GREGORY L. GEIST | DIRECTOR

WATER ENVIRONMENT SERVICES

CLACKAMAS

Water Quality Protection Surface Water Management Wastewater Collection & Treatment

May 15, 2025

BCC Agenda Date/Item: _____

Board of County Commissioners Acting as the governing body of Water Environment Services Clackamas County

Approval of a Public Improvement Contract with JQ Construction for upgrades to wastewater chemical disinfection systems at the Hoodland Water Resource Recovery Facility. Contract Value is \$190,588 for 6 months. Funding is through the WES Sanitary Sewer Construction Fund. No County General Funds are involved.

Previous Board Action/Review	N/A				
Performance Clackamas	 This project supports the WES Strategic Plan goal that WES strategically plan and upgrade WES' infrastructure to ensure the sustainable delivery of reliable, high-quality, and climate-resilient clean water services that support the growth and vitality of our communities, natural environment, and economy. This project supports the County's Strategic Plan of building a strong infrastructure. 				
Counsel Review	Yes	Procurement Review	Yes		
Contact Person	Jeff Stallard	Contact Phone	503-742-4694		

EXECUTIVE SUMMARY: The Hoodland Water Resource Recovery Facility treats wastewater from the Welches area in accordance with its NPDES Waste Discharge Permit, which requires disinfection of treated effluent prior to discharge into the Sandy River. Two chemical feed systems, one for sodium hypochlorite and the other for sodium bisulfite, operate continuously and in concert with each other to disinfect wastewater of human pathogens. The existing disinfection processes, specifically the chemical storage and feed system, lack adequate monitoring and control features to ensure reliable operation. This contract will support upgrading mechanical and electrical systems that dose chemicals. In addition to improving system reliability, the project will enhance the safety of chemical storage and handling for facility staff.

RECOMMENDATION: Staff recommends that the Board of County Commissioners of Clackamas County, acting as the governing body of Water Environment Services, approve Contact #1237 with JQ Construction Inc. for services necessary to complete the Chemical Improvement Project at the Hoodland Water Resource Recovery Facility.

For Filing Use Only

Serving Clackamas County, Gladstone, Happy Valley, Johnson City, Milwaukie, Oregon City, Rivergrove and West Linn

Respectfully submitted,

Grege L an

Greg Geist Director, WES

Attachment: Contract #1237 JQ Construction Inc.



GREGORY L. GEIST | DIRECTOR

Water Quality Protection Surface Water Management Wastewater Collection & Treatment



WATER ENVIRONMENT SERVICES PUBLIC IMPROVEMENT CONTRACT

Contract #1237

This Public Improvement Contract (the "Contract") is made by and between Water Environment Services, an intergovernmental entity formed pursuant to ORS Chapter 190 ("Owner"), and JQ Construction Incorporated (the "Contractor"), both collectively the "Parties". This Contract shall become effective on the date this Contract has been signed by all the Parties and shall expire upon completion the completion of all obligations under the terms of this Contract unless terminated earlier by the Parties.

All capitalized terms in this Contract shall have the meanings identified in the Clackamas County General Conditions for Public Improvement Contracts (11/21/2024) ("General Conditions") referenced within the Instructions to Bidders.

Project Name: BID#2025-05 Chemical Improvement Project at Hoodland Water Resources Recovery Facility

1. Contract Price, Contract Documents and Work.

The Contractor hereby agrees to perform all the work described in, and reasonably inferred from, the Contract Documents, as further defined below ("Work"). In consideration of the Contractor performing the Work in accordance with the terms of the Contract, the Owner agrees to pay the Contractor an amount not to exceed One Hundred Ninety Thousand Five Hundred Eighty-Eight Dollars (\$190,588.00) (the "Contract Price"). Payment will be made in accordance with the terms and conditions provided in the Contract Documents. The Contract Price is the amount contemplated by the Base Bid, as indicated in the accepted Bid.

The following documents are incorporated by reference in this Contract and made a part hereof:

- Notice of Contract Opportunity
- Supplemental Instructions to Bidders
- Bid Form
- Clackamas County General Conditions
- Prevailing Wage Rates
- Plans, Specifications and Drawings
- Instructions to Bidders
- Bid Bond
- Performance Bond and Payment Bond
- Supplemental General Conditions
- Payroll and Certified Statement Form
- Addenda 1

2. Representatives.

Contractor has named Manolo Low as its Authorized Representative to act on its behalf. Owner designates, or shall designate, its Authorized Representative as indicted below (check one):

 \square Unless otherwise specified in the Contract Documents, the Owner designates Haakon Ogbeide as its Authorized Representative in the administration of this Contract. The above-named individual shall be the initial point of contact for matters related to Contract performance, payment, authorization, and to carry out the responsibilities of the Owner.

Name of Owner's Authorized Representative shall be submitted by Owner in a separate writing.

3. Key Persons.

 \square

The Contractor's personnel identified below shall be considered Key Persons and shall not be replaced during the project without the written permission of Owner, which shall not be unreasonably withheld. If the Contractor intends to substitute personnel, a request must be given to Owner at least 30 days prior to the intended time of substitution. When replacements have been approved by Owner, the Contractor shall provide a transition period of at least 10 working days during which the original and replacement personnel shall be working on the project concurrently. Once a replacement for any of these staff members is authorized, further

replacement shall not occur without the written permission of Owner. The Contractor's project staff shall consist of the following personnel:

Project Executive: <u>Manolo J Low</u> shall be the Contractor's project executive, and will provide oversight and guidance throughout the project term.

Project Manager: <u>Vern Gardner</u> shall be the Contractor's project manager and will participate in all meetings throughout the project term.

Job Superintendent: <u>Jullien Low</u> shall be the Contractor's on-site job superintendent throughout the project term.

4. Contract Dates.

The Contractor agrees to complete the Work in accordance with the following key dates:

COMMENCEMENT DATE: Upon Issuance of Notice to Proceed SUBSTANTIAL COMPLETION DATE: 5 months from issuance of NTP FINAL COMPLETION DATE: 6 months from issuance of NTP

Time is of the essence for this Contract. It is imperative that the Work in this Contract reaches Substantial Completion and Final Completion by the above specified dates.

5. Liquidated Damages.

The Owner and the Contractor acknowledge and agree that if the Contractor fails to reach Substantial Completion of the entire Work by the Substantial Completion Date identified in Section 4 above, the Owner will suffer damages, which are both extremely difficult and impracticable to ascertain, and on that basis agree to the assessment by Owner of liquidated damages as provided in this Section. These damages may include, but are not limited to, use of the Project, costs associated with Contract administration, and use of temporary facilities. The liquidated damages amount is not a penalty, but a reasonable estimate of the amount of losses the Owner will suffer. The Owner may deduct such liquidated damages as are payable under this Section from money due or to become due to the Contractor, or pursue any other legal remedy to collect such liquidated damages from the Contractor and/or its Surety.

If the Contractor fails to achieve Substantial Completion of the entire Work by the Substantial Completion Date identified in Section 4, the Contractor shall pay the Owner as liquidated damages the amount of **\$1,500** for each day occurring after the expiration of the date for Substantial Completion until the Contractor achieves Substantial Completion of the entire Work.

6. Change Order Authorization.

Throughout the performance of the Work under this Agreement, the Owner's Authorized Representative is hereby granted the authority to verbally authorize change orders in the field for an amount up to \$10,000. As soon as possible following the authorization, the Owner's Authorized Representative shall complete the change order form provided by Clackamas County Procurement ("Procurement"), obtain the signature of Owner's Director or other authorized signatory, and submit the form to Procurement for processing. As soon as the Director signs off on the change order form, the Authorized Representative may then authorize another change order in the future for up to \$10,000 following the same procedure above. Each change order should include the cumulative cost of the entire change and may not be artificially broken up into multiple change orders to fall under the dollar threshold listed above. The authority granted to the Authorized Representative is limited by the Director's authorization to amend the Agreement under Clackamas County's Local Contract Review Board Rules and is subject to the discretion of the Director, who may suspend or restrict the Authorized Representative ability to authorize change orders at any time for any reason.

7. Insurance Certificates.

In accordance with Section G.3.5 of the General Conditions, Contractor shall furnish proof of the required insurance naming Clackamas County and Water Environment Services as additional insureds. Insurance certificates may be returned with the signed Contract or may emailed to <u>Procurement@clackamas.us</u>.

8. Tax Compliance.

The Contractor shall comply with all federal, state and local laws, regulation, executive orders and ordinances applicable to this Contract. Contractor represents and warrants that it has complied, and will continue to comply throughout the duration of this Contract and any extensions, with all tax laws of this state or any political subdivision of this state, including but not limited to ORS 305.620 and ORS chapters 316, 317, and 318. Any violation of this section shall constitute a material breach of this Contract and shall entitle Owner to terminate this Contract, to pursue and recover any and all damages that arise from the breach and the termination of this Contract, and to pursue any or all of the remedies available under this Contract or applicable law.

9. Confidential Information.

Contractor acknowledges that it and its employees or agents may, in the course of performing their responsibilities under this Contract, be exposed to or acquire information that is confidential to Owner. Any and all information of any form obtained by Contractor or its employees or agents in the performance of this Contract shall be deemed confidential information of Owner ("Confidential Information"). Contractor agrees to hold Confidential Information in strict confidence, using at least the same degree of care that Contractor uses in maintaining the confidentiality of its own confidential information, and not to copy, reproduce, sell, assign, license, market, transfer or otherwise dispose of, give, or disclose Confidential Information to third parties or use Confidential Information for any purpose unless specifically authorized in writing under this Contract.

10. Counterparts.

This Contract may be executed in several counterparts, all of which when taken together shall constitute an agreement binding on all Parties, notwithstanding that all Parties are not signatories to the same counterpart. Each copy of the Contract so executed shall constitute an original.

11. Integration.

All provisions of state law required to be part of this Contract, whether listed in the General or Supplemental Conditions or otherwise, are hereby integrated and adopted herein. Contractor acknowledges the obligations thereunder and that failure to comply with such terms is a material breach of this Contract.

The Contract Documents constitute the entire agreement between the parties. There are no other understandings, agreements or representations, oral or written, not specified herein regarding this Contract. Contractor, by the signature below of its authorized representative, hereby acknowledges that it has read this Contract, understands it, and agrees to be bound by its terms and conditions.

12. Compliance with Applicable Law. Contractor shall comply with all federal, state, county, and local laws, ordinances, and regulations applicable to the Work to be done under this Contract including, but not limited to, compliance with the prohibitions set forth in ORS 652.220, compliance of which is a material element of this Contract and failure to comply is a material breach that entitles Owner to exercise any rights and remedies available under this Contract including, but not limited to, termination for default.

13. Responsibility for Taxes. Contractor is solely responsible for payment of any federal, state, or local taxes required as a result of the Contract or the Work including, but not limited, to payment of the corporate activity tax imposed under enrolled HB 3427 (2019 Oregon regular legislative session). Contractor may not include its federal, state, or local tax obligations as part of the cost to perform the Work.

In witness whereof, Owner executes this Contract and the Contractor does execute the same as of the day and year first above written.

Contractor DATA: JQ Construction Incorporated P.O. Box 250 Beaverton, Oregon 97075

Contractor CCB # 237402 Expiration Date: 8/31/2025 Oregon Business Registry # 1850516-96 Entity Type: DBC

State of Formation: Oregon

Payment information will be reported to the IRS under the name and taxpayer ID# provided by the Contractor. Information must be provided prior to contract approval. Information not matching IRS records could subject Contractor to 28 percent backup withholding.

JQ Construction	Incorporated
Signature	Date
MANOLO	JLOW, President

Name / Title Printed

Water Environment Services

Chair

Date

Recording Secretary

APPROVED AS TO FORM

County Counsel

4/23/2025 Date

Clackamas County Contract Form B-6 (1/2025)



CLACKAMAS COUNTY PUBLIC IMPROVEMENT CONTRACT OPPORTUNITY

Table of Contents

Section B-1	Notice of Public Improvement Contract Opportunity
Section B-2	Instructions to Bidders
Section B-3	Supplemental Instructions to Bidders
Section B-4	Bid Bond
Section B-5	Bid Form
Section B-6	Public Improvement Contract
Section B-7	Supplemental General Conditions
Section B-8	General Conditions
Section B-9	Performance Bond
Section B-10	Payment Bond
Section B-11	Project Information, Plans, Specifications and Drawings



CLACKAMAS COUNTY NOTICE OF PUBLIC IMPROVEMENT CONTRACT OPPORTUNITY

INVITATION TO BID #2025-05

Chemical Improvement Project at Hoodland Water Resources Recovery Facility February 5, 2025

Clackamas County ("County") on behalf of Water Environment Services through their Board of County Commissioners is accepting sealed bids for the **Chemical Improvement Project at Hoodland Water Resources Recovery Facility** until **March 5, 2025, 2:00 PM,** Pacific Time, ("Bid Closing") at the following location:

Bidding Documents can be downloaded from the state of Oregon procurement website ("OregonBuys") at the following address: <u>https://oregonbuys.gov/bso/view/login/login.xhtml</u>, Document No.S-C01010-00012748.

Prospective Bidders will need to sign in to download the information and that information will be accumulated for a Plan Holder's List. Prospective Bidders are responsible for obtaining any Addenda from Website listed above.

Submitting Proposals: Bid Locker

Proposals will only be accepted electronically thru a secure online bid submission service, **<u>Bid Locker</u>**. *Email submissions to Clackamas County email addresses will no longer be accepted.*

- A. Completed proposal documents must arrive electronically via Bid Locker located at <u>https://bidlocker.us/a/clackamascounty/BidLocker</u>.
- B. Bid Locker will electronically document the date and time of all submissions. Completed documents must arrive by the deadline indicated in Section 1 or as modified by Addendum. LATE PROPOSALS WILL NOT BE ACCEPTED.
- C. Proposers must register and create a profile for their business with Bid Locker in order to submit for this project. It is free to register for Bid Locker.
- D. Proposers with further questions concerning Bid Locker may review the Vendor's Guide located at <u>https://www.clackamas.us/how-to-bid-on-county-projects</u>.

Engineers Estimate: \$70,000.00

Contact Information

Procurement Process and Technical Questions: Tralee Whitley at Twhitley@clackamas.us .

Bids will be opened and publicly read aloud on Zoom after the Bid Closing. Bid results will also be posted to the OregonBuys listing shortly after the opening.

Prevailing Wage

Prevailing Wage Rates requirements apply to this Project because the maximum compensation for all Owner-contracted Work is more than \$50,000. Contractor and all subcontractors shall comply with the provisions of ORS 279C.800 through 279C.870, relative to Prevailing Wage Rates. The Bureau of Labor and Industries (BOLI) wage rates and requirements set forth in the following BOLI booklet (and any listed amendments to that booklet), which are incorporated herein by reference, apply to the Work authorized under this Agreement:

PREVAILING WAGE RATES for Public Works Contracts in Oregon, January 5, 2025, which can be downloaded at the following web address: which can be downloaded at the following web address: <u>http://www.oregon.gov/boli/WHD/PWR/Pages/pwr_state.aspx</u> The Work will take place in Clackamas County, Oregon.

Clackamas County encourages bids from Minority, Women, and Emerging Small Businesses.



CLACKAMAS COUNTY PUBLIC IMPROVEMENT CONTRACT

INSTRUCTIONS TO BIDDERS

Clackamas County Local Contract Review Board Rules ("LCRB Rules") govern this procurement process. LCRB Rules may be found at: <u>http://www.clackamas.us/code/documents/appendi</u> <u>xc.pdf</u>. The Instructions to Bidders is applicable to the procurement process for Clackamas County, or any component unit thereof identified on the Notice of Public Improvement Contract Opportunity, herein after referred to as the "Owner."

Article 1. Scope of Work

The work contemplated under this contract with the Owner, includes all labor, materials, transportation, equipment and services necessary for, and reasonably incidental to, the completion of all construction work in connection with the project described in the Project Manual which includes, but is not necessarily limited to, the Notice of Public Improvement Contract Opportunity, Instructions to Bidders, Supplemental Instructions to Bidders, Bid Form, Bid Bond, Public Improvement Contract Form, Performance Bond, Payment Bond, Clackamas County General Conditions for Public Improvement Contracts (10/13/2021), Supplemental General Conditions, and Plans, Specifications and Drawings.

Article 2. Examination of Site and Conditions

Before making a Bid, the Bidder shall examine the site of the work and ascertain all the physical conditions in relation thereto. The Bidder shall also make a careful examination of the Project Manual including the plans, specifications, and drawings and other contract documents, and shall be fully informed as to the quality and quantity of materials and the sources of supply of the materials. Failure to take these steps will not release the successful Bidder from entering into the contract nor excuse the Bidder from performing the work in strict accordance with the terms of the contract at the price established by the Bid.

The Owner will not be responsible for any loss or for any unanticipated costs, which may be suffered by the successful Bidder, as a result of such Bidder's failure to be fully informed in advance with regard to all conditions pertaining to the work and the character of the work required, including site conditions. No statement made by an elected official, officer, agent, or employee of the Owner in relation to the physical or other conditions pertaining to the site of the work will be binding on the Owner, unless covered by the Project Manual or an Addendum.

Article 3. Interpretation of Project Manual and Approval of Materials Equal to Those Provided in the Specifications

If any Bidder contemplating submitting a Bid for the proposed contract is in doubt as to the true meaning of any part of the plans, specifications or forms of contract documents, or detects discrepancies or omissions, such Bidder may submit to the Architect (read "Engineer" throughout in lieu of Architect as appropriate) a written request for an interpretation thereof at least ten (10) calendar days prior to the date set for the Bid Closing.

When a prospective Bidder seeks approval of a particular manufacturer's material, process or item of equal value, utility or merit other than that designated by the Architect in the Project Manual, the Bidder may submit to the Architect a written request for approval of such substitute at least ten (10) calendar days prior to the date set for the Bid Closing. The prospective Bidder submitting the request will be responsible for its prompt delivery.

Requests of approval for a substitution from that specified shall be accompanied by samples, records of performance, certified copies of tests by impartial and recognized laboratories, and such other information as the Architect may request.

To establish a basis of quality, certain processes, types of machinery and equipment or kinds of materials may be specified in the Project Manual either by description of process or by designating a manufacturer by name and referring to a brand or product designation or by specifying a kind of material. Whenever a process is designated or a manufacturer's name, brand or item designation is given, or whenever a process or material covered by patent is designated or described, it shall be understood that the words "or approved equal" follow such name, designation or description, whether in fact they do so or not.

Any interpretation of the Project Manual or approval of manufacturer's material will be made only by an Addendum duly issued. All Addenda will be posted to the OregonBuys listing and will become a part of the Project Manual. The Owner will not be responsible for any other explanation or interpretation of the Project Manual nor for any other approval of a particular manufacturer's process or item for any Bidder.

When the Architect approves a substitution by Addendum, it is with the understanding that the Contractor guarantees the substituted article or material to be equal or better than the one specified.

Article 4. Security to Be Furnished by Each Bidder

Each Bid must be accompanied by either 1) a cashier's check or a certified check drawn on a bank authorized to do business in the State of Oregon, or 2) a Bid bond described hereinafter, executed in favor of the Owner, for an amount equal to ten percent (10%) of the total amount Bid as a guarantee that, if awarded the contract, the Bidder will execute the contract and provide a performance bond and payment bond as required. The successful Bidder's check or Bid bond will be retained until the Bidder has entered into a contract satisfactory to Owner and furnished a one hundred percent (100%) performance bond. The Owner

reserves the right to hold the Bid security as described in Article 10 hereof. Should the successful Bidder fail to execute and deliver the contract as provided for in Article 12 hereof, including a satisfactory performance bond and payment bond within twenty (20) calendar days after the Bid has been accepted by the Owner, then the contract award made to such Bidder may be considered canceled and the Bid security may be forfeited as liquidated damages at the option of the Owner. The date of the acceptance of the Bid and the award of the contract as contemplated by the Project Manual shall mean the date of acceptance specified in the Notice of Intent to Award.

