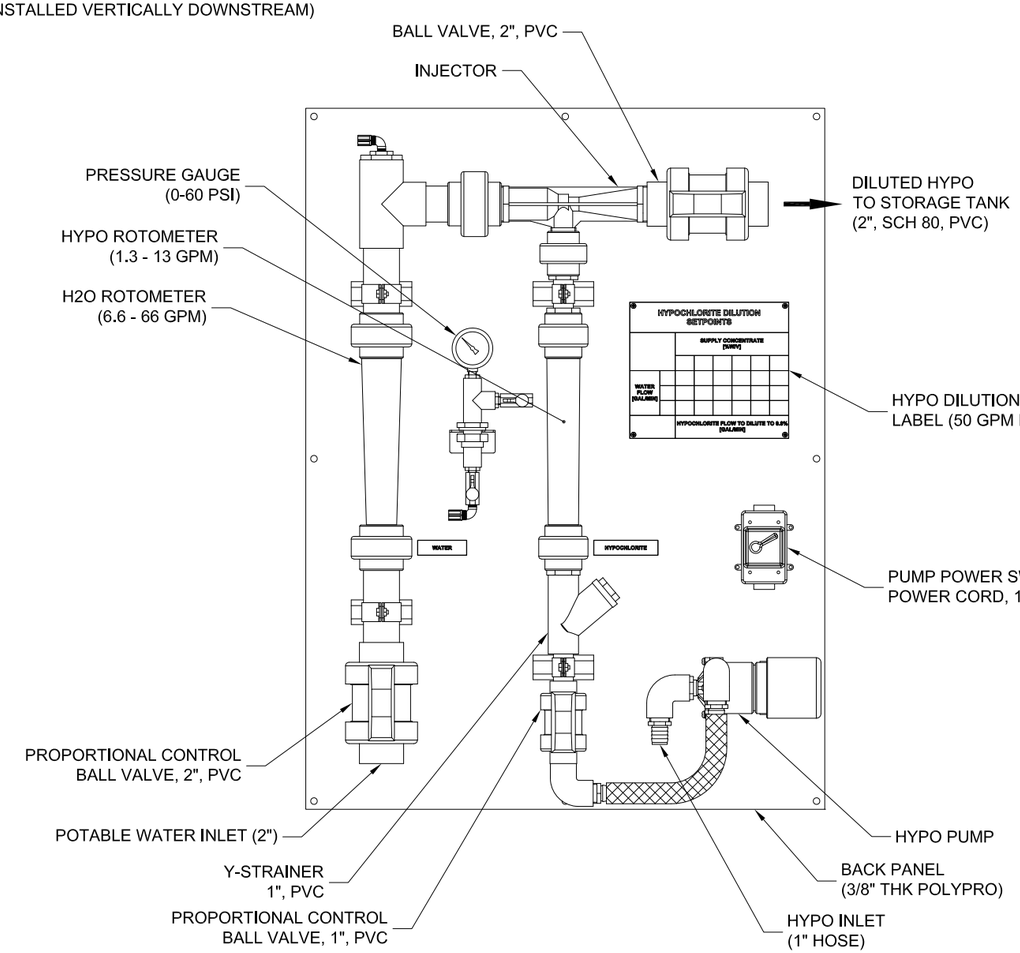
SIZE	DRAWING NO	REV
C	10270–400	01
SCALE = NONE		SHEET 2 OF 2

SECTION 9.4

HYPOCHLORITE DILUTION PANEL



PANEL INSTALLATION



DILUTION PANEL LAYOUT

REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	03/24/21	LT	INITIAL RELEASE				
B	02/15/23	MK	ADDED CHECK VALVE				

PSI Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY:	L. TODD	DATE: 03/24/2021
CHECKED BY:		DATE:
SCALE:	NTS	SIZE: D

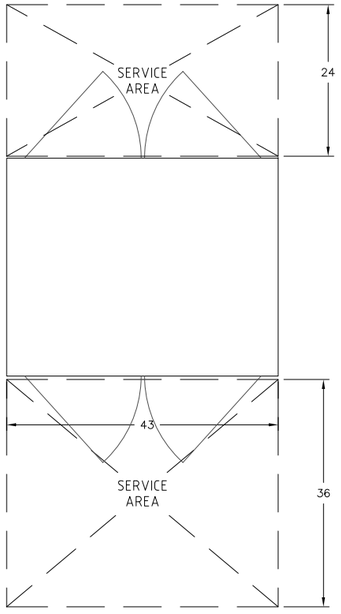
PROJECT:
PSI WATER TECHNOLOGIES, INC.
STANDARD DRAWING

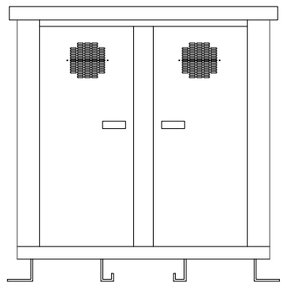
SUBJECT:
DILUTION PANEL
50 GPM
OUTLINE & UTILITY DRAWING

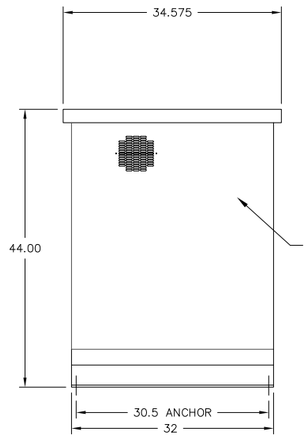
DWG #: 000000-MC0820-OU | SHEET 1 OF 1 | REV. B

NOTES

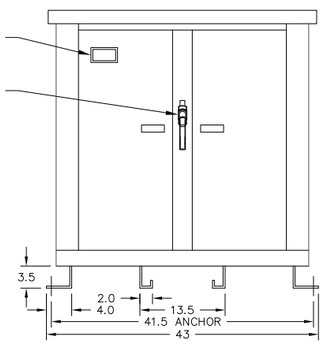
1. WEIGHT
   - A. TOTAL: 900 LB
   - B. RECTIFIER: 600 LB
   - C. ENCLOSURE: 300 LB
2. ENCLOSURE MATERIAL: 304 SS
3. FRAME BASE DIMENSIONS: 43"(W)x32"(D)x44"(H)
4. RECTIFIER ELECTRICAL SERVICE:
   - A. POWER: 480VAC, 3Ø, 80A SERVICE
   - B. SERVICE CONDUIT INGRESS: FIELD FIT TO LEFT SIDE OF ENCLOSURE
5. DC CABLES:
   - A. POSITIVE CABLE 2/0 AWG
   - B. NEGATIVE CABLE 2/0 AWG
6. DC CABLE INSTALLATION:
   - A. CABLE LENGTH: CABLES TO BE CUT TO LENGTH BY INSTALLING CONTRACTOR
   - B. TERMINATION LUGS: LUGS CRIMPED TO CABLES BY INSTALLING CONTRACTOR
   - C. INGRESS/EGRESS: REMOVABLE ACCESS PANEL TO BE MODIFIED AS NEEDED BY INSTALLING CONTRACTOR
   - D. SUPPLIED CORD GRIPS: HUBBEL SHC1042CR, 1" NPT, 1.375" KNOCKOUT

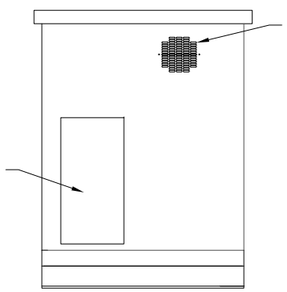






ELECTRICAL SERVICE PENETRATION ON TOP LEFT SIDE, FIELD FIT BY INSTALLING CONTRACTOR.





REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	02/26/20	B.F.	RELEASED				

PSI Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: B. FRITZ	DATE: 02/26/2020
CHECKED BY:	DATE:
SCALE: 1-1/2"=1'-0"	SIZE: D

PROJECT:
PSI WATER TECHNOLOGIES, INC.
STANDARD DRAWING

SUBJECT:
MICROCLOR
MC-400 TRANSFORMER/RECTIFIER (48 kVA)
OUTLINE & UTILITY DRAWING

DWG #: 000000-MC4040-OU | SHEET 1 OF 1 | REV. A

SECTION 9.5

INSTRUMENTATION

9.5.1 Piping and Instrumentation Diagram
~~9.5.2 Instrumentation and Valve Product Data Sheets~~ Available upon request

HUMBOLDT BAY MUNICIPAL WATER DISTRICT
WATER TREATMENT PLANT
ARCATA, CA

MICROCLOR ON-SITE HYPOCHLORITE GENERATION SYSTEM
MC-400 (400 PPD)

PIPING & INSTRUMENTATION DIAGRAM

REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	02/03/23	KF	CREATED				
B	03/16/23	MK	UPDATED DILUTION PANEL, DOSING PLUMBING				
C	01/12/24	WE	ADDED HYPO DOSING SKIDS				

PSI Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: K. FERGUSON	DATE: 02/03/2023
CHECKED BY:	DATE:
SCALE: N/A	SIZE: D

PROJECT:
HUMBOLDT BAY MUNICIPAL WATER DISTRICT
WATER TREATMENT PLANT
ARCATA, CA

SUBJECT:
MICROCLOR
MC-400
PIPING & INSTRUMENTATION DIAGRAM

DWG #: 922028-MC0400-PI | SHEET 1 OF 7 | REV. C

LINE TYPES

- ELECTRICAL (AC, SINGLE PHASE)
- ELECTRICAL (AC, THREE PHASE)
- ELECTRICAL (DC)
- FUTURE
- LIMITS
- LIQUID & GAS FLOW
- NETWORK
- SIGNAL WIRING

TAGS

- [CHEMICAL] [INLET/OUTLET] — LINE CONTINUATION TAG (EXTERNAL)
- [X] [#] — LINE CONTINUATION TAG (INTERNAL)
- [#]" [MATERIAL] — LINE IDENTIFICATION TAG
- [XXX] [###] — LOCAL INSTRUMENTATION TAG
- [DESC.] [WD][I/O] [###] [XXX] — PLC INSTRUMENTATION TAG
- [OBJECT] POWER [###] VAC, [#]ϕ, [##]A SERVICE [(OPTION [#])] — POWER SOURCE TAG
- VFD-[###] [#] HP — VFD TAG

ISA INSTRUMENT LETTER ID

LETTER	PROCESS VARIABLE	MODIFIER	READOUT/OUTPUT FUNCTION	MODIFIER
A	ANALYZER		ALARM	
B	BURNER		USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE	CONTROL	CONTROL	CLOSE
D	USER'S CHOICE	DIFFERENTIAL		
E	VOLTAGE		PRIMARY ELEMENT	
F	FLOW	RATIO		
G	USER'S CHOICE		GLASS	
H	HAND			HIGH
I	CURRENT		INDICATE	
J	POWER	SCAN		
K	TIME		CONTROL SITUATION	
L	LEVEL		LIGHT	LOW
M	USER'S CHOICE	MOMENTARY		INTERMEDIATE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE	OPEN
P	PRESSURE		POINT (TEST CONNECTION)	
Q	QUANTITY	INTEGRATE, TOTALIZE		
R	RADIATION	RELIEF	RECORD	
S	SPEED	SAFETY	SWITCH	
T	TEMPERATURE		TRANSMIT	
U	MULTI-VARIABLE		MULTI-FUNCTION	MULTI-FUNCTION
V	VIBRATION		VALVE, DAMPER	
W	WEIGHT, FORCE		WELL	
X	UNCLASSIFIED	X-AXIS	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE	Y-AXIS	RELAY, COMPUTE	
Z	POSITION	Z-AXIS	DRIVER, ACTUATOR, UNCL. F.C.E.	

VALVES

- ACTUATED VALVE (2-WAY)
- ACTUATED VALVE (3-WAY)
- BALL VALVE
- BALL VALVE (3-WAY)
- BUTTERFLY VALVE
- CHECK VALVE
- CONTROL VALVE
- GLOBE VALVE
- LOCKING DRAIN VALVE
- NEEDLE VALVE (2-WAY)
- NEEDLE VALVE (3-WAY)
- PRESSURE REGULATING VALVE
- PRESSURE RELIEF VALVE (2-WAY)
- PRESSURE RELIEF VALVE (3-WAY)
- SOLENOID VALVE (2-WAY)
- SOLENOID VALVE (3-WAY)

EQUIPMENT

- BLOWER
- CALIBRATION COLUMN
- ELECTROLYTIC CELL
- FILTER
- FLOWMETER (MAGNETIC)
- FLOWMETER (PADDLE-WHEEL)
- FLOWMETER (ROTAMETER)
- GROUNDING TARGET
- ION EXCHANGE BOTTLE
- MIXER STEM (CHEMICAL) [2 MAX]
- MIXER STEM (SAMPLE) [1 MAX]
- PULSATION DAMPENER
- PUMP (CENTRIFUGAL)
- PUMP (POSITIVE DISPL., SIMPLEX)
- PUMP (POSITIVE DISPL., DUPLEX)
- PUMP (SUBMERSIBLE)

FITTINGS

- AIR GAP
- BULKHEAD CONNECTION
- CAP
- DRAIN CONNECTION
- FLANGE CONNECTION
- FLEX CONNECTION
- GAUGE ISOLATOR
- HOSE BARB CONNECTION
- HOSE BIBB / SPIGOT
- QUICK COUPLING
- REDUCER
- UNION CONNECTION
- VENTURI INJECTOR
- Y-STRAINER

- MIXER, IMPELLER/LILY (VARIABLE-ANGLE)
- MIXER, IMPELLER/LILY (VERTICAL)
- MIXER, JET
- MIXER, TANK SHARK (CIRCULAR/FOLDING)
- MIXER, TANK SHARK (SUSPENDED)
- SPRAY AERATOR
- SURFACE AERATOR
- TRANSFORMER/RECTIFIER
- WATER SOFTENER

REV.	DATE	BY	DESCRIPTION	REV.	DATE	BY	DESCRIPTION
A	02/03/23	KF	CREATED				
B	03/16/23	MK	UPDATED DILUTION PANEL, DOSING PLUMBING				
C	01/12/24	WE	ADDED HYPO DOSING SKIDS				

PSI Water Technologies — A UGSI SOLUTIONS COMPANY

DRAWN BY: K. FERGUSON	DATE: 02/03/2023
CHECKED BY:	DATE:
SCALE: N/A	SIZE: D

PROJECT:
HUMBOLDT BAY MUNICIPAL WATER DISTRICT
WATER TREATMENT PLANT
ARCATA, CA

SUBJECT:
MICROCLOR
MC-400
PIPING & INSTRUMENTATION DIAGRAM

DWG #: 922028-MC0400-PI | SHEET 2 OF 7 | REV. C

NOTES

1. PSI IS NOT RESPONSIBLE FOR ANY INTERCONNECTING TUBING, PIPING, FITTINGS, VALVES, ANCHORS, FASTENERS, OR SUPPORTS OF ANY KIND.
2. 60" MINIMUM VERTICAL SEPARATION BETWEEN VENT HEADER (MEASURED AT LOW POINT) AND HYPOCHLORITE OUTLET (MEASURED AT HIGH POINT). MORE SEPARATION MAY BE NECESSARY IF HYPOCHLORITE OUTLET IS RAISED ABOVE TOP OF SKID, OR SKID IS RAISED ABOVE GROUND LEVEL.
3. BLOWER MOUNTED 24" MAXIMUM ABOVE BASE OF GENERATOR SKID.
4. GENERATOR'S BLOWER REQUIRES 39" OF STRAIGHT PIPE BEFORE ANY ELBOWS OR VALVES (FOR THIS SYSTEM'S STANDARD BLOWER).
5. STORAGE TANK BLOWERS REQUIRES 39" OF STRAIGHT PIPE BEFORE ANY ELBOWS OR VALVES (FOR THIS SYSTEM'S STANDARD BLOWER).
6. BLOWERS ARE SHOWN IN DUTY/STANDBY SETUP.
7. METERING PUMPS ARE SHOWN IN DUTY/DUTY/STANDBY SETUP.

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PSI Water Technologies
A UGSI SOLUTIONS COMPANY

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PROJECT:
HUMBOLDT BAY MUNICIPAL WATER DISTRICT
WATER TREATMENT PLANT
ARCATA, CA

SUBJECT:
MICROCLOR
MC-400
PIPING & INSTRUMENTATION DIAGRAM

DWG #: 922028-MC0400-PI | SHEET 3 OF 7 | REV. C

MICROCLOR PLC

CONTROL PANEL POWER
208-240 VAC, 1ϕ

DO
SV
AI
LT
AI
LIT

120 VAC
4-20 mA
24 VDC

SV 001
LT 001
LIT 001

T-001
BRINE STORAGE TANK
(BY OTHERS)

WATER
INLET (50-80 PSI)

1" PVC SCH80

1"x1-1/2"
1"

1-1/2"x1"
1"

PI 001
1/2"

1"x1/2"
1"

WATER FILTER
50 MICRON

SOFTENING
(BY OTHERS)

SOFTENING
(BY OTHERS)

1"
1"

PI 003
1/2"

1-1/2" 1-1/2"x1/2"

1/2" OD PE TUBE

A
5

BRINE FILTER
50 MICRON

PI 002
1/2"

1"
1"

1"x1/2"

1" 1"x1-1/2" 1-1/2"x1" 1"

WATER FILTER
50 MICRON

1"x1/4"
1/4"

1" PVC SCH80

B
5

E
7

REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
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PSI Water Technologies
A UGSI SOLUTIONS COMPANY

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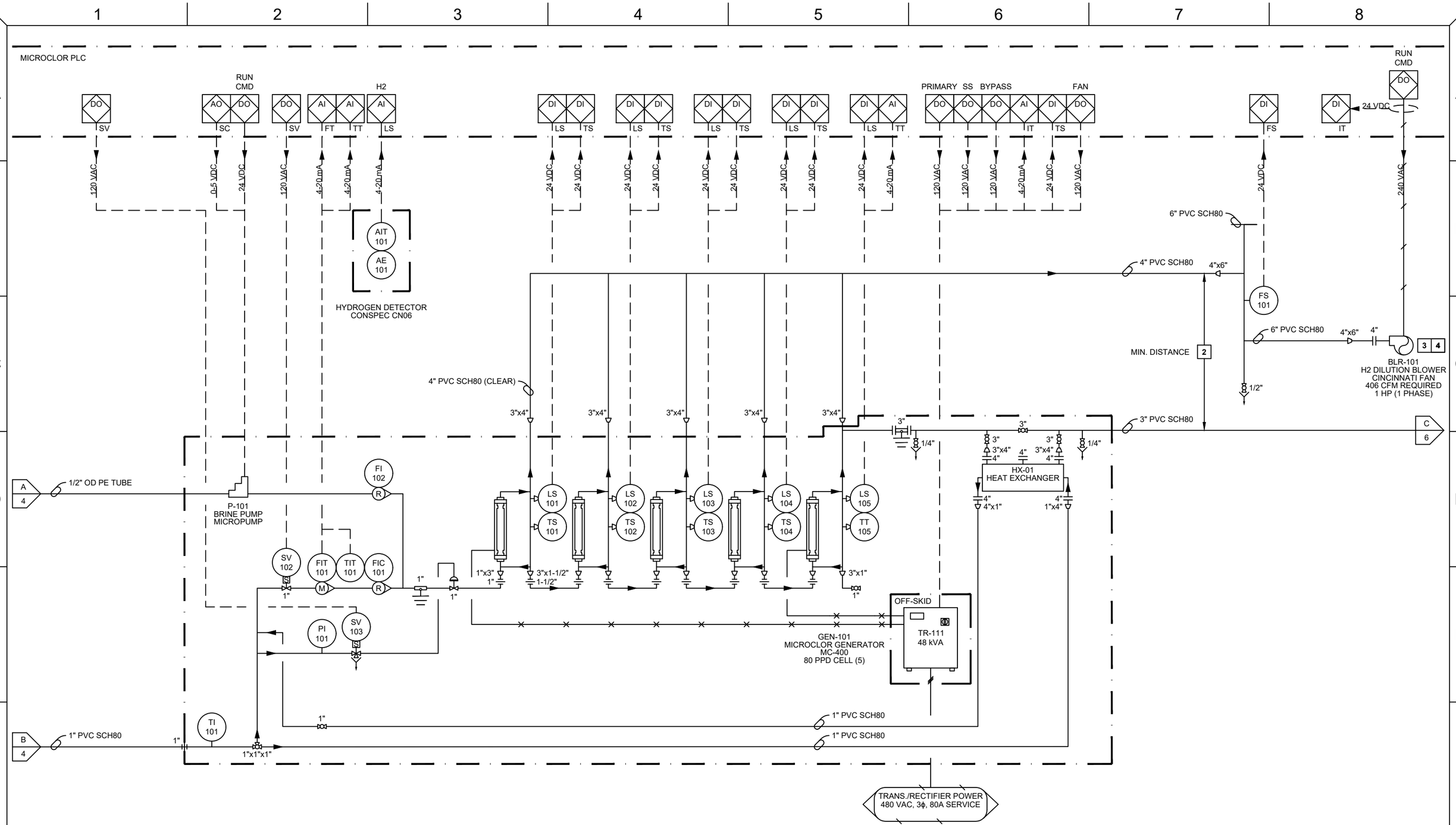
PROJECT:
HUMBOLDT BAY MUNICIPAL WATER DISTRICT
WATER TREATMENT PLANT
ARCATA, CA

SUBJECT:
MICROCLOR
MC-400
PIPING & INSTRUMENTATION DIAGRAM

DWG #: 922028-MC0400-PI | SHEET 4 OF 7 | REV. C



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PROJECT:
HUMBOLDT BAY MUNICIPAL WATER DISTRICT
WATER TREATMENT PLANT
ARCATA, CA

SUBJECT:
MICROCLOR
MC-400
PIPING & INSTRUMENTATION DIAGRAM

DWG #: 922028-MC0400-PI | SHEET 5 OF 7 | REV. C

MICROCLOR PLC

DI FS

AI LT

24 VDC

4-20 mA

4" PVC SCH80

FS 201

LT 201

LT 202

LT 203

T-201
HYPO. STORAGE TANK
3,000 GALLON
(BY OTHERS)

T-202
HYPO. STORAGE TANK
3,000 GALLON
(BY OTHERS)

T-203
HYPO. STORAGE TANK
3,000 GALLON
(BY OTHERS)

DI IT

RUN CMD

DO

240 VAC

BLR-201
H2 DILUTION BLOWER
CINCINNATI FAN
203 CFM REQUIRED
1 HP (1 PHASE)

BLR-202
H2 DILUTION BLOWER
CINCINNATI FAN
203 CFM REQUIRED
1 HP (1 PHASE)

1/2"

C 5 — 3" PVC SCH80

DILUTION PANEL
50 GPM

PI 201

2" PVC SCH80

FI 201

FI 202

P-201
DILUTION PANEL PUMP
MARCH
10 GPM

1"x3/4"

E 4 — 2" PVC SCH80

BULK HYPO.
INLET

1"

HYPO PUMP POWER
120 VAC, 1ϕ, 15A SERVICE

1-1/2" PVC SCH80

D 7

REV. △	DATE	BY	DESCRIPTION
A	02/03/23	KF	CREATED
B	03/16/23	MK	UPDATED DILUTION PANEL, DOSING PLUMBING
C	01/12/24	WE	ADDED HYPO DOSING SKIDS
△			

REV. △	DATE	BY	DESCRIPTION
△			
△			
△			
△			

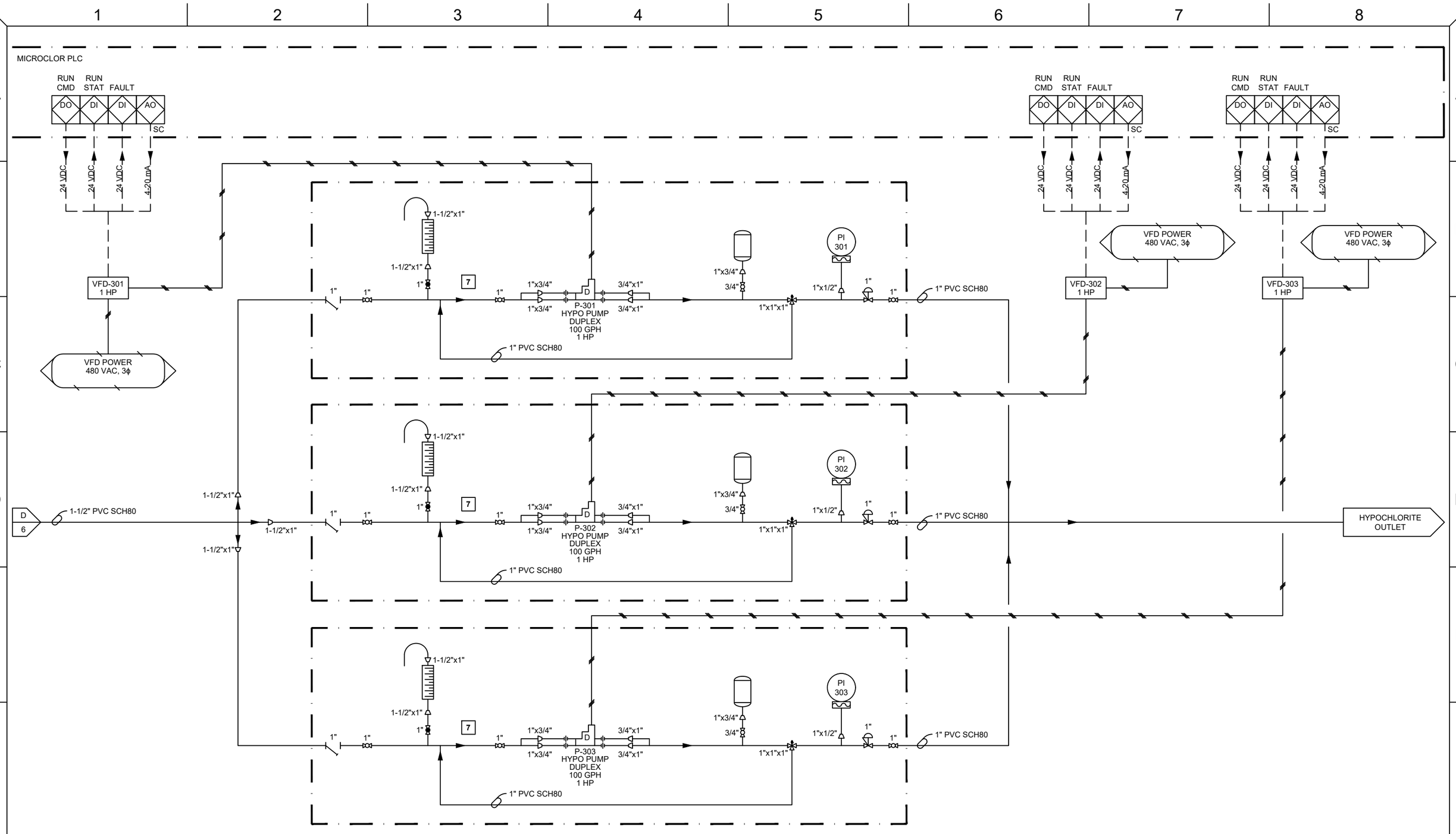
PSI Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: K. FERGUSON	DATE: 02/03/2023
CHECKED BY:	DATE:
SCALE: N/A	SIZE: D