Article 5. Execution of Bid Bond

Should the Bidder elect to utilize a Bid bond as described in Article 4 in order to satisfy the Bid security requirements, such form must be completed in the following manner:

- A. Bid bonds must be executed on the County forms, which will be provided to all prospective Bidders by the Owner.
- B. The Bid bond shall be executed on behalf of a bonding company licensed to do business in the State of Oregon.
- C. In the case of a sole individual, the bond need only be executed as principal by the sole individual. In the case of a partnership, the bond must be executed by at least one of the partners. In the case of a corporation, the bond must be executed by stating the official name of the corporation under which is placed the signature of an officer authorized to sign on behalf of the corporation followed by such person's official capacity, such as president, etc. The corporation seal should then be affixed to the bond.
- D. The name of the surety must be stated in the execution over the signature of its duly authorized attorney-in-fact and accompanied by the seal of the surety corporation.

Article 6. Execution of the Bid Form

Each Bid shall be made in accordance with: (i) the sample Bid Form accompanying these instructions; (ii) the appropriate signatures for a sole individual, partnership, corporation or limited liability corporation shall be added as noted in Article 5C above; (iii) numbers pertaining to base Bids shall be stated both in writing and in figures; and (iv) the Bidder's address shall be typed or printed.

The Bid Form relates to Bids on a specific Project Manual. Only the amounts and information asked for on the Bid Form furnished will be considered as the Bid. Each Bidder shall Bid upon the work exactly as specified and provided in the Bid Form. The Bidder shall include in the Bid a sum to cover the cost of all items contemplated by the Contract. The Bidder shall Bid upon all alternates that may be indicated on the Bid Form. When Bidding on an alternate for which there is no charge, the Bidder shall write the words "No Charge" in the space provided on the Bid Form. If one or more alternates are shown on the Bid Form, the Bidder shall indicate whether each is "add" or "deduct."

Article 7. Prohibition of Alterations to Bid

Bids that are incomplete, or contain ambiguities or have differing conditions required by the Bidder, including requested changes or exceptions to the Public Improvement Contract form or other portions of the Project Manual, may be rejected in Owner's sole and absolute discretion.

Article 8. Submission of Bid

Each Bid shall be sealed in an envelope, properly addressed to the Owner, showing on the outside of the envelope the name of the Bidder and the name of the project. Bids will be received at the time and place stated in the Notice of Public Improvement Contract Opportunity.

Article 9. Bid Closing and Opening of Bids

All Bids must be received by the Owner at the place and time set for the Bid Closing. Any Bids received after the scheduled Bid Closing time for receipt of Bids will be rejected.

At the time of opening and reading of Bids, each Bid received will be publicly opened and read aloud, irrespective of any irregularities or informalities in such Bids.

Generally, Bid results will be posted to the OregonBuys Website within a couple hours of the opening.

Article 10. Acceptance or Rejection of Bids by Owner

Unless all Bids are rejected, the Owner will award a contract based on the lowest responsive Bid from a responsible Bidder. If that Bidder does not execute the contract, it will be awarded to the next lowest responsible Bidder or Bidders in succession.

The Owner reserves the right to reject all Bids and to waive minor informalities. The procedures for contract awards shall be in compliance with the provisions of the LCRB Rules in effect at that time.

The Owner reserves the right to hold the Bid and Bid security of the three lowest Bidders for a period of thirty (30) calendar days from and after the time of Bid opening pending award of the contract. Following award of the contract the Bid security of the three lowest Bidders may be held twenty (20) calendar days pending execution of the contract. All other Bids will be rejected and Bid security will be returned.

In determining the lowest Bidder, the Owner reserves the right to take into consideration any or all authorized base Bids as well as alternates or combinations indicated in the Bid Form.

If no Bid has been accepted within thirty (30) calendar days after the opening of the Bids, each of the three lowest Bidders may withdraw the Bid submitted and request the return of the Bid security.

Article 11. Withdrawal of Bid

At any time prior to the Bid Closing, a Bidder may withdraw its Bid. This will not preclude the

submission of another Bid by such Bidder prior to the time set for the Bid Closing.

After the time set for the Bid Closing, no Bidder will be permitted to withdraw its Bid within the time frames specified in Article 10 for award and execution, except as provided for in that Article.

Article 12. Execution of Contract, Performance Bond and Payment Bond

The Owner will provide the successful Bidder with contract forms within seven (7) calendar days after the completion of the award protest period. The Bidder is required to execute the contract forms as provided, including a performance bond and a payment bond from a surety company licensed to do surety business in the State of Oregon, within seven (7) calendar days after receipt of the contract forms. The contract forms shall be delivered to the Owner in the number called for and to the location as instructed by the Owner.

Article 13. Recyclable Products

Contractors will use recyclable products to the maximum extent economically feasible in the performance of the Contract.

Article 14. Clarification or Protest of the Solicitation Document or Specifications

Any request for clarification or protest of the solicitation document or specifications must be submitted in the manner provided for in the applicable section of the LCRB Rules to the Procurement Representative referenced in the Notice of Public Improvement Contract Opportunity.

A protest of the Solicitation Document must be received within seven (7) business days of the issuance of the Bid or within three (3) business days of issuance of an addendum.

Requests for clarification may be submitted no less than five (5) business days prior to the Bid Closing Date.

Article 15. Protest of Intent to Award

Owner will name the apparent successful Bidder in a "Notice of Intent to Award" letter. Identification of the apparent successful Bidder is procedural only and creates no right in the named Bidder to the award of the contract. Competing Bidders will be notified by publication of the Notice of Intent to Award on the OregonBuys Website of the selection of the apparent successful Bidder(s) and Bidders shall be given seven (7) calendar days from the date on the "Notice of Intent to Award" letter to review the file at the Procurement Division office and file a written protest of award, pursuant to C-049-0450. Any award protest must be in writing and must be delivered by email, hand delivery, or mail to the Procurement Division Director at: Procurement Division, 2051 Kaen Road, Oregon City, OR 97045.

Article 16. Disclosure of First-Tier Subcontractors

Within two (2) working hours after the Bid Closing, all Bidders shall submit to the County a disclosure form identifying any first-tier subcontractors (those entities that would be contracting directly with the prime contractor) that will be furnishing labor and materials on the contract, if awarded, whose subcontract value would be equal to or greater than: (a) Five percent (5%) of the total contract price, but at least \$15,000; or (b) \$350,000, regardless of the percentage of the total contract price.

Disclosures may be submitted with the Bid or may be hand delivered to the Bid Closing address or emailed to the Contract Information Analyst listed on the Notice of Contract Opportunity.



CLACKAMAS COUNTY PUBLIC IMPROVEMENT CONTRACT

SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

Project Name BID# 2025-05 Chemical Improvement Project at Hoodland Water Resources Recovery Facility

The following modify the Clackamas County "Instructions to Bidders" for this Project. Where a portion of the Instructions to Bidders has been modified by these Supplemental Instructions to Bidders, the unaltered portions shall remain in effect.

1. Electronic Submissions: The County is requiring all bids for this project be electronically submitted. Complete Bids (including all attachments) will only be accepted electronically thru a secure online bid submission service, Bid Locker. Email submissions to Clackamas County email addresses will no longer be accepted. https://bidlocker.us/a/clackamascounty/BidLocker.

Bids will be publicly read aloud via the computer application, Zoom. Bidders will be allowed to video conference or listen by phone to the bid results. The projects Zoom meeting can be accessed via the information below:

ZOOM LINKS Join Zoom Meeting https://clackamascounty.zoom.us/j/85460228010

Meeting ID: 854 6022 8010

One tap mobile +16694449171,,85460228010# US +16699006833,,85460228010# US (San Jose)

Dial by your location

- +1 669 444 9171 US
- +1 669 900 6833 US (San Jose)
- +1 719 359 4580 US
- +1 253 205 0468 US
- +1 253 215 8782 US (Tacoma)
- +1 346 248 7799 US (Houston)
- +1 408 638 0968 US (San Jose)
- +1 646 876 9923 US (New York)
- +1 646 931 3860 US
- +1 689 278 1000 US
- +1 301 715 8592 US (Washington DC)
- +1 305 224 1968 US
- +1 309 205 3325 US

- +1 312 626 6799 US (Chicago)
- +1 360 209 5623 US
- +1 386 347 5053 US
- +1 507 473 4847 US
- +1 564 217 2000 US

Meeting ID: 854 6022 8010

Find your local number: https://clackamascounty.zoom.us/u/krtPLKrqD

**The Apparent Low bid results will be posted to the projects OregonBuys listing as soon as possible following the bid opening.

2. Good Faith Effort: Clackamas County encourages participation in contracts by Historically Underrepresented Businesses. "Historically Underrepresented Businesses" are State of Oregon-certified and self-identified minority, women and emerging small business as well as firms that are certified federally or by another state or entity with substantially similar requirements as the State of Oregon.

Bidders must perform Good Faith Effort (defined below) and submit **Form 1 and Form 2** for the Bidders Bid to be considered responsive. **Form 1 and Form 2** must be submitted within <u>two (2) hours</u> after the Closing Date and Time. Form 1 and Form 2 may be submitted to either the Contact Information Analyst listed on Notice of Contract Opportunity or via the <u>https://bidlocker.us/a/clackamascounty/BidLocker</u> listing.

"Good Faith Effort" is a requirement of a prime contractor to reach out to at least three Historically Underrepresented Business Subcontractors for each division of work that will be subcontracted out and to complete the required forms. If fewer than three Historically Underrepresented Business Subcontractors are reasonably available for a particular division of work, the Bidder must specifically note the reason for there being fewer than three contacts. The outreach should be performed with sufficient time to give the subcontractors at least 5 calendar days to respond to the opportunity. Form 3, which documents the actual amount of subcontractors on the project, must be submitted with the project final pay application. Compliance with the Good Faith Effort and submission of Forms 1, 2 and 3 is a contractual requirement for final payment.

The sufficiency of the documentation or the performance of Good Faith Effort shall be in the sole and absolute determination of Clackamas County. Only those Bidders that Clackamas County has determined have not sufficiently performed Good Faith Effort shall have protest rights of the determination for such Bidder. No Bidder shall have protest rights of the sufficiency of any other Bidder completing Good Faith Effort.

CLACKAMAS COUNTY GOOD FAITH EFFORT SUBCONTRACTOR AND SELF-PERFORMED WORK LIST (FORM 1)

Prime Contractor Name: **Total Contract Amount:** Project Name: 2025-05 Chemical Improvement Project at Hoodland PRIME SELF-PERFORMING: Identify below ALL GFE Divisions of Work (DOW) to be self-performed. Good Faith Efforts are otherwise required. DOW BIDDER WILL SELF-PERFORM (GFE not required) JO Longtruction is Mechanical DBE, MBE, ESB PRIME CONTRACTOR SHALL DISCLOSE AND LIST ALL SUBCONTRACTORS, including those Minority-owned, Woman-owned, and Emerging Small Businesses ("M/W/ESB") that you intend to use on the project. Delivery via bid locker https://bidlocker.us/a/clackamascounty/BidLocker within 2 hours of the BID/Quote Closing Date/Time. If Certified or **Division of Work** DOLLAR self-reporting LIST ALL SUBCONTRACTORS BELOW (Painting, electrical, AMOUNT OF MBE/WBE/ESB Use correct legal name of Subcontractor landscaping, etc.) SUBCONTRACT Subcontractor (No Assumed Business Names) List ALL DOW performed by Subcontractors Check box MBE WBE ESB Name La Londe Electric Address 1000 NW Commerce Court City/St/Zip Suit A Phone# 503 469 - 8491 Electrical 12,547 Π OCCB# 174854 Name Address City/St/Zip Π \square Phone# OCCB# Name Address City/St/Zip Π Phone# OCCB# Name Address City/St/Zip Π Phone#

OCCB#

CLACKAMAS COUNTY GOOD FAITH EFFORT M/W/ESB CONTACT / BIDS RECEIVED LOG (FORM 2)

Prime Contractor:

Project: 2025-05 Chemical Improvement Project at Hoodland

Prime Contractor must contact or endeavor to contact at least 3 MW/ESB Subcontractors for each Division of Work. Prime Contractor shall record its contacts with MW/ESB Subcontractors through use of this log (or equivalent) entering all required information. All columns shall be completed where applicable. Additional forms may be copied if needed.

Divisions of Work		k Date Solicitation	PHONE CONTACT		BID ACTIVITY Check Yes or No			REJECTED BIDS (if bid received & not used)		Nintan
SUBCONTRACTOR	(Painting, electrical, landscaping, etc.)	Letter / Fax Sent	Date of Call	Person Receiving Call	Will Bid	Bid Received	Sid Used	Bid Amount	Reason Not Used (Price, Scope or Other, If	140.025
		01			Vis	Unes -	Vin	10 005	Other, explain in Notes-21	······································
lalande	Election-1	1/24		Bruce	í No	No	No	12,541-		
1=leitric					Yas	Yes	Yes			
					€″ No	No	No			
1. (Additional of the second black based on the second second second second second second second second second			···		Yes	Yes	Yes			
					1 No	1 No	No			
					Yes	Yes	1 Yes			
					C No:	i No	No.			
				-	Yes	Yes'	Yes			
					(No	T" No	tin No j			
		+			1 Yes	The Yes	Yes			
					No.	No	No			
			· · · · · · · · · · · · · · · · · · ·		Yea	Yes	Yes			
					No	No	No.			

Clackemas County GFE (2/2023)

Page 3 of 4

PUBLIC IMPROVEMENT CONTRACT



BID BOND

Project Name: #2025-05 Chemical Improvement Project at Hoodland WRRF

We,	JQ Construction Incorporated	, as "Principal,"	
	(Name of Principal)	area area a moreoren branen	
and	SureTec Insurance Company	, an Texas	Corporation
5.1	(Name of Surety)		

authorized to transact Surety business in Oregon, as "Surety," hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns to pay unto Water Environment Services ("Obligee") the sum of ($\$_10\%$)

Ten Percent of Bid Amount

dollars.

WHEREAS, the condition of the obligation of this bond is that Principal has submitted its proposal or bid to an agency of the Obligee in response to Obligee's procurement document (No.) for the project identified above which proposal or bid is made a part of this bond by reference, and Principal is required to furnish bid security in an amount equal to ten (10%) percent of the total amount of the bid pursuant to the procurement document.

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, we have caused this instrument to be executed and sealed by our duly authorized legal representatives this <u>5th</u> day of <u>March</u>, 2025.

Principal:_	JQ Construction Incorporated	Surety: SureTec In	surance Com	pany
By:	Signature MANOLO'J. LOW President Official Capacity	By: Attorney-In-Fact	Name	A. Oth
Attest:	Corporation Secretary	- 8705 SW Nimbus	Suite 100 Address	
		Beaverton City	Oregon State	97008 Zip
		(503) 639-4220 Phone	<u>(5</u> Fax	03) 639-4449
Clacka	amas County Contract Form B-4 (1/2017)		SURFICE	SURANCE S

POA# 3710013

JOINT LIMITED POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That SureTec Insurance Company, a Corporation duly organized and existing under the laws of the State of Texas and having its principal office in the County of Harris, Texas and Markel Insurance Company (the "Company"), a corporation duly organized and existing under the laws of the state of Illinois, and having its principal administrative office in Glen Allen, Virginia, does by these presents make, constitute and appoint:

Nathan Nelson Hurst, Richard Zarosinski, Joseph P. Riter

Their true and lawful agent(s) and attorney(s)-in-fact, each in their separate capacity if more than one is named above, to make, execute, seal and deliver for and on their own behalf, individually as a surety or jointly, as co-sureties, and as their act and deed any and all bonds and other undertaking in suretyship provided, however, that the penal sum of any one such instrument executed hereunder shall not exceed the sum of:

Fifty Million and 00/100 Dollars (\$50,000,000.00)

This Power of Attorney is granted and is signed and sealed under and by the authority of the following Resolutions adopted by the Board of Directors of SureTec

"RESOLVED, That the President, any Senior Vice President, Vice President, Assistant Vice President, Secretary, Assistant Secretary, Treasurer or Assistant Treasurer and each of them hereby is authorized to execute powers of attorney, and such authority can be executed by use of facsimile signature, which may be attested or acknowledged by any officer or attorney, of the company, qualifying the attorney or attorneys named in the given power of attorney, to execute in behalf of, and acknowledge as the act and deed of the SureTec Insurance Company and Markel Insurance Company, as the case may be, all bond undertakings and contracts of suretyship, and to affix the corporate seal thereto."

IN WITNESS WHEREOF, Markel Insurance Company and SureTec Insurance Company have caused their official seal to be hereunto affixed and these presents to be

SureTec Insurance Company

Michael C. Keimig, President

State of Texas County of Harris:





Insurance (Undey Jennings Vice President

On this 8th day of January , 2024 A. D., before me, a Notary Public of the State of Texas, in and for the County of Karris, duly commissioned and gualified, came THE ABOVE OFFICERS OF THE COMPANIES, to me personally known to be the individuals and officers described in, who executed the preceding instrument, and they acknowledged the execution of same, and being by me duly sworn, disposed and said that they are the officers of the said companies aforesaid, and that the seals affixed to the proceeding instrument are the Corporate Seals of said Companies, and the said Corporate Seals and their signatures as officers were duly affixed and subscribed to the said instrument by the authority and direction of the said companies, and that Resolutions adopted by the Board of Directors of said Companies

IN TESTIMONY WHEREOF, I have hereunto set my hand, and affixed my Official Seal at the County of Harris, the day and year first above written.



ie E. McClary, Notary Public

commission expires 3/29/2026

We, the undersigned Officers of SureTec Insurance Company and Markel Insurance Company do herby certify that the original POWER OF ATTORNEY of which the foregoing is a full, true and correct copy is still in full force and effect and has not been revoked.

IN WITNESS WHEREOF, we have hereunto set our hands, and affixed the Seals of said Companies, on the

Any Instrument issued in excess of the penalty stated above is totally void and without any validity. 8710018 For verification of the authority of this Power you may cell (713)812-0800 on any business day between 8:30 AM and 5:00 PM CST.

Markel Insurance Company

int Se



CLACKAMAS COUNTY PUBLIC IMPROVEMENT CONTRACT

BID FORM

PROJECT:	BID# 2025-05 Chemical Improvement Project at Hoodland WRRF
BID CLOSING:	March 5, 2025, 2:00 PM, Pacific Time
BID OPENING:	March 5, 2025, 2:05 PM, Pacific Time

FROM:	Ja	CONST	RUCTIC	SN	Inc	_
	Bidder 's 🕅	me (must be full	l legal name, no	ot ABN/I	DBA)	

TO: https://bidlocker.us/a/clackamascounty/BidLocker

1. Bidder is (check one of the following and insert information requested):

a. An individual; or

; or b. A partnership registered under the laws of the State of

 \underline{X} c. A corporation organized under the laws of the State of \underline{Oregon} ; or

d. A limited liability corporation organized under the laws of the State of _____;

and authorized to do business in the State of Oregon hereby proposes to furnish all material and labor and perform all work hereinafter indicated for the above project in strict accordance with the Contract Documents for the Basic Bid as follows:

Onehundred minely thousand free Dollars (\$ 190,588' hundred eight \$ 100'S and the Undersigned agrees to be bound by the following documents:

- Notice of Public Improvement Contract Opportunity
- Instructions to Bidders
- · Bid Bond
- Public Improvement Contract Form
- Clackamas County General Conditions
- Prevailing Wage Rates

- · Supplemental Instructions to Bidders
- · Bid Form
- · Performance Bond and Payment Bond
- Supplemental General Conditions
- · Payroll and Certified Statement Form
- · Plans, Specifications and Drawings

through 1 ____, inclusive (fill in blanks) ADDENDA numbered

2. The Undersigned proposes to add to or deduct from the Base Bid indicated above the items of work relating to the following Alternate(s) as designated in the Specifications: N/A

3. The Undersigned proposes to add to or deduct from the Base Bid indicated above the items or work relating to the following Unit Price(s) as designated in the Specifications, for which any adjustments in the Contract amount will be made in accordance with Section D of the Clackamas County General Conditions:

4. The work shall be completed within the time stipulated and specified in the contract documents.

5. Accompanying herewith is Bid Security which is equal to ten percent (10%) of the total amount of the Basic Bid, plus the total sum of all Alternatives (if any).

6. The Undersigned agrees, if awarded the Contract, to execute and deliver to Clackamas County, within twenty (20) calendar days after receiving the Contract forms, a Contract Form, and a satisfactory Performance Bond and Payment Bond each in an amount equal to one hundred percent (100%) of the Contract sum, using forms provided by the Owner. The surety requested to issue the Performance Bond and Payment Bond will be:

(name of surety company - not insurance agency)

The Undersigned hereby authorizes said surety company to disclose any information to the Owner concerning the Undersigned's ability to supply a Performance Bond and Payment Bond each in the amount of the Contract.

7. The Undersigned further agrees that the Bid Security accompanying the Bid is left in escrow with Clackamas County; that the amount thereof is the measure of liquidated damages which the Owner will sustain by the failure of the Undersigned to execute and deliver the above-named Contract Form, Performance Bond and Payment Bond, each as published, and that if the Undersigned defaults in either executing the Contract Form or providing the Performance Bond and Payment Bond within twenty (20) calendar days after receiving the Contract forms, then the Bid Security shall become the property of the Owner at the Owner's option; but if the Bid is not accepted within thirty (30) calendar days of the time set for the opening of the Bids, or if the Undersigned executes and timely delivers said Contract Form, Performance Bond and Payment Bond and Payment Bond, the Bid Security shall be returned.

8. The Undersigned certifies that: (i) This Bid has been arrived at independently and is being submitted without collusion with and without any agreement, understanding, or planned common course of action with any other vendor of materials, supplies, equipment or services described in the invitation to bid designed to limit independent bidding or competition; and (ii) the contents of the Bid have not been communicated by the Undersigned or its employees or agents to any person not an employee or agent of the Undersigned or its surety on any Bond furnished with the Bid and will not be communicated to such person prior to the official opening of the Bid.

9. The undersigned \bigwedge HAS, \square HAS NOT (*check one*) paid unemployment or income taxes in Oregon within the past 12 months and \bigotimes DOES, \square DOES NOT (*check one*) a business address in Oregon. The undersigned acknowledges that, if the selected bidder, that the undersigned will have to pay all applicable taxes and register to do business in the State of Oregon before executing the Contract Form.

10. The Undersigned agrees, if awarded a contract, to comply with the provisions of ORS 279C.800 through 279C.870 pertaining to the payment of the prevailing rates of wage.

11. Contractor's CCB registration number is 237402. As a condition to submitting a bid, a Contractor must be registered with the Oregon Construction Contractors Board in accordance with ORS 701.035 to 701.055, and disclose the registration number. Failure to register and disclose the number will make the bid unresponsive and it will be rejected, unless contrary to federal law.

12. The successful Bidder hereby certifies that all subcontractors who will perform construction work as described in ORS 701.005(2) were registered with the Construction Contractors Board in accordance with ORS 701.035 to 701.055 at the time the subcontractor(s) made a bid to work under the contract.

13. The successful Bidder hereby certifies that, in compliance with the Worker's Compensation Law of the State of Oregon, its Worker's Compensation Insurance provider is $\underline{5 + 1} =$, Policy No. $\underline{10003920.3}$, and that Contractor shall submit Certificates of Insurance as required.

14.	Contractor's Key Individuals for this project (supp	ly	information as applicable):	
	Project Executive: MANOLO J NOW	,	Cell Phone: 5037268237	
	Project Manager: VERN Gardver		Cell Phone: 50393364910	?
	Job Superintendent: Julliev Low	•	Cell Phone: 5037268237	_
	Project Engineer:		Cell Phone:	

15. The Undersigned certifies that it has not discriminated against minority, women, or emerging small businesses in obtaining any subcontracts for this project.

16. The Undersigned certifies that it has a drug testing program in accordance with ORS 279C.505.

REMINDER: Bidder must submit the below First-Tier Subcontractor Disclosure Form.

By signature below, Contractor agrees to be bound by this Bid.

NAME OF FIRM	Ja CONSTRUCTION IUC
ADDRESS	P.O. Box 250
	Beaverton, Or 97075
TELEPHONE NO	503 726 8237
EMAIL	Julliev & jacopeterction.com
SIGNATURE 1)	N/A Sole Individual



**** END OF BID *****

FIRST-TIER SUBCONTRACTOR DISCLOSURE FORM PROJECT: 2025-05

BID OPENING: March 5, 2025, 2:00 PM, Pacific Time

Failure to submit this Form by the disclosure deadline will result in a nonresponsive bid.

INSTRUCTIONS:

This First-Tier Subcontractor Disclosure Form ("Form") must be submitted and received at the location specified in the Notice of Public Improvement Contract Opportunity on the advertised Bid Closing, and within two working hours after the advertised Bid Closing Time.

Proposals will only be accepted electronically thru a secure online bid submission service, **<u>Bid Locker</u>**. *Email submissions to Clackamas County email addresses will no longer be accepted*.

- A. Completed proposal documents must arrive electronically via Bid Locker located at https://bidlocker.us/a/clackamascounty/BidLocker.
- B. Bid Locker will electronically document the date and time of all submissions. Completed documents must arrive by the deadline indicated in Section 1 or as modified by Addendum. LATE PROPOSALS WILL NOT BE ACCEPTED.
- C. Proposers must register and create a profile for their business with Bid Locker in order to submit for this project. It is free to register for Bid Locker.
- D. Proposers with further questions concerning Bid Locker may review the Vendor's Guide located at https://www.clackamas.us/how-to-bid-on-county-projects.

Subcontractor lists may be submitted with the bid in the same envelope or email at the Bid Closing date and time. Subcontractor lists <u>MUST</u> be submitted within two (2) hours of the Bid Closing date and time.

List below the name of each subcontractor that will be furnishing labor, or labor and materials, for which disclosure is required, the category of work that the subcontractor will be performing, and the dollar value of the subcontract. Enter **<u>"NONE"</u>** if the value of the project bid is less than \$100,000 or there are no subcontractors that need to be disclosed. ATTACH ADDITIONAL SHEETS IF NECESSARY.

1. 2	SUBCONTRACTOR NAME	DOLLAR VALUE	CATEGORY OF WORK
2. 3. 4			
7. 5			
с. с	water mine in the second s		
5.			

The above listed first-tier subcontractor(s) are providing labor, or labor and material, with a Dollar Value equal to or greater than:

- a) 5% of the total Contract Price, but at least \$15,000. If the Dollar Value is less than \$15,000 do not list the subcontractor above; or
- b) \$350,000 regardless of the percentage of the total Contract Price.

Firm Name: Ja CONSTRUCTION	ITUC
Bidder Signatures MANOLO J LOW	Phone # 503 726 6237



CLACKAMAS COUNTY PUBLIC IMPROVEMENT CONTRACT SUPPLEMENTAL GENERAL CONDITIONS

PROJECT: 2025-05 Chemical Improvement Project at Hoodland Water Resources Recovery Facility

The following modifies the November 21, 2024 Clackamas County General Conditions for Public Improvement Contracts ("County General Conditions") for this Contract. Except as modified below, all other terms and conditions of the County General Conditions shall remain in effect.

Permits

Section B.4 PERMITS of the County General Conditions is hereby deleted in it is entirety and replaced with the following:

B.4 PERMITS

The County shall obtain and pay for all necessary project permits. Contractor shall be responsible for all violations of the law, in connection with the construction or caused by obstructing streets, sidewalks or otherwise. Contractor shall give all requisite notices to public authorities.

Change Order Process – WES

The following subsection is added to Section D.1 CHANGES IN WORK:

D.1.8 Change Order Authorization.

Throughout the performance of the Work under this Agreement, the Owner's Project Manager is hereby granted the authority to verbally authorize change orders in the field for an amount up to \$10,000. As soon as possible following the authorization, the Owner's Project Manager shall complete the change order form provided by Clackamas County Procurement ("Procurement"), obtain the signature of Owner's Director or other authorized signatory, and submit the form to Procurement for processing. As soon as the Director signs off on the change order form, the Project Manager may then authorize another change order in the future for up to \$10,000 following the same procedure above. Each change order should include the cumulative cost of the entire change and may not be artificially broken up into multiple change orders to fall under the dollar threshold listed above. The authority granted to the Project Manager is limited by the Director's authorization to amend the Agreement under Clackamas County's Local Contract Review Board Rules and is subject to the discretion of the Director, who may suspend or restrict the Project Manager's ability to authorize change orders at any time for any reason.

Liquidated Damages

The following subsection is added to Section D.2 - DELAYS:

D.2.3 DAMAGES FOR DELAY – LIQUIDATED DAMAGES

- (a) It is imperative that the Work in this Contract reach Substantial Completion within 5 months (153 calendar days) of the issuance of Notice to Proceed, and as further required in the Plans and Specifications and Section 10 of the Contract to maintain regulatory compliance. The Contractor represents and agrees that the Substantial Completion date is reasonable, that it can meet the Substantial Completion date, and it has taken into account in its Offer the requirements of the Contract Documents, the location, the time allowed for the Work, local conditions, weather, availability of materials, equipment, and labor, and any other factor which may affect performance of the Work.
- (b) If the Contactor fails to achieve Substantial Completion as specified above, then the Contractor and Owner agree that it would be extremely difficult to ascertain the damages incurred by Owner for the Contractor's failure. Therefore, Owner and the Contractor agree that in lieu of actual damages for delay, the Contractor shall reimburse Owner a stipulated sum as identified in the below table. The Contractor further agrees the stipulated sum is not a penalty.

Days Post Substantial Completion Date	Stipulated Sum
1-7 calendar days	\$750.00 each calendar day.
7-15 calendar days	\$1,250.00 each calendar day.
15-21 calendar days	\$1,500.00 each calendar day.

Likewise, if the Work does not reach Final Completion within 30 calendar days of Substantial Completion, then the Contractor shall owe to the Owner, not as a penalty but as liquidated damages, the sum of one thousand five hundred dollars (\$1,500.00) per day for each and every calendar day of delay until Final Completion

Government Regulations

The following subsection is added to Section E.2 APPLICATION FOR PAYMENT:

E.2.4 (i) National Pollution Discharge Elimination System (NPDES) Permit Violations

a. Hoodland WRRF must continuously be in compliance with its National Pollution Discharge Elimination System (NPDES) permit requirements. In the event permit violations are caused or, in the Owner's opinion, will be caused by the Contractor's operations, the Owner shall immediately be entitled to employ others to stop the violations without giving written notice to the Contractor.

- b. Penalties imposed on and costs incurred by the Owner as a result of any violations caused by the actions of the Contractor, his employees, or subcontractors, shall be borne in full by the Contractor, including legal fees and other expenses to the Owner resulting directly or indirectly from the violation. Under the terms of discharge permits issued to the Owner, the Owner is liable for the following penalties: NPDES Permit No. 100962
- c. The Owner may withhold from any payment owed to the Contractor the amount of such costs, and a Change Order shall be issued to reflect any such reduction.

Good Faith Effort

As a condition of Contractor being awarded a Contract for this Project, Contractor must complete Good Faith Effort outreach and documentation as described in the Supplemental Instructions to Bidders of the Solicitation Document.

The Contractor may not change who is performing each Division of Work identified in Form 1 of the Good Faith Effort without the express written advance approval of Owner. This includes substituting identified subcontractors, self-performance of a Division of Work that was identified to be performed by a subcontractor, or the Contractor subcontracting a Division of Work that was identified to be self-performed by the Contractor.

Contractor shall be required to submit the completed Form 3 with its final pay application as a condition of final payment.



CLACKAMAS COUNTY GENERAL CONDITIONS FOR PUBLIC IMPROVEMENT CONTRACTS November 21, 2024

INSTRUCTIONS: The attached **Clackamas County General Conditions for Public Improvement Contracts ("County General Conditions")** apply to all designated Public Improvement contracts. Changes to the County General Conditions (including any additions, deletions or substitutions) should only be made by attaching Public Improvement Supplemental General Conditions. The text of these County General Conditions should not otherwise be altered.

TABLE OF SECTIONS

SECTION A - GENERAL PROVISIONS

- A.1 DEFINITION OF TERMS
- A.2 SCOPE OF WORK
- A.3 INTERPRETATION OF CONTRACT DOCUMENTS
- A.4 EXAMINATION OF PLANS, SPECIFICATIONS, AND PROJECT
- A.5 INDEPENDENT CONTRACTOR STATUS
- A.6 RETIREMENT SYSTEM STATUS AND TAXES
- A.7 GOVERNMENT EMPLOYMENT STATUS

SECTION B - ADMINISTRATION OF THE CONTRACT

- B.1 OWNER'S ADMINISTRATION OF THE CONTRACT
- B.2 CONTRACTOR'S MEANS AND METHODS
- B.3 MATERIALS AND WORKMANSHIP
- B.4 PERMITS
- B.5 COMPLIANCE WITH GOVERNMENT REGULATIONS
- B.6 SUPERINTENDENCE
- B.7 INSPECTION
- B.8 SEVERABILITY
- B.9 ACCESS TO RECORDS
- B.10 WAIVER
- B.11 SUBCONTRACTS AND ASSIGNMENT
- B.12 SUCCESSORS IN INTEREST
- B.13 OWNER'S RIGHT TO DO WORK
- B.14 OTHER CONTRACTS

SECTION C - WAGES AND LABOR

- C.1 MINIMUM WAGES RATES ON PUBLIC WORKS
- C.2 PAYROLL CERTIFICATION AND FEE REQUIREMENTS, ADDITIONAL RETAINAGE
- C.3 PROMPT PAYMENT AND CONTRACT CONDITIONS
- C.4 PAYMENT FOR MEDICAL CARE
- C.5 HOURS OF LABOR

SECTION D - CHANGES IN THE WORK

- D.1 CHANGES IN THE WORK
- D.2 DELAYS
- D.3 CLAIMS REVIEW PROCESS

SECTION E - PAYMENTS

- E.1 SCHEDULE OF VALUES
- E.2 APPLICATIONS FOR PAYMENT
- E.3 PAYROLL CERTIFICATION REQUIREMENT
- E.4 DUAL PAYMENT SOURCES
- E.5 RETAINAGE
- E.6 FINAL PAYMENT

SECTION F - PROJECT SITE CONDITIONS

- F.1 USE OF PREMISES
- F.2 PROTECTION OF WORKERS, PROPERTY, AND THE PUBLIC
- F.3 CUTTING AND PATCHING
- F.4 CLEANING UP
- F.5 ENVIRONMENTAL CONTAMINATION
- F.6 ENVIRONMENTAL CLEAN-UP

SECTION G - INDEMNITY, BONDING AND INSURANCE

- G.1 RESPONSIBILITY FOR DAMAGES/INDEMNITY
- G.2 PERFORMANCE AND PAYMENT SECURITY, PUBLIC WORKS BOND
- G.3 INSURANCE

SECTION H - SCHEDULE OF WORK

- H.1 CONTRACT PERIOD
- H.2 SCHEDULE
- H.3 PARTIAL OCCUPANCY OR USE

SECTION I - CORRECTION OF WORK

- I.1 CORRECTIONS OF WORK BEFORE FINAL PAYMENT
- I.2 WARRANTY WORK

SECTION J - SUSPENSION AND/OR TERMINATION OF THE WORK

- J.1 OWNER'S RIGHT TO SUSPEND THE WORK
- J.2 CONTRACTOR'S RESPONSIBILITIES
- J.3 COMPENSATION FOR SUSPENSION
- J.4 OWNER'S RIGHT TO TERMINATE CONTRACT
- J.5 TERMINATION FOR CONVENIENCE, NON-APPROPRIATION
- OF FUNDS, OR FORCE MAJEURE
- J.6 ACTION UPON TERMINATION

SECTION K - CONTRACT CLOSE-OUT

- K.1 RECORD DOCUMENTS
- K.2 OPERATION AND MAINTENANCE MANUALS
- K.3 COMPLETION NOTICES
- K.4 TRAINING
- K.5 EXTRA MATERIALS
- K.6 ENVIRONMENTAL CLEAN-UP
- K.7 CERTIFICATE OF OCCUPANCY
- K.8 OTHER CONTRACTOR RESPONSIBILITIES
- K.9 SURVIVAL

SECTION L- GENERAL PROVISIONS

L.1 NO THIRD PARY BENEFICIARIES L.2 SEVERABILITY L.3 ACCESS TO RECORDS L.4 WAIVER L.5 SUCCESSORS IN INTEREST L.6 GOVERNING LAW L.7 APPLICABLE LAW L.8 NON-EXCLUSIVE RIGHTS & REMEDIES L.9 INTERPRETATION L.10 DEBT LIMITATION L.11 LITIGATION L.12 SURVIVAL L.13 ACCESS TO RECORDS L.14 WAIVER L.15 NO ATTORNEY FEES

CLACKAMAS COUNTY GENERAL CONDITIONS FOR PUBLIC IMPROVEMENT CONTRACTS ("County General Conditions")

SECTION A GENERAL PROVISIONS

A.1 DEFINITION OF TERMS

In the Contract Documents the following terms shall be as defined below:

<u>APPLICABLE LAWS</u>, means all federal, state and local laws, codes, rules, regulations and ordinances, as amended applicable to the Work, to the Contract, or to the parties individually.

APPROVED BY CONTRACTING AGENCY, for purposes of ORS 279C.570(2), means the date a progress payment is approved by the Clackamas County Treasurer's office.

ARCHITECT/ENGINEER, means the Person appointed by the Owner to make drawings and specifications and, to provide contract administration of the Work contemplated by the Contract to the extent provided herein or by supplemental instruction of Owner (under which Owner may delegate responsibilities to the Architect/Engineer), in accordance with ORS Chapter 671 (Architects) or ORS Chapter 672 (Engineers) and administrative rules adopted thereunder.

AVOIDABLE DELAYS, mean any delays other than Unavoidable Delays, and include delays that otherwise would be considered Unavoidable Delays but that: (a) Could have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its Subcontractors; (b) Affect only a portion of the Work and do not necessarily prevent or delay the prosecution of other parts of the Work nor the completion of the whole Work within the Contract Time; (c) Do not impact activities on the accepted critical path schedule; and (d) Are associated with the reasonable interference of other contractors employed by the Owner that do not necessarily prevent the completion of the whole Work within the Contract Time.

BIDDER, means a bidder in connection with Instructions to Bidders or a proposer in connection with a Request for Proposals, or Solicitation Document. May also be referenced as "Offeror," "Quoter" or "Proposer" based on the type of Solicitation Document.

CHANGE ORDER, means a written order which, when fully executed by the Parties to the Contract, constitutes a change to the Contract Documents. Change Orders shall be issued in accordance with the changes provisions in Section D and, if applicable, establish a Contract Price or Contract Time adjustment. A Change Order shall not be effective until executed by both parties.

CLAIM, means a demand by Contractor pursuant to Section D.3 for review of the denial of Contractor's initial request for an adjustment of Contract terms, payment of money, extension of Contract Time or other relief, submitted in accordance with the requirements and within the time limits established for review of Claims in these County General Conditions.

<u>CONTRACT</u>, means the written agreement between the Owner and the Contractor comprised of the Contract Documents which describe the Work to be done and the obligations between the parties.

<u>CONTRACT DOCUMENTS</u>, means the Contract, County General Conditions, Supplemental General Conditions if any, Plans, Specifications, the accepted Offer, Solicitation Document and addenda thereto, Instructions to Offerors, and Supplemental Instructions to Offerors.

CONTRACT PERIOD, as set forth in the Contract Documents, means the total period of time beginning with the full execution of a Contract

and, if applicable, the issuance of a Notice to Proceed and concluding upon Final Completion.

<u>CONTRACT PRICE</u>, means the total price reflected in the Contract.

<u>CONTRACT TIME</u>, means any incremental period of time allowed under the Contract to complete any portion of the Work as reflected in the Project schedule.

CONTRACTOR, means the Person awarded the Contract for the Work contemplated.

<u>DAYS</u>, are calendar days, including weekdays, weekends and holidays, unless otherwise specified.

DEFECTIVE WORK, means Work that is not completed in accordance with the Specifications or the requirements of the Contract.