PROJECT:
HUMBOLDT BAY MUNICIPAL WATER DISTRICT
WATER TREATMENT PLANT
ARCATA, CA

SUBJECT:
MICROCLOR
MC-400
PIPING & INSTRUMENTATION DIAGRAM

DWG #: 922028-MC0400-PI | SHEET 6 OF 7 | REV. C



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A UGSI SOLUTIONS COMPANY

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PROJECT:
HUMBOLDT BAY MUNICIPAL WATER DISTRICT
WATER TREATMENT PLANT
ARCATA, CA

SUBJECT:
MICROCLOR
MC-400
PIPING & INSTRUMENTATION DIAGRAM

DWG #: 922028-MC0400-PI | SHEET 7 OF 7 | REV. C

SECTION 10.0

SHIPPING, HANDLING, STORAGE, AND INSTALLATION

SHIPPING, HANDLING, STORAGE, AND INSTALLATION

GENERAL

These instructions are provided as guidelines to assist the contractor in the handling and installation of the on-site sodium hypochlorite generation system. Handling and installation instructions are suggestions only, and do not relieve the purchaser of full responsibility for safe and proper handling during installation. The purchaser also accepts liability for damage caused by improper handling or installation.

RECEIVING INSPECTION

Each crate will be shipped with a detailed packing list. Each shipment is complete and free of damage when it leaves the factory. **For each shipment, open all packages immediately and inspect for contents and damage. Any damage must be reported within 48 hours of receipt, in writing, to the freight carrier and to PSI Water Technologies, Inc.**

PRIOR TO INSTALLATION

Store equipment in a climate-controlled environment. Avoid temperatures below 32 °F and above 120 °F. Protect from direct weather exposure (sun, rain, high wind, etc.). Consult PSI Water Technologies, Inc. for additional instructions for any special situations.

Concrete equipment pads must be prepared for water softener, brine tank, electrolytic cell skid, hydrogen dilution blowers, sodium hypochlorite storage tank, and the sodium hypochlorite dosing system. The equipment pads must be perfectly flat and carefully cleaned prior to the installation of equipment.

GENERAL HANDLING RECOMMENDATIONS

The following general recommendations are offered regarding handling, movement, and storage of the equipment.

- Handle all equipment with care. Shipments contain fragile and factory-aligned components.
- Operators of hoist equipment should always follow proper rigging procedures. Care should be taken to prevent the components from swinging out of control.
- Lift and move the equipment using an appropriately sized nylon strap with a spreader bar attached to the hoist cable. The angle between the lifting lines and top of equipment must always be 60˚ or greater. Appropriately sized forklifts may also be used for installation. The forks must extend completely under the equipment to prevent accidental damage. Forks should be spaced widely enough to safely balance the equipment.
- Always lift, never drag, or roll equipment.
- When moving a component, do not subject it to sharp impact. Even though there may be no external sign of damage, sharp impact may cause damage to fragile interior components.
- Never let tools strike against or drop onto the equipment.
- Workmen entering the vessels should wear soft-soled shoes.
- When storing equipment prior to installation, place on 4-inch x 4-inch wooden beams located under the anchor lugs. Tie down securely. Protect all equipment from the weather. Use plywood or plastic to cover all openings into the brine and hypochlorite storage tank vessels.

INSTALLATION INSTRUCTIONS

Preliminary Notes

- ❑ See the Contract Drawings for proper orientation and placement of components.
- ❑ The electrolytic cell skid has been factory-assembled and wired to the maximum extent possible. The electrolytic cells are fit at the factory but removed prior to shipping. Installation for the skid required at the site includes attachment of piping for softened water, brine, sodium hypochlorite, and blower vent, anchoring of the skid, and electrical connections and wiring between the skid electrical control panel and remote-located instrumentation and equipment. Minor field assembly of some sub-assemblies will be required in the field (for shipping purpose, some sub-assemblies are disassembled and will need to be re-assembled in the field).

Mechanical Installation

- ❑ **Install blowers** and align blower outlets with the vent piping. The vent piping flanges should match the blower outlet flanges. See Section 8.4 of this submittal for proper blower outlet dimensions. All vent piping, gaskets, fasteners, and supports are **not** in PSI Water Technologies, Inc.'s scope of supply. Do not anchor the blowers until all connections have been made.
- ❑ **Anchor the electrolytic cell skid and hydrogen dilution blowers to the concrete pad** using appropriate anchoring systems. Install anchor bolts per the manufacturer's instructions.
- ❑ Carefully **clean the surface of the tank equipment pads.**
- ❑ **Clean tank bottom surfaces and place tanks on concrete equipment pads.** Use a crane and two suitably sized nylon slings or lifting straps with a spreader bar to lift the tanks and lower them onto the wooden blocks. While tanks are lifted, prior to setting on the pad, inspect and clean bottom surface of tanks.
- ❑ Once the brine and hypochlorite storage tanks are on the blocks, confirm that the tanks are appropriately centered and oriented on the concrete pad. Lift the tanks sufficiently to remove the wooden blocks from beneath the tanks. Then **lower tanks onto equipment pads**.
- ❑ **Attach piping assemblies and accessories** as shown in the drawings. Support and secure all piping.

Piping

- ❑ **Attach water supply piping** from the water softener to the connection on the electrolytic cell skid shown in the outline and utility drawing.
- ❑ **Run feed tubing** from brine tank to the connection on the electrolytic cell skid shown in the outline and utility drawing. Brine feed tubing should be installed such that it slopes downward continuously from the brine storage tank to the brine metering pump.
- ❑ **Piping for low pressure 0.8% sodium hypochlorite systems is typically Schedule 80 PVC** (Type 1 grade 1). CPVC can also be used, however it tends to become brittle over time when exposed to sodium hypochlorite. Whenever possible use socket solvent welded connections to reduce the possibility of leaking threaded fittings. It is recommended that a high quality CPVC glue such as IPS brand Weld-On 724 CPVC be used. CPVC glue has better resistance to sodium hypochlorite. Gaskets for use with sodium hypochlorite should be Teflon or Viton material. EPDM gaskets should not be used.
- ❑ **Valves should have seals & O-rings constructed of Teflon or Viton.** 0.8% sodium hypochlorite does not need vented valve balls. If there is the possibility that they could be used for 12% sodium hypochlorite, it is recommended that the ball valves be vented.
- ❑ **Storage tanks and piping must be leak-tested** with water prior to addition of brine or sodium hypochlorite. Salt must be available for the Contractor to install inside the brine tank during the on-site hypochlorite generation system startup after the tank internals have been inspected.
- ❑ **Attach drain tubing (or piping)** from the water softener direct to the appropriate facility drain. Note that the electrolytic cell skid drain piping must never be opened when the system is in operation.

- ❑ All hydrogen dilution piping components shall be constructed of Schedule 80 PVC. Solvent-welded joints should use a PVC primer and gray IPS Weld-On 711 PVC cement (or equivalent). The PVC should be coated to prevent UV degradation if it will be exposed to sunlight.
- ❑ All horizontal hydrogen vent piping should have a **minimum upward slope toward the vent outlet of approximately ¼ in per linear foot**. This will prevent any hydrogen from being trapped in the system and allow for proper drainage.
- ❑ **The hydrogen vent stack outlet should be at least 2 feet above the roof line** for at least 15-20 feet in all directions. A screened vent cap should be used to terminate the hydrogen vent stack to the atmosphere. Depending upon the location of the installation, this vent cap may need lightning protection.