DIRECT COSTS, means, unless otherwise provided in the Contract Documents: the cost of materials, including sales tax and the cost of delivery; cost of labor which shall only include the applicable prevailing wage and fringe benefit (if applicable, and if paid to or on behalf of the employee) rate plus a maximum of a twelve percent (12%) markup on the prevailing wage (but not the fringe benefit) to cover Contractor's labor burden including but not limited to social security, Medicare, unemployment insurance, workers' compensation insurance, sick leave pay; substantiated Project cost increases for specific insurance (including, without limitation, Builder's Risk Insurance and Builder's Risk Installation Floater) or bond premiums; rental cost of equipment, and machinery required for execution of the Work; and the additional costs of field personnel directly attributable to the Work; travel expense reimbursement only if specifically authorized and only to the extent allowable under the County Contractor Travel Reimbursement Policy, hereby incorporated by reference.

FINAL COMPLETION, means the final completion of all requirements under the Contract, including Contract Closeout as described in Section K but excluding Warranty Work as described in Section I.2, and the final payment and release of all retainage, if any.

FORCE MAJEURE, means an act, event or occurrence caused by fire, riot, war, acts of God, terrorism, nature, sovereign, or public enemy, strikes, freight embargoes or any other act, event or occurrence that is beyond the control of the party to the Contract who is asserting Force Majeure.

NOTICE TO PROCEED, means the official written notice from the Owner stating that the Contractor is to proceed with the Work defined in the Contract Documents.

OFFER, means a bid in connection with Instructions to Bidders or a proposal in connection with a Request for Proposals, or Solicitation Document to do the work stated in the Solicitation Document at the price quoted. May also be referenced as "Bid," "Quote," or "Proposal" based on the type of Solicitation Document.

OVERHEAD, means those items which may be included in the Contractor's markup (general and administrative expense and profit) and that shall not be charged as Direct Cost of the Work, including without limitation such Overhead expenses as wages or salary of personnel above the level of foreman (i.e., superintendents and project managers), labor rates and fringe benefits above the applicable prevailing wage and fringe benefit (if applicable, and if paid to or on behalf of the employee), Contractor's labor burden for fringe benefit if paid to the employee, expenses of Contractor's offices and supplies at the Project Site (e.g. job trailer) and at Contractor's principal place of business and including expenses of personnel staffing the Project Site office and Contractor's principal place of business, and Commercial General Liability Insurance and Automobile Liability Insurance. **OWNER**, means, Clackamas County or any component unit thereof including Clackamas County Development Agency, Clackamas County Service District No. 1, Surface Water Management Agency of Clackamas County, Tri-City Service District, Water Environment Services, North Clackamas Parks and Recreation District, Clackamas County Extension & 4-H Service District, Library Service District of Clackamas County, Enhanced Law Enforcement District, and Clackamas County Service District No. 5. Owner may elect, by written notice to Contractor, to delegate certain duties to more than one agent, including without limitation, to an Architect/Engineer. However, nothing in these County General Conditions is intended to abrogate the separate design professional responsibilities of Architects under ORS Chapter 671 or of Engineers under ORS Chapter 672.

PERSON, means a natural person or entity doing business as a sole proprietorship, a partnership, a joint venture, a corporation, a limited liability company or partnership, a nonprofit, a trust, or any other entity possessing the legal capacity to contract.

<u>PLANS</u>, means the drawings which show the location, type, dimensions, and details of the Work to be done under the Contract.

PRODUCT DATA, means illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

PROJECT, means the total undertaking to be accomplished for Owner by architects/engineers, contractors, and other others, including planning, study, design, construction, testing, commissioning, start-up, of which the Work to be performed under the Contract Documents is a part.

PROJECT SITE. means the specific real property on which the Work is to be performed, including designated contiguous staging areas, that is identified in the Plans, Specifications and Drawings.

<u>PUNCH LIST</u>, means the list of Work yet to be completed or deficiencies which need to be corrected in order to achieve Final Completion of the Contract.

<u>RECORD DOCUMENT</u>, means the as-built Plans, Specifications, testing and inspection records, product data, samples, manufacturer and distributor/supplier warranties evidencing transfer of ownership to Owner, operational and maintenance manuals, shop drawings, correspondence, certificate(s) of occupancy, and other documents listed in Subsection B.9.1 of these County General Conditions, recording all Services performed.

<u>SAMPLES</u>, means physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

<u>SHOP DRAWINGS</u>, means drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor (including any subsubcontractor), manufacturer, supplier, or distributor to illustrate some portion of the Work.

SOLICITATION DOCUMENT, means an Invitation to Bid, Request for Proposals, Request for Quotes, or other written document issued by Owner that outlines the required Specifications necessary to submit an Offer.

SPECIFICATION, means any description of the physical or functional characteristics of the Work, or of the nature of a supply, service or construction item included in the Solicitation Document. Specifications may include a description of any requirement for inspecting, testing or preparing a supply, service or construction item for delivery and the quantities or qualities of materials to be furnished under the Contract. Specifications generally will state the results or products to be obtained and may, on occasion, describe the method and manner of doing the

Work to be performed. Specifications may be incorporated by reference and/or may be attached to the Contract.

<u>SUBCONTRACTOR</u>, means a Person having a direct contract with the Contractor, or another Subcontractor of any tier, to perform one or more items of the Work.

SUBSTANTIAL COMPLETION, means the date when the Owner accepts in writing the construction, alteration or repair constituting the Work or any designated portion thereof as having reached that state of completion when it may be used or occupied for its intended purpose. Substantial Completion of facilities with operating systems occurs only after thirty (30) continuous Days of successful, trouble-free operation of the operating systems as provided in Section K.3.2.

<u>SUBSTITUTIONS</u>, means items that in function, performance, reliability, quality, and general configuration are the same or better than the product(s) specified. Substitutions also means the performance of the Work by a labor force other than what is submitted in the Offer.

<u>SUPPLEMENTAL GENERAL CONDITIONS</u>, means those conditions that remove from, add to, or modify these County General Conditions. Public Improvement Supplemental General Conditions may be included in the Solicitation Document or may be a separate attachment to the Contract.

UNAVOIDABLE DELAYS, mean delays other than Avoidable Delays that are: (a) to the extent caused by any actions of the Owner, or any other employee or agent of the Owner, or by a separate contractor employed by the Owner; (b) to the extent caused by any Project Site conditions which differ materially from the conditions that would normally be expected to exist and inherent to the construction activities defined in the Contract Documents; or (c) to the extent caused by Force Majeure acts, or events or occurrences.

WORK, means the furnishing of all materials, equipment, labor, transportation, services, incidentals, those permits and regulatory approvals not provided by the owner necessary to successfully complete any individual item or the entire Contract and the carrying out of duties and obligations imposed by the Contract Documents for the Project.

A.2 SCOPE OF WORK

The Work contemplated under the Contract includes all labor, materials, transportation, equipment and services for, and incidental to, the completion of all work in connection with the Project described in the Contract Documents. The Contractor shall perform all Work necessary so that the Project can be legally occupied and fully used for the intended use as set forth in the Contract Documents.

A.3 INTERPRETATION OF CONTRACT DOCUMENTS

- A.3.1 Unless otherwise specifically defined in the Contract Documents, words which have well-known technical meanings or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings. Contract Documents are intended to be complementary. Whatever is called for in one, is interpreted to be called for in all. However, in the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following descending order of precedence:
 - (a) The Contract and any amendments thereto, including Change Orders, with those of later date having precedence over those of an earlier date;
 - (b) The Supplemental General Conditions;
 - (c) County General Conditions;
 - (d) Plans and Specifications;
 - (e) The Solicitation Document, and any addenda thereto.

- A.3.2 In the case of an inconsistency between Plans and Specifications or within either document not clarified by addendum, the better quality or greater quantity of Work shall be provided in accordance with the Owner's interpretation in writing as determined in Owners sole discretion.
- A.3.3 If the Contractor finds discrepancies in, or omissions from the Contract Documents, or if the Contractor is in doubt as to their meaning, the Contractor shall at once notify the Owner. Matters concerning and interpretation of requirements of the Contract Documents will be decided by the Owner in the Owner's sole discretion, who may delegate that duty in some instances to the Architect/Engineer. Responses to Contractor's requests for interpretation of Contract Documents will be made in writing by Owner (or the Architect/Engineer) within any time limits agreed upon or otherwise with reasonable promptness. Contractor shall not proceed without direction in writing from the Owner (or Architect/Engineer).
- A.3.4 References to standard specifications, manuals, codes of any technical society, organization or association, to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, laws or regulations in effect in the jurisdiction where the Project Site is located on the first published date of the Solicitation Document, except as may be otherwise specifically stated.

A.4 EXAMINATION OF PLANS, SPECIFICATIONS, AND PROJECT SITE

- A.4.1 It is understood that the Contractor, before submitting an Offer, has made a careful examination of the Contract Documents; has become fully informed as to the quality and quantity of materials and the character of the Work required; and has made a careful examination of the location and conditions of the Work and the sources of supply for materials. The Owner will in no case be responsible for any loss or for any unanticipated costs that may be suffered by the Contractor as a result of the Contractor's failure to acquire full information in advance in regard to all conditions pertaining to the Work. No oral agreement or conversation with any officer, agent, or personnel of the Owner, or with the Architect/Engineer either before or after the execution of the Contract, shall affect or modify any of the terms or obligations herein contained. Contractor shall at all times be responsible for all utility locates regardless of the ownership of such utility infrastructure or service.
- A.4.2 Should the Plans or Specifications fail to particularly describe the materials, kind of goods, or details of construction of any aspect of the Work, Contractor shall have the duty to make inquiry of the Owner and Architect/Engineer as to what is required prior to performance of the Work. Absent Specifications to the contrary, the materials or processes that would normally be used to produce first quality finished Work shall be considered a part of the Contract requirements.
- A.4.3 Any design errors or omissions noted by the Contractor shall be reported promptly to the Owner, including without limitation, any nonconformity with Applicable Laws.
- A.4.4 If the Contractor believes that adjustments to cost or Contract Time are involved because of clarifications or instructions issued by the Owner (or Architect/Engineer) in response to the Contractor's notices or requests for information, the Contractor must submit a written request to the Owner, setting forth the nature and specific extent of the request, including all time and cost impacts against the Contract as soon as possible, but no later than thirty (30) Days after receipt by Contractor of the clarifications or instructions issued. If the Owner denies Contractor's request for additional compensation, additional Contract Time, or other relief

that Contractor believes results from the clarifications or instructions, the Contractor may proceed to file a Claim under Section D.3, Claims Review Process. If the Contractor fails to perform the obligations of Sections A.4.1 to A.4.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations.

A.4.5 If the Contractor believes that adjustments to cost or Contract Time are involved because of an Unavoidable Delay caused by differing Project Site conditions, the Contractor shall notify the Owner immediately of differing Project Site conditions before the area has been disturbed. The Owner will investigate the area and make a determination as to whether or not the conditions differ materially from either the conditions stated in the Contract Documents or those which could reasonably be expected in execution of this particular Contract. If Contractor and the Owner agrees that a differing Project Site condition exists, any adjustment to compensation or Contract Time will be determined based on the process set forth in Section D.2.2 for adjustments to or deletions from Work. If the Owner disagrees that a differing Project Site condition exists and denies Contractor's request for additional compensation or Contract Time, Contractor may proceed to file a Claim under Section D.3, Claims Review Process.

A.5 INDEPENDENT CONTRACTOR STATUS

The service or services to be performed under the Contract are those of an independent contractor as defined in ORS 670.600. Contractor represents and warrants that it is not an officer, employee or agent of the Owner as those terms are used in ORS 30.265.

A.6 RETIREMENT SYSTEM STATUS AND TAXES

Contractor represents and warrants that it is not a contributing member of the Public Employees' Retirement System and will be responsible for any federal or state taxes applicable to payment received under the Contract. Contractor will not be eligible for any benefits from these Contract payments of federal Social Security, employment insurance, workers' compensation or the Public Employees' Retirement System, except as a self-employed individual. Unless the Contractor is subject to backup withholding, Owner will not withhold from such payments any amount(s) to cover Contractor's federal or state tax obligations.

A.7 GOVERNMENT EMPLOYMENT STATUS

A.7.1 If this payment is to be charged against federal funds, Contractor represents and warrants that it is not currently employed by the Federal Government. This does not preclude the Contractor from holding another contract with the Federal Government.

SECTION B ADMINISTRATION OF THE CONTRACT

B.1 OWNER'S ADMINISTRATION OF THE CONTRACT

- B.1.1 The Owner shall administer the Contract as described in the Contract Documents throughout the term of the Contract, including the one-year period for correction of Work. The Owner will act as provided in the Contract Documents, unless modified in writing in accordance with other provisions of the Contract. In performing these tasks, the Owner may rely on the Architect/Engineer or other agents to perform some or all of these tasks.
- B.1.2 The Owner may visit the Project Site at intervals appropriate to the stage of the Contractor's operations (1) to become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work completed, (2) to endeavor to guard the Owner against defects and deficiencies in the Work, and (3) to determine in general if Work is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. The Owner will not

make exhaustive or continuous on-Project Site inspections to check the quality or quantity of the Work. Unless otherwise required in a Change Order, the Owner will neither have control over or charge of, nor be responsible for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work.

- B.1.3 Except as otherwise provided in the Contract Documents or when direct communications have been specifically authorized, the Owner and Contractor shall communicate with each other within a reasonable time frame about matters arising out of or relating to the Contract. Communications by and with the Architect/Engineer's consultants shall be through the Architect/Engineer. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.
- B.1.4 Based upon the Architect/Engineer's evaluations of the Contractor's Application for Payment, or unless otherwise stipulated by the Owner, the Architect/Engineer will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

B.2 <u>CONTRACTOR'S MEANS AND METHODS; MITIGATION</u> <u>OF IMPACTS</u>

- B.2.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions, sequences or procedures, the Contractor shall evaluate the Project Site safety thereof and, except as stated below, shall be fully and solely responsible for the Project Site safety of such means, methods, techniques, sequences or procedures.
- B.2.2 The Contractor is responsible to protect and maintain the Work during the course of construction and to mitigate any adverse impacts to the Project, including those caused by authorized changes, which may affect cost, schedule, or quality.
- B.2.3 The Contractor is responsible for the actions of all its personnel, laborers, suppliers, agents, and Subcontractors on the Project. The Contractor shall enforce strict discipline and good order among Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of persons who are unfit or unskilled for the tasks assigned to them.

B.3 MATERIALS AND WORKMANSHIP

- B.3.1 The intent of the Contract Documents is to provide for the construction and completion of every detail of the Work described. All Work shall be performed in a professional manner and, unless the means or methods of performing a task are specified elsewhere in the Contract Documents, Contractor shall employ methods that are generally accepted and used by the industry, in accordance with industry standards.
- B.3.2 The Contractor is responsible to perform the Work as required by the Contract Documents. Defective Work shall be corrected at the Contractor's sole expense and within a reasonable time frame.
- B.3.3 Work done and materials furnished may be subject to inspection and/or observation and testing by the Owner to determine if they conform to the Contract Documents. Inspection of the Work by the Owner does not relieve the Contractor of responsibility for the Work in accordance with the Contract Documents.

- B.3.4 Contractor shall furnish adequate facilities, as required, for the Owner to have safe access to the Work including without limitation walkways, railings, ladders, tunnels, and platforms. Producers, suppliers, and fabricators shall also provide proper facilities and access to their facilities.
- B.3.5 The Contractor shall furnish Samples of materials for testing by the Owner and include the cost of the Samples in the Contract Price.

B.4 PERMITS

Contractor shall obtain and pay for all necessary permits, licenses and fees, except for those specifically excluded in the Supplemental General Conditions, as required for the project. Contractor shall be responsible for all violations of the law. Contractor shall give all requisite notices to public authorities.

B.5 COMPLIANCE WITH GOVERNMENT REGULATIONS

- B.5.1 Contractor shall comply with Applicable Laws, as amended pertaining to the Work and the Contract. Failure to comply with such requirements shall constitute a breach of Contract and shall be grounds for Contract termination. Without limiting the generality of the foregoing, Contractor expressly agrees to comply with the following, as applicable and as may be amended from time to time: (i) Title VI and VII of Civil Rights Act of 1964, as amended; (ii) Section 503 and 504 of the Rehabilitation Act of 1973, as amended; (iii) the Health Insurance Portability and Accountability Act of 1996; (iv) the Americans with Disabilities Act of 1990, as amended; (v) ORS Chapter 659A; as amended; (vi) all regulations and administrative rules established pursuant to any applicable laws; and (vii) all other applicable requirements of federal, state, county or other local government entity statutes, rules and regulations.
- B.5.2 Contractor shall comply with all applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations, and
 - (a) Contractor shall not discriminate against Disadvantaged, Minority, Women or Emerging Small Business enterprises, as those terms are defined in ORS 200.005, or a business enterprise that is owned or controlled by or that employs a disabled veteran, as that term is defined in ORS 408.225, in the awarding of subcontracts.
 - (b) Contractor shall maintain, in current and valid form, all licenses and certificates required by Applicable Laws or the Contract when performing the Work.
- B.5.3 Contractor shall certify that it shall not accept a bid from Subcontractors to perform Work unless such Subcontractors are registered with the Construction Contractors Board in accordance with ORS 701.021 at the time they submit their bids to the Contractor.
- B.5.4 Contractor shall certify that each landscape contracting business, as defined in ORS 671.520(2), performing Work under the Contract holds a valid landscape construction professional license issued pursuant to ORS 671.560.
- B.5.5 The following notice is applicable to Contractors who perform excavation Work. ATTENTION: Oregon law requires you to follow rules adopted by the Oregon Utility Notification Center. Those rules are set forth in OAR 952-001-0010 through OAR 952-001-0090. You may obtain copies of the rules by calling the center at (877) 668-4001.
- B.5.6 Failure to comply with any or all of the requirements of B.5.1 through B.5.5 shall be a material breach of Contract and constitute

grounds for Contract termination. Damages or costs resulting from such noncompliance shall be the responsibility of Contractor.

- B.5.7 The Contractor shall include in each subcontract those provisions required under ORS 279C.580.
- B.5.8 Contractor shall comply with ORS 652.220, compliance of which is a material element of this Contract and failure to comply is a material breach that entitles County to exercise any rights and remedies available under this Contract including, but not limited to, termination for default.

B.6 SUPERINTENDENCE

Contractor shall keep on the Project Site, during the progress of the Work, a competent superintendent and any necessary assistants who shall be satisfactory to the Owner and who shall represent the Contractor on the Project Site. Directions given to the superintendent by the Owner shall be confirmed in writing to the Contractor.

B.7 INSPECTION

- B.7.1 Owner shall have access to the Work at all times.
- B.7.2 Inspection of the Work will be made by the Owner at its discretion. The Owner will have authority to reject Work that does not conform to the Contract Documents in the Owner's sole discretion. Any Work found to be not in conformance with the Contract Documents, in the discretion of the Owner, shall be removed and replaced at the Contractor's expense.
- B.7.3 Contractor shall make or obtain at the appropriate time all tests, inspections and approvals of portions of the Work required by the Contract Documents or by Applicable Laws or orders of public authorities having jurisdiction. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work. The Contractor shall give the Owner timely notice of when and where tests and inspections are to be made so that the Owner may be present for such procedures. Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Owner.
- B.7.4 As required by the Contract Documents, Work done or material used without required inspection or testing and/or without providing timely notice to the Owner may be ordered removed at the Contractor's expense.
- B.7.5 If directed to do so by Owner or other permitting authority any time before the Work is accepted, the Contractor shall uncover portions of the completed Work for inspection. After inspection, the Contractor shall restore such portions of Work to the standard required by the Contract. If the Work uncovered is unacceptable or was done without required testing or inspection or sufficient notice to the Owner, the uncovering and restoration shall be done at the Contractor's expense. If the Work uncovered is acceptable and was done with sufficient notice to the Owner, the uncovering and restoration will be paid for pursuant to a Change Order.
- B.7.6 If any testing or inspection reveals failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Owner's and Architect/Engineer's services and expenses, shall be at the Contractor's expense.

B.7.7 In Owner's sole discretion, it may authorize other interested parties to inspect the Work affecting their interests or property. Their right to inspect shall not make them a party to the Contract and shall not interfere with the rights of the parties of the Contract. Instructions or orders of such parties shall be transmitted to the Contractor, through the Owner.

B.8 SUBCONTRACTS AND ASSIGNMENT

- B.8.1 Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound by the terms and conditions of these General Conditions and Supplemental General Conditions, and to assume toward the Contractor all of the obligations and responsibilities which the Contractor assumes toward the Owner thereunder, unless (1) the same are clearly inapplicable to the subcontract at issue because of legal requirements or industry practices, or (2) specific exceptions are requested by Contractor shall require each Subcontract to enter into similar agreements with subsubcontractors at any level.
- B.8.2 At Owner's request, Contractor shall submit to Owner prior to their execution either Contractor's form of subcontract, or the subcontract to be executed with any particular Subcontractor. If Owner disapproves such form, Contractor shall not execute the form until the matters disapproved are resolved to Owner's satisfaction. Owner's review, comment upon or approval of any such form shall not relieve Contractor of its obligations under this Agreement or be deemed a waiver of such obligations of Contractor.
- B.8.3 Contractor shall not assign, sell, or transfer its rights, or delegate its responsibilities under the Contract, in whole or in part, without the prior written approval of the Owner. No such written approval shall relieve Contractor of any obligations of the Contract, and any transferee shall be considered the agent of the Contractor and bound to perform in accordance with the Contract Documents. Contractor shall remain liable as between the original parties to the Contract as if no assignment had occurred.

B.9 OWNER'S RIGHT TO DO WORK

Owner reserves the right to perform other or additional work at or near the Project Site with other agents than those of the Contractor. If such work takes place within or next to the Project Site, Contractor shall coordinate work with the other contractors or agents, cooperate with all other contractors or forces, carry out the Work in a way that will minimize interference and delay for all agents involved, place and dispose of materials being used so as not to interfere with the operations of another, and join the Work with the work of the others in an acceptable manner and perform it in proper sequence to that of the others. The Owner will resolve any disagreements that may arise between or among Contractor and the other contractors over the method or order of doing all work (including the Work). In case of unavoidable interference, the Owner will establish work priority (including the Work) in the Owner's sole discretion.

B.10 OTHER CONTRACTS

In all cases and at any time, the Owner has the right to execute other contracts related to or unrelated to the Work of the Contract. The Contractor of the Contract shall fully cooperate with any and all other contractors without additional cost to the Owner in the manner described in Section B.13.

B.11 ALLOWANCES

B.11.1 The Contractor shall include in the Contract Price all allowances stated in the Contract Documents. Items covered by allowances

shall be supplied for such amounts and by such persons or entities as the Owner may direct.

- B.11.2 Unless otherwise provided in the Contract Documents:
 - (a) when finally reconciled, allowances shall cover the cost of the Contractor's materials and equipment delivered at the Project Site and all required taxes, less applicable trade discounts;
 - (b) Contractor's costs for unloading and handling at the Project Site, labor, installation costs, Overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Price but not in the allowances;
 - (c) whenever costs are more than or less than allowances, the Contract Price shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (i) the difference between actual costs and the allowances under Section B.17.2(a) and (ii) changes in Contractor's costs under Section B.17.2(b);
 - (d) Unless Owner requests otherwise, Contractor shall provide to Owner a proposed fixed price for any allowance work prior to its performance.

B.12 SUBMITTALS, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- B.12.1 The Contractor shall prepare and keep current, for the Architect's/Engineer's approval (or for the approval of Owner if approval authority has not been delegated to the Architect/Engineer), a schedule and list of submittals which is coordinated with the Contractor's construction schedule and allows the Architect/Engineer reasonable time to review submittals. Owner reserves the right to finally approve the schedule and list of submittals. Submittals include, without limitation, Shop Drawings, Product Data, and Samples.
- B.12.2 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review of submittals by the Architect/Engineer is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, or for approval of safety precautions or, unless otherwise specifically stated by the Architect/Engineer, of any construction means, methods, techniques, sequences or procedures, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect/Engineer's review of the Contractor's submittals shall not relieve the Contractor of its obligations under the Contract Documents. The Architect/Engineer's approval of a specific item shall not indicate approval of an assembly of which the item is a component. Informational submittals upon which the Architect/Engineer is not expected to take responsive action may be so identified in the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect/Engineer without action.
- B.12.3 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect/Engineer Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals which are not marked as reviewed for compliance with the Contract Documents

and approved by the Contractor may be returned by the Architect/Engineer without action.

- B.12.4 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.
- B.12.5 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect/Engineer.
- B.12.6 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect/Engineer's review or approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect/Engineer in writing of such deviation at the time of submittal and (i) the Architect/Engineer has given written approval to the specific deviation as a minor change in the Work, or (ii) a Change Order has been executed by Owner authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect/Engineer's review or approval thereof.
- B.12.7 In the event that Owner elects not to have the obligations and duties described under this Section B.18 performed by the Architect/Engineer, or in the event no Architect/Engineer is employed by Owner on the Project, all obligations and duties assigned to the Architect/Engineer hereunder shall be performed by the Owner.

B.13 SUBSTITUTIONS

The Contractor may make Substitutions only with the written consent of the Owner, after evaluation by the Owner and only in accordance with a Change Order. Substitutions shall be subject to the requirements of the Solicitation Document. By making requests for Substitutions, the Contractor represents that the Contractor has personally investigated the proposed substitute product; represents that the Contractor will provide the same warranty for the Substitution that the Contractor would for the product originally specified unless approved otherwise; certifies that the Contract including redesign costs, and waives all claims for additional costs related to the Substitution which subsequently become apparent; and will coordinate the installation of the accepted Substitution, making such changes as may be required for the Work to be completed in all respects.

B.14 USE OF PLANS AND SPECIFICATIONS

Plans, Specifications and related Contract Documents furnished to Contractor by Owner or Owner's Architect/Engineer shall be used solely for the performance of the Work under the Contract. Contractor and its Subcontractors and suppliers are authorized to use and reproduce applicable portions of such documents appropriate to the execution of the Work, but shall not claim any ownership or other interest in them beyond the scope of the Contract, and no such interest shall attach. Unless otherwise indicated, all common law, statutory and other reserved rights, in addition to copyrights, are retained by Owner.

SECTION C WAGES AND LABOR

C.1 PREVAILING WAGE RATES ON PUBLIC WORKS

Contractor shall comply fully with the provisions of ORS 279C.800 through 279C.870. Pursuant to ORS 279C.830(1)(d), Contractor shall pay workers at not less than the specified minimum hourly rate of wage, and shall include that requirement in all subcontracts. If the Work is subject to both the state prevailing wage rate law and the federal Davis-Bacon Act, Contractor shall pay the higher of the applicable state or federal prevailing rate of wage. Contractor shall provide written notice to all workers of the number of hours per day and days per week such workers may be required to work.

C.2 PAYROLL CERTIFICATION AND FEE REQUIREMENTS

- In accordance with ORS 279C.845, the Contractor and every C.2.1 Subcontractor shall submit written certified statements to the Owner on the form prescribed by the Commissioner of the Bureau of Labor and Industries ("BOLI"), certifying the hourly rate of wage paid each worker which the Contractor or the Subcontractor has employed on the Project and further certifying that no worker employed on the Project has been paid less than the prevailing rate of wage or less than the minimum hourly rate of wage specified in the Contract, which certificate and statement shall be verified by the oath of the Contractor or the Subcontractor that the Contractor or Subcontractor has read the certified statement, that the Contractor or Subcontractor knows the contents of the certified statement, and, that to the Contractor's or Subcontractor's best knowledge and belief, the certified statement is true. The certified statements shall set out accurately and completely the payroll records for the prior week, including the name and address of each worker, the worker's correct classification, rate of pay, daily and weekly number of hours worked, deductions made, and actual wages paid. Certified statements for each week during which the Contractor or Subcontractor has employed a worker on the Project shall be submitted once a month, by the fifth (5th) business day of the following month. The Contractor and Subcontractors shall preserve the certified statements for a period of ten (10) years from the date of completion of the Contract.
- C.2.2 Pursuant to ORS 279C.845(7), the Owner shall retain 25 percent of any amount earned by the Contractor on the Project until the Contractor has filed the certified statements required by section C.2.1. The Owner shall pay to the Contractor the amount retained under this subsection within 14 days after the Contractor files the required certified statements, regardless of whether a Subcontractor has failed to file certified statements.
- C.2.3 Pursuant to ORS 279C.845(8), the Contractor shall retain 25 percent of any amount earned by a first-tier Subcontractor on this Project until the first-tier Subcontractor has filed with the Owner the certified statements required by C.2.1. Before paying any amount retained under this subsection, the Contractor shall verify that the first-tier Subcontractor has filed the certified statement. Within 14 days after the first-tier Subcontractor files the required certified statement the Contractor shall pay the first-tier Subcontractor any amount retained under this subsection.
- C.2.4 In accordance with statutory requirements and administrative rules promulgated by the Commissioner of the Bureau of Labor and Industries, the fee required by ORS 279C.825(1) will be paid by Owner to the Commissioner.

C.3 PROMPT PAYMENT AND CONTRACT CONDITIONS

- C.3.1 As a condition to Owner's performance hereunder, the Contractor shall:
- C.3.1.1 Make payment promptly, as due, to all persons supplying to Contractor labor or materials for the prosecution of the Work provided for in the Contract.
- C.3.1.2 Pay all contributions or amounts due the State Industrial Accident Fund or successor program from such Contractor or Subcontractor incurred in the performance of the Contract.
- C.3.1.3 Not permit any lien or claim to be filed or prosecuted against the Owner on account of any labor or material furnished. Contractor will not assign any claims that Contractor has against Owner, or assign any sums due by Owner, to Subcontractors, suppliers, or manufacturers, and will not make any agreement or act in any way to give Subcontractors a claim or standing to make a claim against the Owner.
- C.3.1.4 Pay to the Department of Revenue all sums withheld from employees pursuant to ORS 316.167.
- C.3.2 If Contractor fails, neglects or refuses to make prompt payment of any claim for labor or services furnished to the Contractor of a Subcontractor by any person in connection with the Project as such claim becomes due, the proper officer(s) representing the Owner may pay the claim and charge the amount of the payment against funds due or to become due Contractor under the Contract. Payment of claims in this manner shall not relieve the Contractor or the Contractor's surety from obligation with respect to any unpaid claims.
- C.3.3 Contractor shall include in each subcontract for property or services entered into by the Contractor and a first-tier subcontractor, including a material supplier, for the purpose of performing a construction contract, a payment clause that obligates the Contractor to pay the first-tier Subcontractor for satisfactory performance under its subcontract within ten (10) Days out of such amounts as are paid to the Contractor by the Owner under such contract.
- C.3.4 If the Contractor or a first-tier subcontractor fails, neglects or refuses to pay a person that provides labor or materials in connection with the Contract within 30 days after receiving payment from the contracting agency or a contractor, the Contractor or first-tier subcontractor owes the person the amount due plus interest charges that begin at the end of the 10-day period within which payment is due under ORS 279C.580 (4) and that end upon final payment, unless payment is subject to a good faith dispute as defined in ORS 279C.580. The rate of interest on the amount due is nine percent per annum. The amount of interest may not be waived.
- C.3.5 If the Contractor or a subcontractor fails, neglects or refuses to make payment to a person furnishing labor or materials in connection with the Contract, the person may file a complaint with the Construction Contractors Board, unless payment is subject to a good faith dispute as defined in ORS 279C.580.
- C.3.6 All employers, including Contractor, that employ subject workers who work under the Contract in the State of Oregon shall comply with ORS 656.017 and provide the required Workers' Compensation coverage, unless such employers are exempt under ORS 656.126. Contractor shall ensure that each of its Subcontractors complies with these requirements.
- C.3.7 In accordance with ORS 279C.570, for all subcontracts that exceed \$500,000 that the Contractor withholds retainage, the Contractor shall place amounts deducted as retainage into an interest-bearing escrow account. Interest on the retainage amount accrues from the

date the payment request is approved until the date the retainage is paid to the Subcontractor to which it is due.

C.4 PAYMENT FOR MEDICAL CARE

As a condition to Owner's performance hereunder, Contractor shall promptly, as due, make payment to any person, co-partnership, association or corporation furnishing medical, surgical, and hospital care or other needed care and attention, incident to sickness or injury, to the employees of the Contractor, of all sums of which the Contractor agrees to pay for the services and all moneys and sums that the Contractor collected or deducted from the wages of employees under any law, contract or agreement for the purpose of providing or paying for the services.

C.5 HOURS OF LABOR

As a condition to Owner's performance hereunder, no person shall be employed to perform Work under the Contract for more than ten (10) hours in any one day or forty (40) hours in any one week, except in cases of necessity, emergency or where public policy absolutely requires it. In such instances, Contractor shall pay the employee at least time and a half pay:

- (a) For all overtime in excess of eight (8) hours a day or forty
 (40) hours in any one week when the work week is five consecutive Days, Monday through Friday; or
- (b) For all overtime in excess of ten (10) hours a day or forty (40) hours in any one week when the work week is four consecutive Days, Monday through Friday; and
- (c) For all Work performed on Saturday and on any legal holiday specified in ORS 279C.540.

This Section C.5 will not apply to Contractor's Work under the Contract to the extent Contractor is currently a party to a collective bargaining agreement with any labor organization.

This Section C.5 shall not excuse Contractor from completion of the Work within the time required under the Contract.

SECTION D CHANGES IN THE WORK

D.1 CHANGES IN WORK

- D.1.1 The terms of the Contract shall not be waived, altered, modified, supplemented or amended in any manner whatsoever, without prior written agreement and then only after any necessary approvals have been obtained. A Change Order is required to modify the Contract, which shall not be effective until its execution by the parties to the Contract and all approvals required by public contracting laws have been obtained.
- D.1.2 It is mutually agreed that changes in Plans, quantities, or details of construction may be necessary or desirable during the course of construction. Within the general scope of the Contract, the Owner may at any time, without notice to the sureties and without impairing the Contract, require changes it deems necessary or desirable within the scope of this Project and consistent with this Section D.1. All changes to the Work shall be documented and Change Orders shall be executed under the conditions of the Contract Documents. Such changes may include, but are not limited to:
 - (a) Modification of specifications and design.
 - (b) Increases or decreases in quantities.
 - (c) Increases or decreases to the amount of Work.
 - (d) Addition or elimination of any Work item.
 - (e) Change in the duration of the Project.

(f) Acceleration or delay in performance of Work.(g) Deductive changes.

Deductive changes are those that reduce the scope of the Work, and shall be made by mutual agreement whenever feasible. In cases of suspension or partial termination under Section J, Owner reserves the right to unilaterally impose a deductive change and to selfperform such Work, for which the provisions of Section B.13 (Owner's Right to Do Work) shall then apply. Adjustments in compensation shall be made under Section D.1.3, in which costs for deductive changes shall be based upon a Direct Costs adjustment together with the related percentage markup specified for profit, Overhead and other indirect costs, unless otherwise agreed to by Owner.

- D.1.3 The Owner and Contractor agree that adjustments to or deletions from the Work shall be administered and compensated according to the following:
- (a) Unit Pricing: Unit pricing may be utilized at the Owner's option when unit prices or solicitation alternates were provided that established the cost for adjustments to Work, and a binding obligation exists under the Contract on the parties covering the terms and conditions of the adjustment to Work.
- (b) Fixed Fee: If the Owner elects not to utilize unit pricing, or in the event that unit pricing is not available or appropriate, fixed pricing may be used for adjustments to or deletions from the Work. In fixed pricing, the basis of payments or total price shall be agreed upon in writing between the parties to the Contract, and shall be established before the Work is done whenever feasible. Notwithstanding the foregoing, the mark-ups set forth in Section D.1.3(c) shall be utilized in establishing fixed pricing, and such mark-ups shall not be exceeded. Cost and price data relating to adjustments to or deletions from the Work shall be supplied by Contractor to Owner upon request, but Owner shall be under no obligation to make such requests.
- (c) Time and Material: In the event that unit pricing and fixed pricing are not utilized, then adjustments to or deletions from the Work shall be performed on a cost reimbursement basis for Direct Costs. Such Work shall be compensated on the basis of the actual, reasonable and allowable cost of labor, equipment, and material furnished on the Work performed. The Contractor or Subcontractor who performs the Work shall be allowed to add up to ten percent (10%) markup to the Direct Costs as full compensation for profit, Overhead and other indirect costs for Work performed with the Contractor's or Subcontractor's own agents

Each ascending tier Subcontractor or the Contractor that did not perform the Work, will be allowed to add up to five percent (5%) supplemental markup on the Direct Costs of the Work (but not the above allowable markups) covered by a Change Order. No additional markup shall be permitted for any third tier or greater descending Subcontractor.

Example: \$20,000 of Direct Costs Work performed by a 2nd Tier Subcontractor

	Markup	Allowed Total Fee Plus Markup
General Contractor	5%	\$1,000.00
1st Tier Sub Contractor	5%	\$1,000.00
2 nd Tier Sub Contractor	10%	\$22,000.00

(d) Payments made to the Contractor shall be complete compensation for Overhead, profit, and all costs that were incurred by the Contractor or by other agents furnished by the Contractor, including Subcontractors, for adjustments to or deletions from the Work pursuant to a Change Order. Owner may establish a maximum cost for additional Work under this Section D.1.3, which shall not be exceeded for reimbursement without additional written
authorization from Owner in the form of a Change Order. Contractor shall not be required to complete such additional Work without additional authorization.

D.1.4 Any necessary adjustment of Contract Time that may be required as a result of adjustments to or deletions from the Work must be agreed upon by the parties before the start of the revised Work unless Owner authorizes Contractor to start the revised Work before agreement on Contract Time adjustment.

Contractor shall submit any request for additional compensation (and additional Contract Time if Contractor was authorized to start Work before an adjustment of Contract Time was approved) as soon as possible but no later than thirty (30) Days after receipt of Owner's request for additional Work . If Contractor's request for additional compensation or adjustment of Contract Time is not made within the thirty (30) Day time limit, Contractor's requests pertaining to that additional Work shall be barred. The thirty (30) Day time limit for making requests shall not be extended for any reason, including without limitation Contractor's claimed inability to determine the amount of additional compensation or adjustment of Contract Time, unless an extension is granted in writing by Owner. If the Owner denies Contractor's request for additional compensation or adjustment of Contract Time, Contractor may proceed to file a Claim under Section D.3, Claims Review Process. No other reimbursement, compensation, or payment will be made, except as provided in Section D.1.5 for impact claims.

D.1.5 If any adjustment to Work under Section D.1.3 causes an increase or decrease in the Contractor's cost of, or the Contract Time required for the performance of any other part of the Work under the Contract, Contractor shall submit a written request to the Owner, setting forth the nature and specific extent of the request, including all time and cost impacts against the Contract as soon as possible, but no later than thirty (30) Days after receipt of Owner's request for adjustments to or deletions from the Work by Contractor.

The thirty (30) Day time limit applies to claims of Subcontractors, suppliers, or manufacturers who may be affected by Owner's request for adjustments to or deletions from the Work and who request additional compensation or an extension of Contract Time to perform; Contractor has responsibility for contacting its Subcontractors, suppliers, or manufacturers within the thirty (30) Day time limit, and including their requests with Contractor's requests. If the request involves Work to be completed by Subcontractors, or materials to be furnished by suppliers or manufacturers, such requests shall be submitted to the Contractor in writing with full analysis and justification for the adjustments to compensation and Contract Time requested. The Contractor shall analyze and evaluate the merits of the requests submitted by Subcontractors, suppliers, and manufacturers to Contractor prior to including those requests and Contractor's analysis and evaluation of those requests with Contractor's requests for adjustments to compensation or Contract Time that Contractor submits to the Owner. Failure of Subcontractors, suppliers, manufacturers or others to submit their requests to Contractor for inclusion with Contractor's requests submitted to Owner within the time period and by the means described in this section shall constitute a waiver of these Subcontractor claims. The Owner will not consider direct requests or claims from Subcontractors, suppliers, manufacturers or others not a party to the Contract. The consideration of such requests and claims under this section does not give any Person, not a party to the Contract the right to bring a claim against Owner, whether in this claims process, in litigation, or in any dispute resolution process.

If the Owner denies the Contractor's request for adjustment to compensation or Contract Time, the Contractor may proceed to file a Claim under Section D.3, Claims Review Process.