Electrical

- ❑ It is left to the facility electrician to **determine appropriate wire sizing, conduit runs**, grounding, and other aspects of the electrical installation as needed to be consistent with local electrical codes and regulations. All components mounted on the electrolytic cell skids, all provided electrical control panels, and the transformer/rectifiers are pre-wired at the factory in accordance with U.S. electrical codes.
- ❑ **Run power to the electrical control panel and transformer/rectifier**. See Section 9.0 of this submittal for service requirement details for the panel.
- ❑ **Run electrical conduit and wiring from the blowers** to the proper connection points located inside the electrical control panel. See Section 9.0 of this submittal for details

DO NOT FILL OR OPERATE THE ON-SITE SODIUM HYPOCHLORITE GENERATION SYSTEM UNTIL A PSI WATER TECHNOLOGIES, INC. FIELD SERVICE TECHNICIAN HAS INSPECTED THE INSTALLATION.

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APPENDIX B – SODIUM HYPOCHLORITE BATCH TANK CUT SHEET

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EQUIPMENT SUBMITTAL

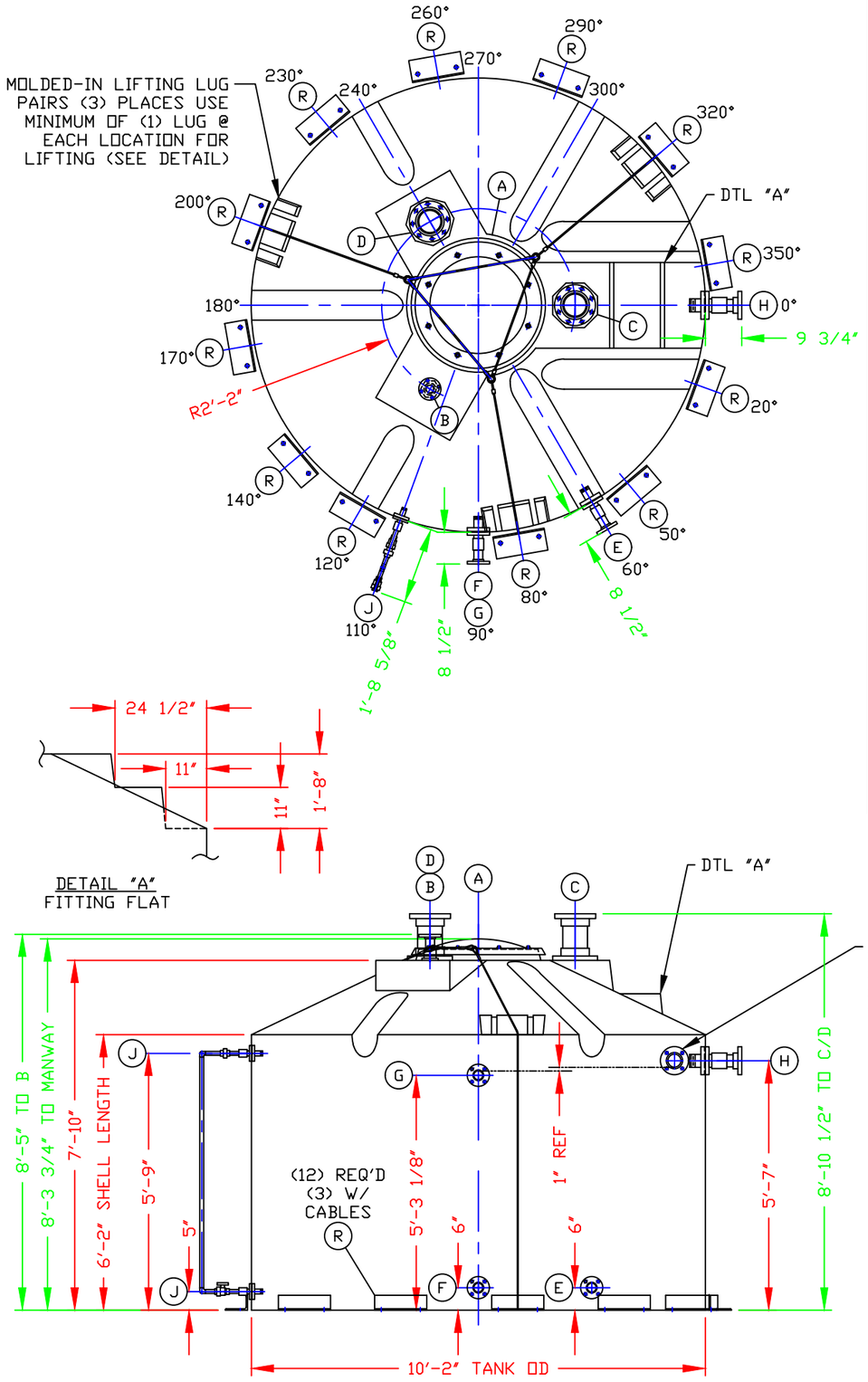
Prepared for:

Humboldt Bay MWD-3,650-gallon Vertical Sodium Hypochlorite Storage Tanks

Sodium Hypochlorite Tank

Prepared By:
Navid Saeidi
949-458-5555
nsaeidi@miscowater.com

TANK:	RESIN TYPE:	STOCK #:	TK SPG:	TK COLOR:	OR COLOR:
PRIMARY	XLPE/OR1000	11003650448	1.90	WHITE	NATURAL
SECONDARY	N/A	N/A	N/A	N/A	N/A

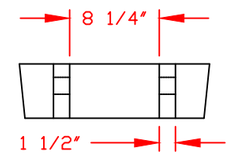


NOZZLE SCHEDULE & ACCESSORIES

SERVICE	MK	STOCK NO	SIZE	FITTING	DEG	ELEV
LID/MANWAY	A	3218	24"	CVR ASMBLY 24" 8-BLT	CTR	DOME
LEVEL SENSOR PORT	B	8047 2063	2"	BHF ASMLY 2" SXT H'WARD PVC/VITON GF FLG ADPT 2" THRD PVC	120°	DOME
BLOWER INLET	C	8053 2129	6"	BHF ASMLY 6" SXT SPEARS PVC/VITON GF FLG ADPT 6" THREADED PVC	0°	DOME
BLOWER OUTLET	D	8053 2129	6"	BHF ASMLY 6" SXT SPEARS PVC/VITON GF FLG ADPT 6" THREADED PVC	240°	DOME
OUTLET	E	9746 8616	2"	B.O.S.S. FITTING 2" ASMLY PE/PVC/TITAN/VITON GF FLG ADPT 2" SLIP PVC	60°	6"
DRAIN	F	9746 8616	2"	B.O.S.S. FITTING 2" ASMLY PE/PVC/TITAN/VITON GF FLG ADPT 2" SLIP PVC	90°	6"
OVERFLOW	G	9746 8616	2"	B.O.S.S. FITTING 2" ASMLY PE/PVC/TITAN/VITON GF FLG ADPT 2" SLIP PVC	90°	5'-3 1/8"
FILL	H	9875 8617	3"	B.O.S.S. FITTING 3" ASMLY PE/PVC/TITAN/VITON GF FLG ADPT 3" SLIP PVC PVC	0°	5'-7"
SITE GAUGE	J	3354 9783 9044 GAL. TAPE 2650+	-- 1"	LEVEL GAGE LRG STD TYPE PVC W/1 VALVE & DRAIN W/VITON (2) B.O.S.S. FITTING 1" ASMLY PE/PVC/TITAN/VITON GF (2) BUSH 1" X 3/4" SXT PVC 80 GALLONAGE TAPE	110°	5"/ 5'-9"
OUTDOOR RESTRAINT	R	NS-139 11517	--	A6-14 SSMC GALVANIZED OUTDOOR @GRADE (12) RC A6-14 GALVANIZED HOT DIP 6"X 4" X 3/8" X 14" HR ANGLE	20° 50° 80° 120° 140° 170° 200° 230° 260° 290° 320° 350°	DOME/ SDWL

RELEASED TO MANUFACTURING
NAME: sdoty
DATE: 11/03/2023

REVISED AND RE-RELEASED 11/3/2023



LIFTING LUG DETAIL
(3) PLACES
SCALE: 1"=1'-0"

CALCULATED CAPACITIES/ VOLUME IN U.S. GALLONS		
DESIGN CAP	DOME VOL	TOTAL VOL
3692	500	4192

NOTES:
1. MUST USE FLEXIBLE CONNECTION ALL LOWER SIDEWALL FITTINGS.
2. ANY ASSEMBLIES/PARTS NOT SAFE TO SHIP INSTALLED WILL REQUIRE JOBSITE INSTALLATION BY OTHERS. FOR FURTHER DETAIL CONTACT YOUR PPC REPRESENTATIVE.
3. DIMENSIONS WILL VARY ±3% DUE TO VARIATIONS IN MULTIPLE MOLDS & CONDITIONS PREVALENT DURING MANUFACTURE & USAGE.
4. MOLDED IN GALLONAGE @ 0° IN 500 GAL INCREMENTS STARTING @ 500 GAL UP TO 3500 GAL. AVOID WHEN PLACING FITTINGS.
5. TANK DESIGNED FOR 1.90 SpG MAT'L @ 100°F/ATMOS PRESSURE.