- D.1.6 No request or Claim by the Contractor for additional costs or an adjustment of Contract Time shall be allowed if made after receipt of final payment application under the Contract. Final payment application must be made by Contractor within the time required under Section E.6.4.
- D.1.7 It is understood that changes in the Work are inherent in construction of this type. The number of changes, the scope of those changes, and the effect they have on the progress of the original Work cannot be defined at this time. The Contractor agrees that it will work in good faith with Owner to undertake changes, when agreed upon by execution of a Change Order. Each change will be evaluated for extension of Contract Time and increase or decrease in compensation based on its own merit.

D.2 DELAYS

- D.2.1 Contractor shall not be entitled to additional compensation or additional Contract Time for Avoidable Delays.
- D.2.2 In the event of Unavoidable Delays, Contractor may be entitled to the following:
 - (a) Contractor may be entitled to additional compensation or additional Contract Time, or both, for Unavoidable Delays described in Section D.2.1.2 (a) and (b).
 - (b) Contractor may be entitled to additional Contract Time for Unavoidable Delays described in Section D.2.1.2(c) and (d).

In the event of any requests for additional compensation or additional Contract Time, or both, as applicable, arising under this Section D.2.2 for Unavoidable Delays, other than requests for additional compensation or additional Contract Time for differing Project Site conditions for which a review process is established under Section A.4.5, Contractor shall submit a written notification of the delay to the Owner within two (2) Days of the occurrence of the cause of the delay. This written notification shall state the cause of the potential delay, the Project components impacted by the delay, and the anticipated additional Contract Time extension or the additional compensation, or both, as applicable, resulting from the delay. Within seven (7) Days after the cause of the delay has been mitigated, or in no case more than thirty (30) Days after the initial written notification, the Contractor shall submit to the Owner, a complete and detailed request for additional compensation or additional Contract Time, or both, as applicable, resulting from the delay. If the Owner denies Contractor's request for additional compensation or adjustment of Contract Time, the Contractor may proceed to file a Claim under Section D.3, Claims Review Process.

If Contractor does not timely submit the notices required under this Section D.2, Contractor's Claim shall be barred.

D.3 CLAIMS REVIEW PROCESS

D.3.1 All Contractor Claims shall be referred to the Owner for review. Contractor's Claims, including Claims for adjustments to compensation or Contract Time, shall be submitted in writing by Contractor to the Owner within five (5) Days after a denial of Contractor's initial request for an adjustment of Contract terms, payment of money, extension of Contract Time or other relief, provided that such initial request has been submitted in accordance with the requirements and within the time limits established in these County General Conditions. Within thirty (30) Days after the initial Claim, Owner shall receive from Contractor a complete and detailed description of the Claim (the "Detailed Notice") that includes all information required by Section D.3.2. Unless the Claim is made in accordance with these time requirements, it shall be barred.

- D.3.2 The Detailed Notice of the Claim shall be submitted in writing by Contractor and shall include all information, records and documentation necessary for the Owner to properly and completely evaluate the claim, including, but not limited to a detailed, factual statement of the basis of the Claim, pertinent dates, Contract provisions which support or allow the Claim, reference to or copies of any documents which support the Claim, the dollar value of the Claim, and the Contract Time adjustment requested for the Claim. If the Claim involves Work to be completed by Subcontractors, the Contractor will analyze and evaluate the merits of the Subcontractor claim prior to forwarding it and that analysis and evaluation to the Owner. The Owner will not consider direct claims from Subcontractors, suppliers, manufacturers, or others not a party to the Contract. Contractor agrees that it will make no agreement, covenant, or assignment, nor will it commit any other act that will permit or assist any Subcontractor, supplier, manufacturer, or other to directly or indirectly make a claim against Owner.
- D.3.3 The Owner, through the Architect/Engineer (or other employee or agent assigned by the Owner) will review all Claims and take one or more of the following preliminary actions within ten (10) Days of receipt of the Detailed Notice of a Claim: (1) request additional supporting information from the Contractor; (2) inform the Contractor and Owner in writing of the time required for adequate review and response; (3) reject the Claim in whole or in part and identify the reasons for rejection; (4) recommend approval of all or part of the Claim; (5) arrange a meeting with the Contractor for formal review of the Claim; or (6) propose an alternate resolution.
- D.3.4 Once the Engineer or Project Manager determines the Owner is in receipt of a properly submitted claim, the Engineer or Project Manager may arrange a meeting, as agreed by the parties, with the Contractor in order to present the claim for formal review and discussion. A person authorized by the Contractor to execute Change Orders on behalf of the Contractor must be present and attend all claim meetings.
- D.3.5 The Owner's decision, through the Architect/Engineer (or other employee or agent assigned by the Owner), shall be final and binding on the Contractor unless appealed by written notice to the Owner within fifteen (15) Days of receipt of the decision. The Contractor must present written documentation supporting the Claim within fifteen (15) Days of the notice of appeal. After receiving the appeal documentation, the Owner, through the appropriate department director, shall review the materials and render a decision within thirty (30) Days after receiving the appeal documents.
- D.3.6 If, at any step in the claim decision or review process, the Contractor fails to promptly submit requested information or documentation that the Owner deems necessary to analyze the claim, the Contractor is deemed to have waived its right to further review, and the Claim will not be considered properly filed and preserved.
- D.3.7 Both parties agree to exercise their best efforts in good faith to resolve all disputes within sixty (60) Days of the issuance of the appeal in Section D. 3.4 above. If the parties are unable to resolve their issues through mediation or otherwise, either party may seek redress through all available remedies in equity or in law.
- D.3.8 Unless otherwise directed by Owner, Contractor shall proceed with the Work while any Claim, or mediation or litigation arising from a Claim, is pending. Regardless of the review period or the final decision of the Owner, the Contractor shall continue to diligently pursue the Work as identified in the Contract Documents. In no case is the Contractor justified or allowed to cease or delay Work, in whole or in part, without a written stop work order from the Owner.

SECTION E PAYMENTS

E.1 <u>SCHEDULE OF VALUES</u>

The Contractor shall submit, by or before the pre-construction conference (as described in Section H.1.3), a schedule of values ("Schedule of Values") for the Contract Work. This schedule shall provide a breakdown of values for the Contract Work and will be the basis for progress payments. The breakdown shall demonstrate reasonable, identifiable, and measurable components of the Work. Unless objected to by the Owner, this schedule shall be used as the basis for reviewing Contractor's applications for payment. If objected to by Owner, Contractor shall revise the schedule of values and resubmit the same for approval of Owner.

E.2 APPLICATIONS FOR PAYMENT

- E.2.1 Owner shall make progress payments on the Contract monthly as Work progresses, in accordance with the requirements of this Section E.2 and ORS 279C.570. Applications for payment shall be based upon estimates of Work completed and the Schedule of Values. As a condition precedent to Owner's obligation to pay, all applications for payment shall be approved by the Owner. A progress payment shall not be considered acceptance or approval of any Work or waiver of any defects therein. Owner shall pay to Contractor interest in accordance with ORS 279C.570 for overdue invoices, not including retainage, due the Contractor. Overdue invoices will be those that have not been paid within the earlier of:
 - (a) Thirty (30) days after receipt of the invoice; or
 - (b) Fifteen (15) days after the payment is approved by the County.

Notwithstanding the foregoing, in instances when an application for payment is filled out incorrectly, or when there is any defect or impropriety in any submitted application or when there is a good faith dispute, Owner shall so notify the Contractor within fifteen (15) Days stating the reason or reasons the application for payment is defective or improper or the reasons for the dispute. A defective or improper application for payment, if corrected by the Contractor within seven (7) Days of being notified by the Owner, shall not cause a payment to be made later than specified in this section unless interest is also paid. Payment of interest will be postponed when payment on the principal is delayed because of disagreement between the Owner and the Contractor.

Owner reserves the right, instead of requiring the Contractor to correct or resubmit a defective or improper application for payment, to reject the defective or improper portion of the application for payment and pay the remainder of the application for such amounts which are correct and proper.

Owner, upon written notice to the Contractor, may elect to make payments to the Contractor only by means of Electronic Funds Transfers ("EFT") through Automated Clearing House ("ACH") payments. If Owner makes this election, the Contractor shall arrange for receipt of the EFT/ACH payments.

E.2.2 Contractor shall submit to the Owner an application for each payment and, if required, receipts or other vouchers showing payments for materials and labor including payments to Subcontractors. Contractor shall include in its application for payment a schedule of the percentages of the various parts of the Work completed, based on the Schedule of Values which shall aggregate to the payment application total, and shall include, on the face of each copy thereof, a certificate in substantially the following form:

"I, the undersigned, hereby certify that the above bill is true and correct, and the payment therefore, has not been received.

Signed:	
Dated:	"

- E.2.3 Generally, applications for payment will be accepted only for materials that have been installed. Under special conditions, applications for payment for stored materials will be accepted at Owner's sole discretion. Such a payment, if made, will be subject to the following conditions:
 - (a) The request for stored material shall be submitted at least thirty (30) Days in advance of the application for payment on which it appears. Applications for payment shall be entertained for major equipment, components or expenditures only.
 - (b) The Contractor shall submit applications for payment showing the quantity and cost of the material stored.
 - (c) The material shall be stored in a bonded warehouse and Owner shall be granted the right to access the material for the purpose of removal or inspection at any time during the Contract Period.
 - (d) The Contractor shall name the Owner as co-insured on the insurance policy covering the full value of the property while in the care and custody of the Contractor until it is installed. A certificate noting this coverage shall be issued to the Owner.
 - (e) Payments shall be made for materials and equipment only. The submitted amount in the application for payment shall be reduced by the cost of transportation from the storage site to the Project Site and for the cost of an inspector to verify delivery and condition of the goods at the storage site. The cost of storage and inspection shall be borne solely by the Contractor.
 - (f) Within sixty (60) Days of the application for payment, the Contractor shall submit evidence of payment covering the material and/or equipment stored and of payment for the storage site.
 - (g) Payment for stored materials and/or equipment shall in no way indicate acceptance of the materials and/or equipment or waive any rights under the Contract for the rejection of the Work or materials and/or equipment not in conformance with the Contract Documents.
 - (h) All required documentation shall be submitted with the respective application for payment.
- E.2.4 The Owner reserves the right to withhold all or part of a payment, or may nullify in whole or part any payment previously made, to such extent as may be necessary in the Owner's opinion to protect the Owner from loss because of:
 - (a) Work that is defective and not remedied, or that has been demonstrated or identified as failing to conform with Applicable Laws or the Contract Documents;
 - (b) third party claims filed or evidence reasonably indicating that such claims will likely be filed unless security acceptable to the Owner is provided by the Contractor;
 - (c) failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment (in which case Owner may issue checks made payable jointly to Contractor and such unpaid persons under this provision, or directly to Subcontractors and suppliers at any level under Section C.3.2);

- (d) reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Price;
- (e) damage to the Work, Owner or Owner's agent;
- (f) reasonable evidence that the Work will not be completed within the Contract Time required by the Contract, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
- (g) failure to carry out the Work in accordance with the Contract Documents; or
- (h) assessment of liquidated damages, when withholding is made for offset purposes.
- E.2.5 Subject to the provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:
 - (a) Take that portion of the Contract Price properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the total Contract Price allocated to that portion of the Work in the Schedule of Values, less retainage as provided in Section E.5. Pending final determination of cost to the Owner of changes in the Work, no amounts for changes in the Work can be included in applications for payment until the Contract Price has been adjusted by a Change Order;
 - (b) Add that portion of the Contract Price properly allocable to materials and equipment delivered and suitably stored at the Project Site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner pursuant to Section E.2.3, suitably stored off the Project Site at a location agreed upon in writing), less retainage as provided in Section E.5;
 - (c) Subtract the aggregate of previous payments made by the Owner; and
 - (d) Subtract any amounts for which the Owner has withheld or nullified payment as provided in the Contract Documents.
- E.2.6 Contractor's applications for payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay to a Subcontractor or material supplier.
- E.2.7 The Contractor warrants to Owner that title to all Work covered by an application for payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an application for payment all Work for which payments are received from the Owner shall be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided financing, labor, materials and equipment relating to the Work.
- E.2.8 If Contractor disputes any determination by Owner with regard to any application for payment, Contractor nevertheless shall continue to expeditiously perform the Work. No payment made hereunder shall be or be construed to be final acceptance or approval of that portion of the Work to which such partial payment relates or shall relieve Contractor of any of its obligations hereunder.

E.3 PAYROLL CERTIFICATION REQUIREMENT

Owner's receipt of payroll certification pursuant to Section C.2 of the Contract shall be a condition precedent to Owner's obligation to pay any progress payments or final payment otherwise due.

E.4 DUAL PAYMENT SOURCES

Contractor shall not be compensated for Work performed under the Contract from any state agency other than the agency that is a party to the Contract.

E.5 <u>RETAINAGE</u>

- E.5.1 Retainage shall be withheld and released in accordance with the requirements set forth in Local Contract Review Board Rules or the applicable County standard.
- E.5.1.1 Owner may reserve as retainage from any progress payment an amount not to exceed five percent of the payment. As Work progresses, Owner may reduce the amount of retainage on or may eliminate retainage on any remaining monthly Contract payments after fifty (50) percent of the Work under the Contract is completed if, in the Owner's discretion, such Work is progressing satisfactorily. Elimination or reduction of retainage shall be allowed only upon written application by the Contractor, which application shall include written approval of Contractor's surety; except that when the Work is ninety-seven and a half percent (97.5%) completed in Owner's estimation, the Owner may, at its discretion and without application by the Contractor, reduce the retained amount to hundred (100) percent of the value of the Work remaining to be done. Upon receipt of written application by the Contractor, Owner shall respond in writing within a reasonable time.

E.5.1.2 If retainage is withheld, unless the Contractor requests and the Owner accepts a form of retainage described in options (a) or (b) below, the Owner (except as otherwise provided below for a contract of \$500,000 or less), will deposit the retainage in an interest-bearing escrow account as required by ORS 279C.570(2). The Contractor shall execute such documentation and instructions respecting the interest-bearing escrow account as the Owner may require to protect its interests, including but not limited to a provision that no funds may be paid from the account to anyone without the Owner's advance written authorization. For a Contract over \$500,000, if the Contractor requests that the Owner deposit the retainage in an interest-bearing account under ORS 279C.560(5), the Owner will use an interest-bearing escrow account as stated above. For a Contract of \$500,000 or less, if the Contractor requests that the Owner deposit the retainage in an interest-bearing account under ORS 279C.560(5), the Owner will use an interest-bearing account (in a bank, savings bank, trust company or savings association) as provided under ORS 279C.450(5).

In accordance with the provisions of ORS 279C.560, Local Contract Review Board Rules, or the applicable County standard, unless the Owner finds in writing that accepting bonds, securities or other instruments described in option (a) below or a security bond described in option (b) below poses an extraordinary risk that is not typically associated with the bond, security or instrument, the Owner will approve the Contractor's written request:

 to be paid amounts which would otherwise have been retained from progress payments where Contractor has deposited acceptable bonds, securities or other instruments of equal value with Owner or in a custodial account or other mutuallyagreed account satisfactory to Owner, with an approved bank or trust company to be held in lieu of the cash retainage for the benefit of Owner. Interest or earnings on the bonds, securities or other instruments shall accrue to the Contractor. The Contractor shall execute and provide such documentation and instructions respecting the bonds, securities and other instruments as the Owner may require to protect its interests. To be permissible, the bonds, securities and other instruments must be of a character approved by Owner; or b. that the Contractor be allowed, with the approval of the Owner, Owner allow Contractor to deposit a surety bond for the benefit of Owner, in a form acceptable to Owner, in lieu of all or a portion of funds retained, or to be retained. Such bond and any proceeds therefrom shall be made subject to all claims and liens in the manner and priority as set forth for retainage under ORS 279C.550 to ORS 279C.625.

When the Owner has accepted the Contractor's election of option (a) or (b), Owner may recover from Contractor any additional costs incurred through such election by reducing Contractor's final payment. Where the Owner has agreed to Contractor's request for option (b), Contractor shall accept like bonds from Subcontractors and suppliers on the Project from which Contractor has required retainages.

- E. 5.1.3 The retainage held by Owner shall be included in and paid to the Contractor as part of the final payment of the Contract Price. The Owner shall pay to Contractor interest at the rate of two thirds of one percent per month on the final payment due Contractor, interest to commence forty-five (45) Days after the date which Owner receives Contractor's final approved application for payment and Work under the Contract has been completed and accepted and to run until the date when final payment is tendered to Contractor. The Contractor shall notify Owner in writing when the Contractor considers the Work complete and deliver to Owner its final application for payment and Owner shall, within fifteen (15) Days after receiving the written notice and the application for payment, either accept the Work or notify the Contractor of Work yet to be performed on the Contract. If Owner does not within the time allowed notify the Contractor of Work yet to be performed to fulfill contractual obligations, the interest provided by this subsection shall commence to run forty-five (45) Days after the end of the fifteen (15) Day period.
- E.5.1.4 Owner will reduce the amount of the retainage if the Contractor notifies the Owner that the Contractor has deposited in an escrow account with a bank or trust company, in a manner authorized by the Owner, bonds and securities of equal value of a kind approved by the Owner and such bonds and securities have in fact been deposited.
- E.5.1.5 Contractor agrees that if Contractor elects to reserve a retainage from any progress payment due to any Subcontractor or supplier, such retainage shall not exceed five percent of the payment, and such retainage withheld from Subcontractors and suppliers shall be subject to the same terms and conditions stated in Subsection E.5 as apply to Owner's retainage from any progress payment due to Contractor.
- E.5.1.6 The Contractor shall comply with all applicable legal requirements for withholding and releasing retainage and for prompt payments, including but not limited to those in ORS Chapters 279C and 701, and 49 CFR 26.29.

E.6 FINAL PAYMENT

E.6.1 Upon completion of all the Work under the Contract, the Contractor shall notify the Owner, in writing, that Contractor has completed Contractor's obligations under the Contract and shall prepare its application requesting final payment. The amount of final payment will be the difference between the total amount due the Contractor pursuant to the Contract Documents and the sum of all payments previously made. Upon receipt of such notice and application for payment, the Owner will inspect the Work, and, if acceptable, submit to Contractor a recommendation as to acceptance of the completed Work and the final estimate of the amount due the Contractor. If the Work is not acceptable, Owner will notify Contractor within fifteen (15) Days of Contractor's request for final payment. Upon approval of this final application for payment by the Owner and compliance by the Contractor with provisions in Section K, and Contractor's satisfaction of other provisions of the Contract Documents as may be applicable, the Owner shall pay to the Contractor all monies due under the provisions of these Contract Documents.

- E.6.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Owner (1) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least thirty (30) Days' prior written notice has been given to the Owner, (2) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (3) consent of surety, if any, to final payment and (4), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien.
- E.6.3 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final application for payment.
- E.6.4 Contractor agrees to submit its final payment application within ninety (90) Days after Substantial Completion, unless written extension is granted by Owner. Contractor shall not delay final payment application for any reason, including without limitation nonpayment of Subcontractors, suppliers, manufacturers or others not a party to the Contract, or lack of resolution of a dispute with Owner or any other person of matters arising out of or relating to the Contract. If Contractor fails to submit its final payment application within ninety (90) Days after Substantial Completion, and Contractor has not obtained written extension by Owner, all requests or Claims for additional costs or an extension of Contract Time shall be barred.

SECTION F PROJECT SITE CONDITIONS

F.1 USE OF PREMISES

Contractor shall confine equipment, storage of materials and operation of Work to the limits indicated by Contract Documents, Applicable Laws, permits or directions of the Owner. Contractor shall follow the Owner's instructions regarding use of premises, if any.

F.2 PROTECTION OF WORKERS, PROPERTY AND THE PUBLIC

- F.2.1 Contractor shall maintain continuous and adequate protection of all of the Work from damage and shall protect the Owner, workers and property from injury or loss arising in connection with the Contract. Contractor shall remedy acceptably to the Owner any damage, injury, or loss, except such as may be directly due to errors in the Contract Documents or caused by authorized representatives or personnel of the Owner. Contractor shall adequately protect adjacent property as provided by law and the Contract Documents.
- F.2.2 Contractor shall take all necessary precautions for the safety of all personnel on the Project Site or otherwise engaged in the undertaking of the Work and shall comply with the Contract Documents, best practices and all applicable provisions of federal, state and municipal safety laws and building codes to prevent

accidents or injury to persons on, about or adjacent to the premises where the Work is being performed. Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the Work, all necessary safeguards for protection of workers and the public against any hazards created by construction. Contractor shall designate a responsible employee or associate on the Project Site, whose duty shall be the prevention of accidents. The name and position of the person designated shall be reported to the Owner. The Owner has no responsibility for Project Site safety. Project Site safety shall be the responsibility of the Contractor.