DWG TITLE
3650 GALLON VERTICAL TANK

NO. OF TANKS: 3
SERVICE: SODIUM HYPOCHLORITE 0.8% NSF CERTIFIED: YES

SCALE: 3/8"=1'-0"	PolyProcessing SOLUTIONS, SIMPLIFIED. Western Region P.O. Box 80 8055 South Ash Street French Camp, CA 95231 (209) 982-4904 FAX (209) 982-0455	DRAWN BY: C. JOHNSON
SHEET: 1 OF 1		DATE: 08/18/2023
TW ASSOC. DBA MISCOWATER PO #9506NM FOR: HUMBOLT BAY MWD PROJECT:	COMPUTER FILE: TWA9506A	REV: B

8-375

APPENDIX C – BRINE STORAGE TANK CUT SHEET

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CUSTOMER NOTES:

1.) RAISED FACE FLANGES SHALL NOT BE USED, TO BOLT-UP TO TANK NOZZLES.
2.) UPON DELIVERY, INSPECT TANK CLOSELY FOR DAMAGE. IF TANK IS DAMAGED, NOTE ON BILL OF LADING. ENSURE TANK IS HANDLED WITH CARE TO PREVENT INADVERTENT DAMAGE DURING INSTALLATION.
3.) TANK IS SPECIFICALLY DESIGNED FOR A PARTICULAR SERVICE. DO NOT PLACE IN ALTERNATE SERVICE WITHOUT CONTACTING THE FACTORY FOR AUTHORIZATION.
4.) MAKE NO REPAIRS OR MODIFICATIONS WITHOUT CONTACTING YOUR SERVICE REPRESENTATIVE. WARRANTY MAY BE VOIDED.
5.) PURCHASED PARTS CARRY THE WARRANTY OF THE ORIGINAL MANUFACTURER, OR ONE YEAR, WHICH EVER IS LONGER.
6.) MATERIAL SHIPPED LOOSE, EXAMPLE: LADDERS, AGITATOR SUPPORTS ETC. MOUNTED AT THE FACTORY AND REMOVED FOR SHIPMENT, CUSTOMER TO REINSTALL AT THE JOB SITE.
7.) PRIOR TO INSTALLING ADDITIONAL COMPONENTS/HARDWARE INSIDE OF VESSEL, VERIFY COMPATIBILITY WITH SOLUTION. INCOMPATIBILITY MAY CAUSE DEGRADATION OF COMPONENT, VESSEL, AND/OR SOLUTION.
8.) UNLESS SPECIFICALLY STATED ELSEWHERE VALVES, PIPING, AGITATOR DRIVES, LADDERS ETC. ARE TO BE INDEPENDENTLY SUPPORTED.
9.) INSTALL TANK IN ACCORDANCE WITH PLAS-TANKS IND. INC. INSTALLATION INSTRUCTIONS NO. 502.
10.) THE TANK IS DESIGNED FOR ATMOSPHERIC PRESSURE ONLY. THE PROCESS SYSTEM THAT THE TANK WILL BE INSTALLED IN MUST BE DESIGNED (BY OTHERS) TO PREVENT ANY PRESSURE ABOVE OR BELOW ATMOSPHERIC.
11.) DUE TO THE TOLERANCES ASSOCIATED WITH FIBERGLASS TANK FABRICATION & THE FACT THAT THE TANK & FITTINGS ARE MANUALLY FABRICATED & INSTALLED, PLAS-TANKS CANNOT GUARANTEE FIT UP TO PREPOURED ANCHORS & PREFABRICATED OR EXISTING PIPING.
12.) CUSTOMER NOTE: BEFORE OPERATING THIS TANK WITH GRANULATED SALT OR A FINE GRADE OF SOLAR SALT, YOU MUST FIRST INSTALL A QUARTZ ROCK FILTER BED.
13.) SLOTTED PVC PIPE (ITEM "12A") TO STRADDLE ITEMS "R" & "16A".
14.) P.T.I. SHIPPING DEPT. TO SHIP PLENUM (ITEM "17A") LOOSE, CUSTOMER TO BOLT UP PLENUM TO CLIPS (ITEM "V").

★ SHELL FAB. NOTES:

1.) INSTALL TIE DOWNS LUGS TO SIDE SHELL WITH 6 CYCLES OF 250 WINDING GLASS (.30" THICK BAND).
2.) INSTALL LIFTING CHANNELS TO SIDE SHELL WITH 6 CYCLES OF 250 WINDING GLASS (.30" THICK BAND).

FITTINGS NOTES:

1.) P.T.I. FITTING DEPT. TO USE SILICON CARBIDE ON THE INSIDE OF THE NOZZLE NECK OF ITEM "E".

■ FINISHING DEPT. NOTES:

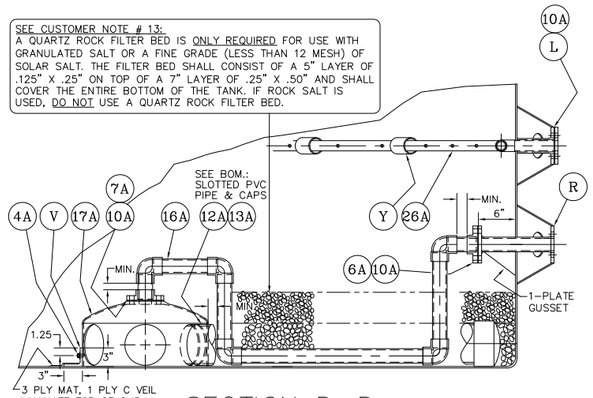
1.) P.T.I. TO LABEL A CUTOUT FROM EACH SECTION OF THE TANK; SIDE SHELL, KNUCKLE, TOP, BOTTOM AND SAVE FOR TWO YEARS.
2.) NOZZLE PROJECTION(S): ARE TO BE MEASURED FROM THE TANK OUTER SURFACE TO THE FLANGE FACE, ON A SLOPED SURFACE, NOZZLE PROJECTION(S) WILL BE MEASURED ON THE SHORT SIDE.

◆ QA DEPARTMENT/TESTING DATA:

1.) P.T.I. QUALITY ASSURANCE DEPT. TO FOLLOW ALLOWABLE VISUAL DEFECTS TABLE 6.1 TO ASSURE PRODUCT CONFORMS TO LAMINATE REQUIREMENTS.
2.) P.T.I. QUALITY ASSURANCE DEPT. TO CHECK ALL DIMENSIONAL TOLERANCES. SEE PLAS-TANKS STANDARD TOLERANCE DRAWING ST0401092.
3.) P.T.I. TO TEST HARDNESS BARCOL SHOULD BE 90% OF INEOS VALUE OF 40 WITH MINIMUM ACCEPTANCE VALUE OF 36.

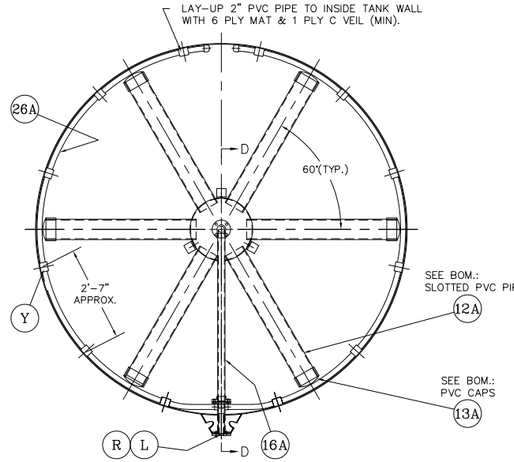
SHIPPING DEPARTMENT DATA:

1.) TANK SHIPPING DIMENSIONS: (BASED ON CHANNEL LOCATIONS)
TANK LENGTH = 17'-4" WIDTH = 11'-3"
TANK HEIGHT = 11'-2" (INCLUDING 4.5" HIGH SADDLE)
2.) P.T.I. TO CLEAN TANK INSIDE & OUTSIDE OF ALL LOOSE GLASS, RESIN RUNS, ETC. PRIOR TO SHIPMENT.
3.) P.T.I. SHIPPING DEPT. TO COVER FLANGE(S) WITH MASONITE BEFORE SHIPPING THE VESSEL.
4.) FOR ITEMS "12A" & "13A", BOND PVC CAPS TO SLOTTED PVC PIPES BY PLAS-TANKS IND., INC. BEFORE SHIPPING TANK.
5.) BOTTOM OF LADDER TO BE .50" UP FROM TANK BOTTOM TO ALLOW FOR LADDER TO BE SUPPORTED OFF OF CONCRETE OR SUITABLE BASE. FRP LADDER CLIPS ON TANK WALL ACT AS STABILIZERS ONLY.