- F.2.3 Contractor shall not enter upon private property without first obtaining permission from the property owner or its duly authorized representative. Contractor shall be responsible for the preservation of all public and private property along and adjacent to the Work contemplated under the Contract and shall use every precaution necessary to prevent damage thereto. In the event the Contractor damages any property, the Contractor shall at once notify the property owner and make, or arrange to make, full restitution. Contractor shall, immediately and in writing, report to the Owner, all pertinent facts relating to such property damage and the ultimate disposition of the claim for damage.
- F.2.4 Contractor shall be responsible for protection of adjacent work areas including impacts brought about by activities, equipment, labor, utilities, vehicles and materials on the Project Site.
- F.2.5 Contractor shall at all times direct its activities in such a manner as to minimize adverse effects on the environment. Handling of all materials shall be conducted so no release will occur that may pollute or become hazardous.
- F.2.6 In an emergency affecting the safety of life or limb or of the Work or of adjoining property, the Contractor, without special instruction or authorization from the Owner, shall act reasonably to prevent threatened loss or injury, and shall so act, without appeal, if instructed by the Owner. Any compensation claimed by the Contractor on account of emergency work shall be determined in accordance with section D.
- F.2.7 Contractor shall comply with all Owner safety rules and regulations, if applicable. Prior to commencement of any Work, Contractor and Subcontractors shall be required to complete an Owner Contractor Safety Orientation and submit all Owner required safety plans.
- F.2.8 Contractor shall demonstrate that an employee drug testing program is in place.

F.3 CUTTING AND PATCHING

- F.3.1 If applicable, Contractor shall be responsible for coordinating all cutting, fitting, or patching of the Work to make its several parts come together properly and fit to receive or be received by work of other contractors or Subcontractors shown upon, or reasonably implied by, the Contract Documents.
- F.3.2 If applicable, Contractor shall be responsible for restoring all cut, fitted, or patched surfaces to an original condition; provided, however, that if a different condition is specified in the Contract Documents, then Contractor shall be responsible for restoring such surfaces to the condition specified in the Contract Documents.

F.4 <u>CLEANING UP</u>

From time to time as may be prudent or ordered by the Owner and, in any event, immediately after completion of the Work, the Contractor shall, at its own expense, clean up and remove all refuse and unused materials of any kind resulting from the Work. If Contractor fails to do so within twenty-four (24) hours after notification by the Owner the work may be done by others and the cost charged to the Contractor and deducted from payment due the Contractor.

F.5 ENVIRONMENTAL CONTAMINATION

- F.5.1. Contractor shall be held responsible for and shall indemnify, defend (with counsel of Owner's choice), and hold harmless Owner from and against any costs, expenses, damages, claims, and causes of action, or any of them, resulting from all spills, releases, discharges, leaks and disposal of environmental pollution, including storage, transportation, and handling during the performance of the Work or Contractor's obligations under the Contract which occur as a result of, or are contributed by, the negligence or actions of Contractor or its personnel, agents, or Subcontractors or any failure to perform in accordance with the Contract Documents (except to the extent otherwise void under ORS 30.140). Nothing in this section F.5.1 shall limit Contractor's responsibility for obtaining insurance coverages required under Section G.3 of the Contract, and Contractor shall take no action that would void or impair such coverages.
- F.5.1.1 Contractor agrees to promptly dispose of such spills, releases, discharge or leaks to the satisfaction of Owner and regulatory agencies having jurisdiction in a manner that complies with Applicable Laws. Cleanup shall be at no cost to the Owner and shall be performed by properly qualified and, if applicable, licensed personnel.
- F.5.1.2 Unless otherwise approved in the Solicitation Document, Contractor shall obtain the Owner's written consent prior to bringing onto the Project Site any (i) environmental pollutants or (ii) hazardous substances or materials, as the same or reasonably similar terms are used in any Applicable Laws. In any event, Contractor shall provide prior written notice to Owner when hazardous materials are brought on to the Project Site. The Contractor, at all times, shall:
 - (a) properly handle, use and dispose of all environmental pollutants and hazardous substances or materials on the Project Site, in accordance with all Applicable Laws;
 - (b) be responsible for any and all spills, releases, discharges, or leaks of (or from) environmental pollutants or hazardous substances or materials which Contractor has brought onto the Project Site; and
 - (c) promptly clean up and remediate, without cost to the Owner, such spills, releases, discharges, or leaks to the Owner's satisfaction and in compliance with all Applicable Laws.
- F.5.2 Contractor shall report all reportable quantity releases, as such releases are defined in Applicable Laws. Upon discovery, regardless of quantity, Contractor must verbally report all releases to the Owner in a prompt manner. A written follow-up report shall be submitted to Owner within 48 hours of the telephonic report. Such written report shall contain, as a minimum:
 - (a) Description of items released (identity, quantity, manifest numbers, and any and all other documentation required by law).
 - (b) Whether amount of items released is EPA/DEQ reportable, and, if so, when reported.
 - (c) Exact time and location of release, including a description of the area involved.
 - (d) Containment procedures initiated.

- (e) Summary of communications about the release between Contractor and State, local or federal officials other than Owner. Any communication to the press will be done by Owner and Contractor will defer to Owner.
- (f) Description of cleanup procedures employed or to be employed at the Project Site, including disposal location of spill residue.
- (g) Personal injuries, if any, resulting from, or aggravated by, the release.

F.6 ENVIRONMENTAL CLEAN-UP

- F.6.1 Unless disposition of environmental pollution is specifically a part of the Contract, or was caused by the Contractor (reference F.5 Environmental Contamination), Contractor shall immediately notify Owner of any hazardous substance(s) which Contractor discovers or encounters during performance of the Work required by the Contract. "Hazardous substance(s)" means any hazardous, toxic and radioactive materials and those substances defined as "hazardous substances," "hazardous materials," "hazardous wastes," "toxic substances," or other similar designations in any federal, state, or local law, regulation, or ordinance, including without limitation asbestos, polychlorinated biphenyl ("PCB"), or petroleum, and any substances, materials or wastes regulated by 40 CFR, Part 261 and defined as hazardous in 40 CFR S 261.3. In addition to notifying Owner of any hazardous substance(s) discovered or encountered, Contractor shall immediately cease working in any particular area of the Project where a hazardous substance(s) has been discovered or encountered if continued work in such area would present a risk or danger to the health or wellbeing of Contractor's or any Subcontractor's work force, property or the environment.
- F.6.2 Upon being notified by Contractor of the presence of hazardous substance(s) on the Project Site, not brought on to the Project Site by Contactor, Owner shall arrange for the proper disposition of such hazardous substance(s).

F.7 DEMOLITION

F.7.1 For demolition tasks, if any, the Contractor shall salvage or recycle construction and demolition debris, if feasible and cost-effective.

SECTION G INDEMNITY, BONDING, AND INSURANCE

G.1 RESPONSIBILITY FOR DAMAGES / INDEMNITY

- G.1.1 Contractor shall be responsible for all damage to property, injury to persons, and loss, expense, inconvenience, and delay that may be caused by, or result from, the carrying out of the Work to be done under the Contract, or from any act, omission or neglect of the Contractor, its Subcontractors, employees, guests, visitors, invitees and agents.
- G.1.2 To the fullest extent permitted by law, Contractor shall indemnify, defend (with counsel approved by Owner) and hold harmless the Owner and its elected officials, officers, directors, agents, and employees (collectively "Indemnitees") from and against all liabilities, damages, losses, claims, expenses, demands and actions of any nature whatsoever which arise out of, result from or are related to: (a) any damage, injury, loss, expense, inconvenience or delay described in this Section G.1; (b) any accident or occurrence which happens or is alleged to have happened in or about the Project Site or any place where the Work is being performed, or in the vicinity of either, at any time prior to the time the Work is fully completed in all respects; (c) any failure of the Contractor to

observe or perform any duty or obligation under the Contract Documents which is to be observed or performed by the Contractor, or any breach of any agreement, representation or warranty of the Contractor contained in the Contract Documents or in any subcontract; (d) the negligent acts or omissions of the Contractor, a Subcontractor or anyone directly or indirectly employed by them or any one of them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder (except to the extent otherwise void under ORS 30.140); and (e) any lien filed upon the Project or bond claim in connection with the Work. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section G.1.2.

G.1.3 In claims against any person or entity indemnified under Section G.1.2 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section G.1.2 shall not be limited on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

G.2 PERFORMANCE AND PAYMENT SECURITY; PUBLIC WORKS BOND

- G.2.1 When the Contract Price is \$50,000 or more, the Contractor shall furnish and maintain in effect at all times during the Contract Period a performance bond in a sum equal to the Contract Price and a separate payment bond also in a sum equal to the Contract Price. Contractor shall furnish such bonds even if the Contract Price is less than the above thresholds if otherwise required by the Contract Documents. If the Contract Price is increased, Contractor shall increase its payment and performance bonds to reflect the amended Contract Price.
- G.2.2 Bond forms furnished by the Owner and notarized by Contractor's surety company authorized to do business in Oregon are the only acceptable forms of performance and payment security, unless otherwise specified in the Contract Documents.
- G.2.3 Before execution of the Contract, the Contractor shall file with the Construction Contractors Board, and maintain in full force and effect, the separate public works bond required by Oregon Revised Statutes, Chapter 279C.830 and 279C.836, unless otherwise exempt under those provisions. The Contractor shall also include in every subcontract a provision requiring the Subcontractor to have a public works bond filed with the Construction Contractors Board before starting Work, unless otherwise exempt, and shall verify that the Subcontractor has filed a public works bond before permitting any Subcontractor to start Work.

G.3 INSURANCE

- G.3.1 Primary Coverage: Insurance carried by Contractor under the Contract shall be the primary coverage. The coverages indicated are minimums unless otherwise specified in the Contract Documents.
- G.3.2 Workers' Compensation: All employers, including Contractor, that employ subject workers who work under the Contract in the State of Oregon shall comply with ORS 656.017 and provide the required Workers' Compensation coverage, unless such employers are exempt under ORS 656.126. This shall include Employer's Liability Insurance with coverage limits of not less than the minimum amount required by statute for each accident. Contractors who perform the Work without the assistance or labor of any employee need not obtain such coverage if the Contractor certifies so in writing. Contractor shall ensure that each of its

Subcontractors complies with these requirements. The Contractor shall require proof of such Workers' Compensation coverage by receiving and keeping on file a certificate of insurance from each Subcontractor or anyone else directly employed by either the Contractor or its Subcontractors.

G.3.3 Builder's Risk Insurance:

- G.3.3.1 Builder's Risk: During the term of the Contract, for new construction the Contractor shall obtain and keep in effect Builder's Risk insurance on an all risk forms, including earthquake and flood, for an amount equal to the full amount of the Contract, plus any changes in values due to modifications, Change Orders and loss of materials added. Such Builder's Risk shall include, in addition to earthquake and flood, theft, vandalism, mischief, collapse, transit, debris removal, and architect's fees "soft costs" associated with delay of Project due to insured peril. Any deductible shall not exceed \$50,000 for each loss, except the earthquake and flood deductible which shall not exceed 2 percent of each loss or \$50,000, whichever is greater. The deductible shall be paid by Contractor. The policy will include as loss payees Owner, the Contractor and its Subcontractors as their interests may appear.
- G.3.3.2 Builder's Risk Installation Floater: For Work other than new construction, Contractor shall obtain and keep in effect during the term of the Contract, a Builder's Risk Installation Floater for coverage of the Contractor's labor, materials and equipment to be used for completion of the Work performed under the Contract. The minimum amount of coverage to be carried shall be equal to the full amount of the Contract. The policy will include as loss payees Owner, the Contractor and its Subcontractors as their interests may appear. Owner may waive this requirement at its sole and absolute discretion.
- G.3.3.3 Such insurance shall be maintained until Owner has occupied the facility.
- G.3.3.4 A loss insured under the Builder's Risk insurance shall be adjusted by the Owner and made payable to the Owner as loss payee. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner. The Owner shall have power to adjust and settle a loss with insurers.
- G.3.4 General Liability Insurance:
- G.3.4.1 Commercial General Liability: Upon execution of a Contract, Contractor shall obtain, and keep in effect at Contractor's expense for the term of the Contract, Commercial General Liability Insurance ("CGL") covering bodily injury and property damage in the amount of not less than \$1,000,000 per claim and \$2,000,000 per occurrence in a form satisfactory to Owner. This insurance shall include personal injury liability, products and completed operations, and contractual liability coverage for the indemnities provided under the Contract (to the extent contractual liability coverage for the indemnity is available in the marketplace), and shall be issued on an occurrence basis written on ISO Form GC 00 01 (12 04 or later) or an equivalent form approved in advance by Owner. The CGL shall provide separation of insured language. The policy or policies obtained by Contractor for purposes of fulfilling the requirements of this section shall be primary insurance with respect to the Owner. Any insurance or self-insurance maintained by the County shall be excess and shall not contribute to it.
- G.3.4.2 Automobile Liability: Contractor shall obtain, at Contractor's expense, and keep in effect during the term of the Contract, Automobile Liability Insurance covering owned, and/or hired

vehicles, as applicable. The coverage may be written in combination with the Commercial General Liability Insurance. Contractor shall provide proof of insurance of not less than \$1,000,000 per claim and \$2,000,000 per occurrence. Contractor and its Subcontractors shall be responsible for ensuring that all non-owned vehicles maintain adequate Automobile Liability insurance while on Project Site.

- G.3.4.3 Owner may adjust the insurance amounts required in Section G.3.4.1 and G.3.4.2 based upon institution specific risk assessments through the issuance of Supplemental General Conditions and a Contract.
- G.3.4.4 To the extent that the Contract Documents require the Contractor to provide professional design services, design-build, or certifications related to systems, materials, or equipment, the Contractor shall (1) purchase and maintain professional liability/errors-and-omissions insurance with limits of not less than \$1,000,000 for each claim and \$2,000,000 general annual aggregate and (2) cause those Subcontractors (of any tier) who are providing professional design services including any designbuild services to procure and maintain professional liability/errors-and-omissions insurance with limits of not less than \$1,000,000 for each claim and \$2,000,000 general annual aggregate. This policy shall be for the protection of the Owner, its elected officials, officers, agents and employees against liability for damages because of personal injury, bodily injury, death, or damage to property, including loss of use thereof, and damages because of negligent acts, errors and omissions in any way related to the Contract. The Owner, at its option, may require a complete copy of the above policy.
- G.3.4.5 "Tail" Coverage: If any of the required liability insurance is arranged on a "claims made" basis, "tail" coverage will be required at the completion of the Contract for a duration of 36 months or the maximum time period available in the marketplace if less than 36 months. Contractor shall furnish certification of "tail" coverage as described or continuous "claims made" liability coverage for 36 months following Final Completion. Continuous "claims made" coverage will be acceptable in lieu of "tail" coverage, provided its retroactive date is on or before the effective date of the Contract. Owner's receipt of the policy endorsement evidencing such coverage shall be a condition precedent to Owner's obligation to make final payment and to Owner's final acceptance of Work or services and related warranty (if any).
- G.3.4.6 Umbrella Liability (if required by Owner through issuance of Supplemental General Conditions): Contractor shall obtain, at Contractor's expense, and keep in effect during the term of the Contract, Umbrella liability Insurance over and above the general liability, automobile liability and workers' compensation coverage if required by Owner in specified limits at time of requirement.
- G.3.4.7 Pollution Liability may be required by Owner through issuance of Supplemental General Conditions.
- G.3.5 Additional Insured: The general liability insurance coverage, automobile liability, umbrella, and pollution liability if required, shall include the Owner as additional insureds but only with respect to the Contractor's activities to be performed under the Contract. The additional-insured endorsement for CGL insurance must be written on ISO Form CG 20 10 (10 01) and CG 20 37 (10 01), or their equivalent, but shall not use either of the following forms: CG 20 10 (10 93) or CG 20 10 (03 94). Proof of insurance must include a copy of the endorsement showing "Clackamas County, its elected officials, agents, officers, and employees" as scheduled insureds.

If Contractor cannot obtain an insurer to name the Owner as additional insureds, Contractor shall obtain at Contractor's

expense, and keep in effect during the term of the Contract, Owners and Contractors Protective Liability Insurance, naming the Owner as additional insureds with not less than a \$2,000,000 limit per occurrence. This policy must be kept in effect for 36 months following Final Completion. As evidence of coverage, Contractor shall furnish the actual policy to Owner prior to execution of the Contract.

G.3.6 Notice of Cancellation or Change: If the Contractor receives a non-renewal or cancellation notice from an insurance carrier affording coverage required herein, or receives notice that coverage no longer complies with the insurance requirements herein, Contractor agrees to notify Owner by fax within five (5) business days with a copy of the non-renewal or cancellation notice, or written specifics as to which coverage is no longer in compliance. When notified by Owner, the Contractor agrees to stop Work pursuant to the Contract at Contractor's expense, unless all required insurance remain in effect. Any failure to comply with the reporting provisions of this insurance, except for the potential exhaustion of aggregate limits, shall not affect the coverages provided to the Owner and its institutions, divisions, officers, and employees.

Owner shall have the right, but not the obligation, of prohibiting Contractor from entering the Project Site until a new certificate(s) of insurance is provided to Owner evidencing the replacement coverage. The Contractor agrees that Owner reserves the right to withhold payment to Contractor until evidence of reinstated or replacement coverage is provided to Owner.

G.3.7 Certificate(s) of Insurance/Insurance Carrier Qualification: As evidence of the insurance coverage required by the Contract, the Contractor shall furnish certificate(s) of insurance to the Owner prior to execution of the Contract. The certificate(s) will specify all of the parties who are additional insureds or loss payees for the Contract. A renewal certificate shall be sent to Owner at least 10 days prior to coverage expiration. Insurance coverage required under the Contract shall be obtained from insurance companies or entities acceptable to the Owner and that are eligible to provide such insurance under Oregon law. Eligible insurers include admitted insurers that have been issued a certificate of authority from the Oregon Department of Consumer and Business Services authorizing them to conduct an insurance business and issue policies of insurance in the state of Oregon, and certain non-admitted surplus lines insurers that satisfy the requirements of applicable Oregon law and which are subject to approval by the Owner. The Contractor shall be financially responsible for all deductibles, self-insured retentions and/or selfinsurance included hereunder. Any deductible, self-insured retention and/or self-insurance in excess of \$50,000 shall be subject to approval by the Owner in writing and shall be a condition precedent to the effectiveness of any Contract.

SECTION H SCHEDULE OF WORK

H.1 CONTRACT PERIOD

- H.1.1 Time is of the essence. The Contractor shall at all times carry on the Work diligently, without delay and punctually fulfill all requirements herein.
- H.1.2 Notice to Proceed. Unless otherwise directed in the Contract Documents, Contractor shall commence Work on the Project Site within fifteen (15) Days of the Notice to Proceed. Notwithstanding the Notice to Proceed, Contractor shall not be authorized to proceed with the Work until all initial Contract requirements, including the Contract, performance bond and payment bond, and certificates of insurance, have been fully executed and submitted in a form acceptable to Owner.

- H.1.3 Unless otherwise not required in the Construction Documents, Contractor shall participate in a pre-construction conference with the Owner's representative and designated design team. The purpose of this pre-construction conference is to review the Contractor's proposed Schedule of Values and to review any other Project logistics to be coordinated between the parties.
- H.1.4 Unless specifically extended by a Change Order, all Work shall be complete by the date contained in the Contract Documents. The Owner shall have the right to accelerate the completion date of the Work, which may require the use of overtime. Such accelerated Work schedule shall be an acceleration in performance of Work under Section D.1.2(f) and shall be subject to the provisions of Section D.1.
- H.1.5 The Owner shall not waive any rights under the Contract by permitting the Contractor to continue or complete in whole or in part the Work after the date described in Section H.1.2 above.