SECTION D-D
SCALE: 2X

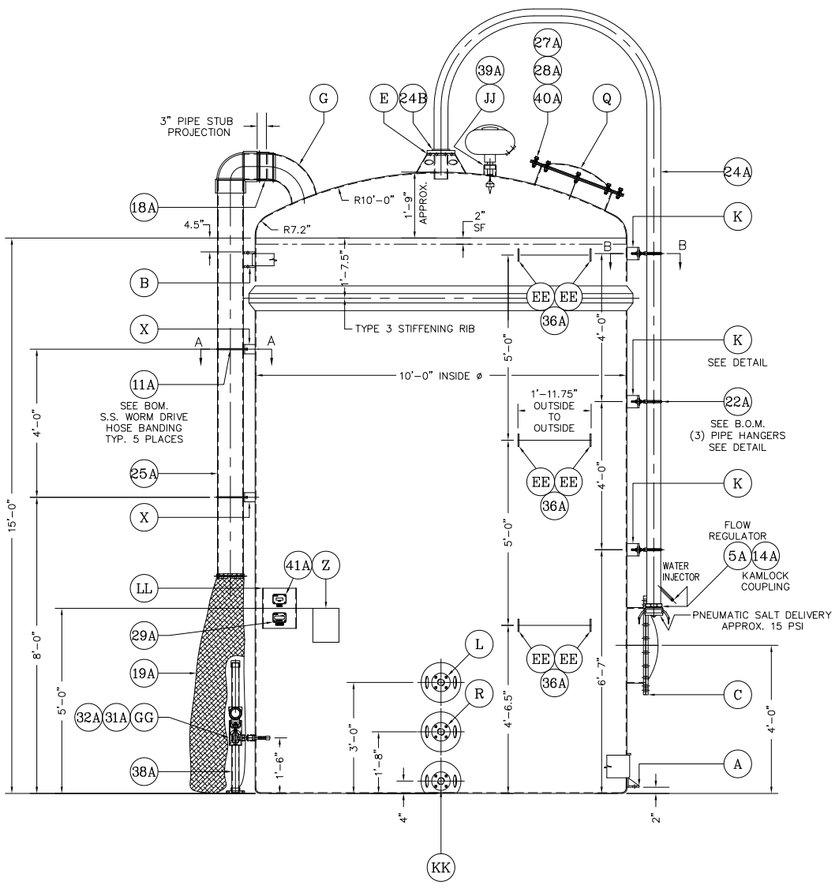
LAY-OUT DIMENSIONS
CIRCUMFERENCE = _____
1" = _____



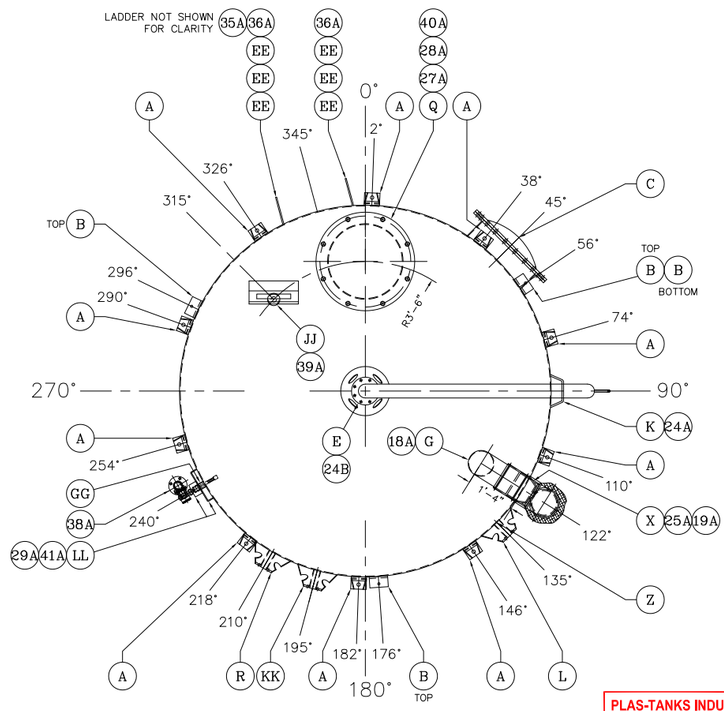
INSIDE TANK BOTTOM VIEW
SEE PLAN VIEW FOR TRUE ORIENTATION

PROJ.	SERVICE	ITEM	DESCRIPTION	QTY
–	TANK TIE DOWN	A	304 STAINLESS STEEL TIE DOWN LUGS PART NO.: PT-TD12-304	10
–	TANK LIFTING	B	304 STAINLESS STEEL LIFTING CHANNELS PART NO.: PT-LFB-304	4
6"	TANK ACCESS	C	24"ø FRP SIDE MANWAY W/.75" THICK FLANGE AND COVER	1
SEE FITTINGS NOTE 1	6"	SALT INLET	E	4"ø CONICALLY GUSSETED FLANGED NOZZLE-TYPE 1	1
–	VENT	G	8"ø FRP 90° ELBOW	1
–	SALT PIPE SUPPORT	K	FRP SUPPORT MOUNT FOR SALT PIPE SEE DETAIL	3
6"	WATER INLET	L	2"ø CONICALLY GUSSETED FLANGED NOZZLE-TYPE 2	1
6"	TANK ACCESS/ PRESSURE RELIEF	Q	24"ø FRP TOP FLANGED MANWAY WITH .38" THICK FLANGE & COVER	1
SEE CUSTOMER NOTE 13	6"	BRINE OUTLET	R	2"ø EXT. CONICALLY GUSSETED, 1-PLATE INT. GUSSETED DOUBLE FLANGED NOZZLE	1
–	PLENUM CLIPS	V	FRP PLENUM CLIPS 3" X 3" X 2" WIDE X .38" THICK	3
–	VENT PIPE SUPPORT	X	FRP VENT CLIPS WITH HOLES FOR INSERTION OF PIPE STRAPS	2
SEE SEC. D-D	–	WATER INLET RING SUPPORT	Y	2"ø X 3" LG. SCH 40 PVC PIPE FOR INLET RING SUPPORT MOUNTS	12
–	TANK I.D.	Z	FRP ENCAPSULATED NAMEPLATE	1
–	LADDER CLIP	EE	FRP LADDER CLIP 4" WIDE X 9" LONG X .38" THICK	6
3"	PRESSURE TRANS.	GG	1.25"ø F-NPT FRP HALF COUPLING SEE SHEET 2 FOR PROJECTION	1
3"	SALT LEVEL MOUNT	JJ	3"ø F-NPT FRP HALF COUPLING	1
6"	DRAIN	KK	2"ø CONICALLY GUSSETED FLANGED NOZZLE-TYPE 2	1
–	LEVEL CONTROL BOX	LL	FRP CONTROL BOX MOUNTING BRACKET W/2" PROJECTION, SEE SHEET 2 FOR DETAIL	1

PART NO.	FOR ITEM(S)	ITEM	PARTS/ACCESSORIES	QTY
	C	2A	.625"ø X 2.75" LG. 304 STAINLESS STEEL HEX BOLTS, NUTS, AND SAE WASHERS	20,20 40
	V	4A	.375"ø X 1.5" LG. 316 STAINLESS STEEL HEX BOLTS, NUTS, AND SAE WASHERS	3,3 6
	24A	5A	.75"ø FLOW REGULATOR 5 GPM.	1
	R	6A	.625"ø X 2.5" LG. 316 STAINLESS STEEL HEX BOLTS, NUTS, AND SAE WASHERS	4,4 8
	17A	7A	.625"ø X 2.5" LG. 316 STAINLESS STEEL HEX BOLTS, NUTS, AND SAE WASHERS	4,4 8
	C	8A	24"ø NEOPRENE GASKET-1/8"THK. FULL-FACE, 50 DURO.	1
	E	9A	4"ø NEOPRENE GASKET-1/8"THK. FULL-FACE, 50 DURO.	1
	L,R,17A	10A	2"ø NEOPRENE GASKET-1/8"THK. FULL-FACE, 50 DURO.	3
	X,18A,19A	11A	S.S. WORM-DRIVE HOSE BANDING. 1/2" WIDE, 1/32" THK. 2'-6" LONG.	5
	17A	12A	6" SLOTTED PVC PIPE SDR 26, 4'-0" LONG EACH, SEE SHIPPING NOTE NO. 4	6
	12A	13A	6" PVC CAPS, SEE SHIPPING NOTE NO. 4	6
	24A	14A	4"ø ALUMINUM KAMLOCK COUPLING WITH CAP (OPW)	1
	17A	16A	2"ø SCH. 80 PVC BRINE OUTLET PIPE W/FLANGED ENDS & 90° ELBOW (SEE SECTION D-D & CUSTOMER NOTE NO. 13)	1
PT-MC10001	V	17A	20"ø FRP BRINE PLENUM W/(6) HOLES & DISHED HEAD, SEE CUSTOMER NOTE NO. 14	1
	G	18A	8"ø NEOPRENE CONNECTION BOOT 9" I.D. X 8" LONG X .125" THICK	1
PT-DB10010	25A	19A	POLYESTER BAG #27 - 9"ø THROAT X 24"ø X 7'-0" LONG	1
	22A	21A	.50"-13 X 5.5" LG. 304 S.S. STAINLESS STEEL STUD NUTS, AND FENDER WASHERS	3,9 6
	K	22A	4" ROD MOUNT SPLIT-RING PIPE HANGER SEE DETAIL	3
	E	23A	.625"ø X 2.5" LG. 304 STAINLESS STEEL HEX BOLTS, NUTS, AND SAE WASHERS	8,8 16
PT-SP10015	E	24A	4"ø 304 STAINLESS STEEL FILL PIPE SCH. 40	1
	24A	24B	4"ø 304 STAINLESS STEEL THREADED FLANGE .75" THK., FLAT FACE, 150# BOLT PATTERN	1
	G	25A	8" SCH. 40 PVC PIPE 10'-0" LONG W/90° ELBOW & PIPE STUB (FOR VENT ATTACHMENT)	1
PT-SA10034	L,Y	26A	1.25"ø PVC WATER INLET RING SCH.80	1
	Q	27A	.625"ø X 4" LG. 304 STAINLESS STEEL HEX BOLT, NUT AND SAE WASHERS	8,8 24
	Q	28A	2" LONG S.S. COMPRESSION SPRING	8
PT-LC30002	–	29A	LEVEL PRO TVL-550-1829 W/NEMA 4X ENCLOSURE, SHIP LOOSE	1
PT-PT10013	GG	31A	PRESSURE TRANSMITTER W/.50" FNPT. & MOUNTING BRACKET, SHIP LOOSE	1
PT-SA10013	GG	32A	PRESSURE TRANSMITTER MOUNT SUB ASSEMBLY SEE SHEET 2 FOR DETAIL	1
PT-SV10010	–	33A	1.25"ø NORMALLY CLOSED SOLENOID VALVE (2 WAY)	1
PT-15004C	EE	35A	FRP LADDER W/LADDER CAGE SEE PT-FL15004C-IGF FOR DETAIL	1
	EE	36A	.375"ø X 3.5" LONG 304 STAINLESS STEEL HEX BOLTS, NUTS, AND SAE WASHERS	6,6 12
	29A,41A	37A	S.S. SELF TAPPING SCREW	8
	32A	38A	2"ø SCH. 80 PVC PIPE, 3'-6" LONG W/2"ø SCH. 80 PVC SOCKET FLANGE, & A 2"ø SCH. 80 PVC SOCKET CAP	1
	JJ	39A	SMARTBOB REMOTE UNIT, AO	1
	Q	40A	24" I.D. X 32" O.D. X .50" THICK NEOPRENE SPONGE GASKET	1
PT-LC30003	–	41A	LEVEL PRO ITC250-L W/NEMA 4X ENCLOSURE, SHIP LOOSE	1
PT-BRY1001	–	42A	OPERATION & MAINTENANCE MANUAL	1



ELEVATION VIEW
NOT A TRUE VIEW-SEE PLAN



PLAN VIEW
TRUE PLAN VIEW

PLAS-TANKS INDUSTRIES INC.
39 Standen Drive Hamilton, OH 45015
CERTIFIED DRAWING FOR FABRICATION
No Further Approval Required
By: B. Wesley Date: 10/4/23

BRYNEER™ SALT SYSTEM

MATERIAL SPECIFICATION KEY:

V = 1 LAYER OF "C" VEIL, .01" THICK
N = 1 LAYER OF NEXUS VEIL, .01" THICK
R = 1 LAYER OF 24 oz/sq yd WOVEN ROVING, .033" THICK
M = 1 LAYER OF 1.5 oz/sq ft MAT, .043" THICK
U = 1 LAYER OF 16 oz/sq yd UNI DIRECTIONAL, .023" THICK
C"ab" = 1 LAYER OF CHOP 22%-32% GLASS LAMINATE, .ab" THICK
FW = 85° FILAMENT WOUND HELICAL CYCLE OF 250 YIELD WINDING GLASS, .050" THICK
BC = 1 LAYER OF BEDDING CHOP 22%-32% GLASS LAMINATE
TYPE OF GLASS
CORROSION BARRIER: E GLASS
STRUCTURAL LAYER: E GLASS

LAMINATE SEQUENCES

ITEM	LAY-UP SEQUENCE	THICKNESS
TANK SHELL: 0'-10'	V,C10,BC,2FW,U,2FW,U,2FW,U,3FW	.62"
TANK SHELL: 10'-15'	V,C10,BC,2FW,U,3FW	.37"
DISH TOP	V,C10,C06,R,C06	.25"
FLAT BOTTOM	V,C10,C15	.25"
TOTAL KNUCKLE	V,C10,C09,R,C08,R,C08,R,C08,R,C08,R,C08,R,C08	.87"
DISH TOP TO SHELL (EXTERIOR)	2M,2(MR),2M	.32"
DISH TOP TO SHELL (INTERIOR)	3M,2V	.13"

CORROSION BARRIER (PLIES V & C10) OF THE TANK SHALL GEL AND EXOTHERM BEFORE STRUCTURAL PLIES ARE ADDED.

FILAMENT WINDING

CONSTRUCTION DATA:

RESIN CORROSION BARRIER: AROPOL 7241T-15
RESIN CURE SYSTEM (CB): MEKP-COBALT
LINER REINFORCEMENT: 1 PLY C GLASS
RESIN STRUCTURAL LAYER: AROPOL 7241T-15
RESIN CURE SYSTEM (SL): MEKP-COBALT
OUTER SURFACE LAYER: TRANSLUCENT W/UV-9 INHIBITOR
FABRICATION STANDARD: ASTM D-3299-18

NOZZLES/MANWAYS:		NOZZLE TYPE:	
ANSI B16.5 BOLTING:	150#	TYPE-1	2" PROJ.
NOZZLE PRESSURE RATING:	25 PSI	TYPE-2	FLUSH
MAX. BOLT TORQUE NOZZLE.:	30 FT-LBS		
MAX. BOLT TORQUE SIDE MANWAY.:	80 FT-LBS		
BOLT HOLE CIRCLE STRADDLE PLAN:	0°-180°		
BOLT HOLE CIRCLE STRADDLE ELEV.:	VERTICAL		

DESIGN DATA:

EMPTY WEIGHT (LBS.): 4,500
CAPACITY (TONS): 42
SERVICE: SODIUM CHLORIDE

CONCENTRATION: SATURATED
SPECIFIC GRAVITY: 1.2
SEISMIC LOAD PER: 2015 IBC, ASCE 7-10

	OPERATING	DESIGN
PRESSURE:	ATMOSPHERIC	ATMOSPHERIC
VACUUM:	ATMOSPHERIC	ATMOSPHERIC
TEMPERATURE:	AMBIENT	AMBIENT
WIND LOAD:	100 MPH	
SEISMIC DATA:	Ss=2.923	S_1=1.156
SITE CLASS:	C	

CUSTOMER
HUMBOLDT BAY MUNICIPAL WATER DISTRICT
7220 WEST END RD.
ARCATA, CA 95521

CUSTOMER P.O.: 23-1039

SHIP TO:
HUMBOLDT BAY MUNICIPAL WATER DISTRICT
7270 WEST END RD.
ARCATA, CA 95521

REV:	DRAWN:	CHECKED:	DESCRIPTION
2	G. WESLEY 10/04/23	A. ANDERSON 10/04/23	UPDATED THE LOCATIONS FOR ITEM "B" AND THE STIFFENING RIB ON ELEVATION VIEW.
1	G. WESLEY 06/28/23	A. ANDERSON 06/28/23	RELOCATED ITEMS "G, X, Z, 18A, 19A & 25A" ON PLAN VIEW.
0	G. WESLEY 06/16/23	A. ANDERSON 06/21/23	INITIAL SUBMITTAL.

Plas-Tanks Industries, Inc.
39 Standen Drive 513-942-3800
Hamilton, Ohio 45015 www.plastanks.com

JOB NO.:18923-T1 | SCALE:0.5"=12" | SHEET: 1 OF 2

PART 6
DRAWINGS