H.2 SCHEDULE

- H.2.1 Contractor shall provide, by or before the pre-construction conference, the initial as-planned schedule for review and acceptance by the Owner. The submitted schedule must illustrate Work by Project components, labor trades, and long lead items broken down by building and/or floor where applicable. If Owner shall so elect, Contractor shall provide the schedule in CPM format showing the graphical network of planned activities, including i) a reasonably detailed list of all activities required to complete the Work; ii) the time and duration that each activity will take to completion; and iii) the dependencies between the activities. Schedules lacking adequate detail, or unreasonably detailed, will be rejected. The schedule shall include the following: Notice to Proceed or the date the Work commences, if no Notice to Proceed is issued by Owner, Substantial Completion, and Final Completion. Schedules shall be updated monthly, unless otherwise required by the Contract Documents, and submitted with the monthly application for payment. Acceptance of the Schedule by the Owner does not constitute agreement by the Owner as to the Contractor's sequencing, means, methods, or durations. Any positive difference between the Contractor's scheduled completion and the Contract completion date is float owned by the Owner. Owner reserves the right to negotiate the float if it is deemed to be in Owner's best interest to do so. In no case shall the Contractor make a claim for delays if the Work is completed within the Contract Time but after Contractor's scheduled completion.
- H.2.2 All Work shall be completed during normal weekdays (Monday through Friday) between the hours of 7:00 a.m. and 5:00 p.m. unless otherwise specified in the Contract Documents. Unless otherwise specified in the Contract Documents, no Work shall be performed during the following holidays:
 - New Year's Day
 - Martin Luther King Day
 - Memorial Day
 - Independence Day
 - Labor Day
 - Veterans Day
 - Thanksgiving Day
 - Christmas Day
 - President's Day

When a holiday falls on a Sunday, the following Monday shall be recognized as a legal holiday. When a holiday falls on Saturday, the preceding Friday shall be recognized as a legal holiday.

H.3 PARTIAL OCCUPANCY OR USE

The Owner may occupy or use any completed or partially completed portion of the Work at any stage, provided such occupancy or use is consented to by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have reasonably accepted in writing the responsibilities assigned to each of them. Approval by the Contractor to partial occupancy or use shall not be unreasonably withheld. Immediately prior to such partial occupancy or use, the Owner and Contractor shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work. Partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

SECTION I CORRECTION OF WORK

I.1 CORRECTION OF WORK BEFORE FINAL PAYMENT

The Contractor warrants to the Owner that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects, and that the Work will conform to the requirements of the Contract Documents. Work failing to conform to these requirements shall be deemed defective. Contractor shall promptly remove from the premises and replace all defective materials and equipment as determined by the Owner, whether incorporated in the Work or not. Removal and replacement shall be without loss or expense to the Owner, and Contractor shall bear the cost of repairing all Work destroyed or damaged by such removal or replacement. Contractor shall be allowed a period of no longer than thirty (30) Days after Substantial Completion for completion of defective (Punch List) work. At the end of the thirty-day period, or earlier if requested by the Contractor, Owner shall arrange for inspection of the Work by the Architect/Engineer. Should the work not be complete, and all corrections made, the costs for all subsequent reinspections shall be borne by the Contractor. If Contractor fails to complete the Punch List work within the thirty (30) Day period, Owner may perform such work and Contractor shall reimburse Owner all costs of the same within ten (10) Days after demand without affecting Contractor's obligations.

I.2 WARRANTY WORK

I.2.1 Neither the final certificate of payment nor any provision of the Contract Documents shall relieve the Contractor from responsibility for Defective Work and, unless a longer period is specified, Contractor shall correct all defects that appear in the Work within a period of one year from the date of issuance of the written notice of Substantial Completion by the Owner except for latent defects which will be remedied by the Contractor at any time they become apparent. The Owner shall give Contractor notice of defects with reasonable promptness. Contractor shall perform such warranty work within a reasonable time after Owner's demand and at Contractors sole expense. If Contractor fails to complete the warranty work within such period as Owner determines reasonable, or at any time in the event of warranty work consisting of emergency repairs, Owner may perform such work and Contractor shall reimburse Owner all costs of the same within ten (10) Days after demand, without affecting Contractor's obligations. The Contractor shall perform the warranty Work by correcting defects within twenty-four (24) hours of notification by Owner, unless otherwise specified in the Contract Documents. Should the Contractor fail to respond within the specified response time, the Owner may, at its option, complete the necessary repairs using another contractor or its agents. If Owner completes the repairs using Owner's agent, Contractor shall pay Owner at the rate of one and one-half (11/2) times the standard hourly rate of Owner's agent, plus related overhead and any direct non-salary costs. If Owner completes the repairs using another contractor, Contractor shall pay Owner the amount of Owner's direct costs billed by the other contractor for the work, plus the direct salary costs and related overhead and direct non-salary expenses of Owner's agents who are required to monitor that contractor's work. Work performed by Owner using Owner's own agents or those of another contractor shall not affect the Contractor's contractual duties under these provisions, including warranty provisions.

- I.2.2 Nothing in this Section I.2 provision shall negate guarantees or warranties for periods longer than one year including without limitation, such guarantees or warranties required by other sections of the Contract Documents for specific installations, materials, processes, equipment or fixtures.
- I.2.3 In addition to Contractor's warranty, manufacturer's warranties shall pass to the Owner and shall not take effect until such portion of the Work covered by the applicable warranty has been accepted in writing by the Owner.
- I.2.4 The one-year period for correction of Work shall be extended with respect to portions of Work performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work, and shall be extended by corrective Work performed by the Contractor pursuant to this Section, as to the Work corrected. The Contractor shall remove from the Project Site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.
- I.2.5 Nothing contained in this Section I.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the period for correction of Work as described in this Section I.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.
- I.2.6 If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Price will be reduced as appropriate and equitable as determined by Owner. Such adjustment shall be effected whether or not final payment has been made.

SECTION J

SUSPENSION AND/OR TERMINATION OF THE WORK

J.1 OWNER'S RIGHT TO SUSPEND THE WORK

- J.1.1 The Owner has the authority to suspend portions or all of the Work due to the following causes:
 - (a) Failure of the Contractor to correct unsafe conditions;
 - (b) Failure of the Contractor to carry out any provision of the Contract;
 - (c) Failure of the Contractor to carry out orders;
 - (d) Conditions, in the opinion of the Owner, which are unsuitable for performing the Work;
 - (e) Time required to investigate differing Project Site conditions; or
 - (f) Any reason considered to be in the public interest.

J.1.2 The Owner shall notify Contractor and the Contractor's Surety in writing of the effective date and time of the suspension, and Owner shall notify Contractor and Contractor's surety in writing to resume Work.

J.2 CONTRACTOR'S RESPONSIBILITIES

- J.2.1 During the period of the suspension, Contractor is responsible to continue maintenance at the Project just as if the Work were in progress. This includes, but is not limited to, protection of completed Work, maintenance of access, protection of stored materials, temporary facilities, and clean-up.
- J.2.2 When the Work is recommenced after the suspension, the Contractor shall replace or renew any Work damaged during the suspension, remove any materials or facilities used as part of temporary maintenance, and complete the Work in every respect as though its prosecution had been continuous and without suspension.

J.3 COMPENSATION FOR SUSPENSION

Depending on the reason for suspension of the Work, the Contractor or the Owner may be due compensation by the other party. If the suspension was required due to acts or omissions of Contractor, the Owner may assess the Contractor actual costs of the suspension in terms of administration, remedial work by the Owner's agents or another contractor to correct the problem associated with the suspension, rent of temporary facilities, and other actual costs related to the suspension, and any liquidated damages arising from the delay. If the suspension was caused by acts or omissions of the Owner, the Contractor may be due compensation which shall be defined using Section D, Changes in Work. If the suspension was required through no fault of the Contractor or the Owner, neither party shall owe the other for the impact.

J.4 OWNER'S RIGHT TO TERMINATE CONTRACT

- J.4.1 The Owner may, without prejudice to any other right or remedy, and after giving Contractor seven (7) Days' written notice and an opportunity to cure, terminate the Contract in whole or in part under the following conditions:
 - (a) If Contractor should, voluntarily or involuntarily, seek protection under the United States Bankruptcy Code and Contractor as debtor-in-possession or the Trustee for the estate fails to assume the Contract within a reasonable time;
 - (b) If Contractor should make a general assignment for the benefit of Contractor's creditors;
 - (c) If a receiver should be appointed on account of Contractor's insolvency;
 - (d) If Contractor should repeatedly refuse or fail to supply an adequate number of skilled workers or proper materials to carry on the Work as required by the Contract Documents, or otherwise fail to perform the Work in a timely manner;
 - (e) If Contractor should repeatedly fail to make prompt payment to Subcontractors or for material or labor, or should disregard laws, ordinances or the instructions of the Owner;
 - (f) If Contractor is otherwise in breach of any part of the Contract; or
 - (g) If Contractor is in violation of Applicable Laws, either in the conduct of its business or in its performance of the Work.
- J.4.2 At any time that any of the above occurs, Owner may exercise all rights and remedies available to Owner at law or in equity, and, in

addition, Owner may take possession of the premises and of all materials and appliances and finish the Work by whatever method it may deem expedient. In such case, the Contractor shall not be entitled to receive further payment until the Work is completed. If the Owner's cost of finishing the Work exceeds the unpaid balance of the Contract Price, Contractor shall pay the difference to the Owner.

J.5 <u>TERMINATION FOR CONVENIENCE, NON-</u> <u>APPROPRIATION OF FUNDS</u>, OR FORCE MAJEURE

- J.5.1 Owner may terminate the Contract in whole or in part whenever Owner determines: (a) that termination of the Contract is in the best interest of Owner or the public; (b) that the Owner failed to receive funding, appropriations, allocations or other expenditure authority as contemplated by Owner's budget and Owner determines, in its sole determination, and its assessment and ranking of the policy objectives explicit or implicit in Owner's budget, Owner may determine it is necessary to and may terminate the Contract.; or (c) in the event of Force Majeure.
- J.5.2 The Owner shall provide the Contractor with seven (7) Days prior written notice of a termination for Owner's or for public convenience. After such notice, the Contractor shall provide the Owner with immediate and peaceful possession of the premises and materials located on and off the premises for which the Contractor received progress payment under Section E. Compensation for Work terminated by the Owner under this provision will be according to Section E. In no circumstance shall Contractor be entitled to lost profits for Work not performed due to termination. If the Contract is terminated for public convenience, neither the Contractor not its Surety shall be relieved of liability for damages or losses suffered by the Owner as a result of defective, unacceptable or unauthorized Work completed or performed.

J.6 ACTION UPON TERMINATION

- J.6.1 Upon receiving a notice of termination, and except as directed otherwise by the Owner, Contractor shall immediately cease placing further subcontracts or orders for materials, services, or facilities. In addition, Contractor shall terminate all subcontracts or orders to the extent they relate to the Work terminated and, with the prior written approval of the Owner, settle all outstanding liabilities and termination settlement proposals arising from the termination of subcontracts and orders.
- J.6.2 As directed by the Owner, Contractor shall, upon termination, transfer title and deliver to the Owner all Record Documents, information, and other property that, if the Contract had been completed, would have been required to be furnished to the Owner.
- J.6.3 Upon Owner's notice of termination pursuant to either Section J.4 or J.5, if Owner shall so elect, Contractor shall assign to the Owner such subcontracts and orders as Owner shall specify. In the event Owner elects to take assignment of any such subcontract or order, Contractor shall take such action and shall execute such documents as Owner shall reasonably require for the effectiveness of such assignment and Contractor shall ensure that no contractual arrangement between it and its subcontractors or suppliers of any tier or sub-tier shall prevent such assignment.

SECTION K CONTRACT CLOSE OUT

K.1 <u>RECORD DOCUMENTS</u>

As a condition of final payment (refer also to section E.6), Contractor shall comply with the following: Contractor shall provide Record Documents for the entire Project to Owner. Record Documents shall depict the Project as constructed and shall reflect each and every change, modification, and deletion made during the construction. Record

Documents are part of the Work and shall be provided prior to the Owner's issuance of final payment. Record Documents include all modifications to the Contract Documents unless otherwise directed.

K.2 OPERATION AND MAINTENANCE MANUALS

As part of the Work, Contractor shall submit two completed operation and maintenance manuals ("O & M Manuals") for review by the Owner prior to submission of any pay request for more than 75% of the Work. Owner's receipt of the O & M Manuals shall be a condition precedent to any payment thereafter due. The O & M Manuals shall contain a complete set of all submittals, all product data as required by the specifications, training information, telephone list and contact information for all consultants, manufacturers, installer and suppliers, manufacturer's printed data, record and shop drawings, schematic diagrams of systems, appropriate equipment indices, warranties and bonds. The Owner shall review and return one O & M Manual for any modifications or adjustments required. Prior to submission of its final pay request, Contractor shall deliver two (2) complete and approved sets of O & M Manuals in paper form and one (1) complete and approved set in electronic form to the Owner and Owner's receipt of the O & M Manuals shall be a condition precedent to Owner's obligation to make final payment.

K.3 COMPLETION NOTICES

- K.3.1 Contractor shall provide Owner written notice of both Substantial and Final Completion. The certificate of Substantial Completion shall state the date of Substantial Completion, the responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and the time within which the Contractor shall finish all items on the Punch List accompanying the Certificate. Both completion notices must be signed and notarized by the Contractor and signed by the Architect/Engineer (if applicable) and Owner to be valid. The Owner shall provide the final signature on the notices. The notices shall take effect on the date they are signed by the Owner.
- K.3.2 Substantial Completion of a facility with operating systems (e.g., mechanical, electrical, HVAC) shall be that degree of completion that has provided a minimum of thirty (30) continuous Days of successful, trouble-free operation, which period shall begin after all performance and acceptance testing has been successfully demonstrated to the Owner. All equipment contained in the Work, plus all other components necessary to enable the Owner to operate the facility in the manner that was intended, shall be complete on the Substantial Completion date. The Contractor may request that a Punch List be prepared by the Owner with submission of the request for the Substantial Completion notice.

K.4 TRAINING

As part of the Work, and prior to submission of the final application for payment, the Contractor shall schedule with the Owner training sessions for all equipment and systems as required by the Contract Documents. Contractor shall schedule training sessions at least two weeks in advance of the date of training to allow Owner to provide its personnel with adequate notice. If assignments arise because of termination under Section J.4, then such assignments shall not relieve Contractor of liability hereunder. The O & M Manual shall be used as a basis for training. In addition to any off-Project Site training required by the Contract Documents, training shall include a formal session conducted at the Project Site after the equipment and/or system is completely installed and operational in its normal operating environment.

K.5 EXTRA MATERIALS

As part of the Work, Contractor shall provide spare parts, extra maintenance materials, and other materials or products in the quantities specified in the Contract Documents prior to final payment. Delivery point for extra materials shall be designated by the Owner.

K.6 ENVIRONMENTAL CLEAN-UP

As part of the Final Completion notice, or as a separate written notice submitted with or before the notice of Final Completion, the Contractor shall notify the Owner that all environmental and pollution clean-up, remediation and closure have been completed in accordance with all Applicable Laws and pursuant to the authority of all agencies having jurisdiction, and Contractor shall provide Owner with any and all documentation related to the same, including but not limited to directives, orders, letters, certificates and permits related to or arising from such environmental pollution. The notice shall reaffirm the indemnification given under Section F.5.1 above. Contractor's completion of its obligations under this Section K.6 and Owner's receipt of documents evidencing such completion shall be a condition precedent to Owner's obligation to make final payment.

K.7 CERTIFICATE OF OCCUPANCY

Owner's receipt of an unconditioned certificate of occupancy from the appropriate state and/or local building officials shall be a condition precedent to Owner's obligation to make final payment, except to the extent failure to obtain an unconditional certificate of occupancy is due to the fault or neglect of Owner.

K.8 OTHER CONTRACTOR RESPONSIBILITIES

The Contractor shall be responsible for returning to the Owner all property of Owner issued to Contractor during construction such as keys, security passes, Project Site admittance badges, and all other pertinent items. Upon notice from Owner, Contractor shall be responsible for notifying the appropriate utility companies to transfer utility charges from the Contractor to the Owner. The utility transfer date shall not be before Substantial Completion and may not be until Final Completion, if the Owner does not take beneficial use of the facility and the Contractor's agents continue with the Work.

The Owner's property is drug free and weapons free areas and the use of tobacco products is only allowed in designated areas. Contractor shall be required to ensure that its employees, Subcontractors and agents shall comply with these requirements.

SECTION L GENERAL PROVISIONS

L.1 NO THIRD PARTY BENEFICIARIES

Owner and Contractor are the only parties to the Contract and are the only parties entitled to enforce its terms. Nothing in the Contract gives, is intended to give, or shall be construed to give or provide any benefit or right, whether directly, indirectly, or otherwise, to third persons unless such third persons are individually identified by name herein and expressly described as intended beneficiaries of the terms of the Contract.

L.2 SEVERABILITY

If any provision of the Contract is declared by a court to be unenforceable, illegal, or in conflict with any law, the validity of the remaining terms and provisions shall not be affected and the rights and obligations of the parties shall be construed and enforced as if the Contract did not contain the particular provision held to be invalid.

L.3 ACCESS TO RECORDS

L.3.1 Contractor shall keep, at all times on the Project Site, one record copy of the complete Contract Documents, including the Plans, Specifications, addenda, and Change Orders (if any) in good order and marked currently to record field changes and selections made during construction, and one record copy of Shop Drawings, Product Data, Samples and similar submittals, and shall at all times give the Owner access thereto. L.3.2 Contractor shall retain and the Owner and its duly authorized representatives shall have access, for a period not less than ten (10) years, to all Record Documents, financial and accounting records, and other books, documents, papers and records of Contractor which are pertinent to the Contract, including records pertaining to Overhead and indirect costs, for the purpose of making audit, examination, excerpts and transcripts. If for any reason, any part of the Work or the Contract shall be subject to litigation, Contractor shall retain all such records until all litigation is resolved and Contractor shall continue to provide Owner and/or its agents with full access to such records until such time as all litigation is complete and all periods for appeal have expired and full and final satisfaction of any judgment, order or decree is recorded and Owner receives a record copy of documentation from Contractor.

L.4 WAIVER

Failure of the Owner to enforce any provision of the Contract shall not constitute a waiver or relinquishment by the Owner of the right to such performance in the future nor of the right to enforce any other provision of the Contract.

L.5 SUCCESSORS IN INTEREST

The provisions of the Contract shall be binding upon and shall accrue to the benefit of the parties to the Contract and their respective permitted successors and assigns.

L.6 GOVERNING LAW

The Contract shall be governed by and construed in accordance with the laws of the State of Oregon without giving effect to the conflict of law provisions thereof.

L.7 APPLICABLE LAW

Contractor hereto agrees to comply in all ways with applicable local, state and federal ordinances, statutes, laws and regulations.

L.8 NON-EXCLUSIVE RIGHTS AND REMEDIES

Except as otherwise expressly provided herein, the rights and remedies expressly afforded under the provisions of the Contract shall not be deemed exclusive, and shall be in addition to and cumulative with any and all rights and remedies otherwise available at law or in equity. The exercise by either Party of any one or more of such remedies shall not preclude the exercise by it, at the same or different times, of any other remedies for the same default or breach, or for any other default or breach, by the other Party.

L.9 INTERPRETATION

The titles of the sections of the Contract are inserted for convenience of reference only and shall be disregarded in construing or interpreting any of its provisions.

L.10 DEBT LIMITATION

The Contract is expressly subject to the debt limitation of Oregon counties set forth in Article XI, Section 10, of the Oregon Constitution, and is contingent upon funds being appropriated therefore. Any provisions herein which would conflict with law are deemed inoperative to that extent.

L.11 LITIGATION

Any Claim between Owner and Contractor that arises from or relates to the Contract and that is not resolved through the Claims Review Process in Section D.3 shall be brought and conducted solely and exclusively within the Circuit Court of Clackamas County for the State of Oregon; provided, however, if a Claim must be brought in a federal forum, then it shall be brought and conducted solely and exclusively within the United States District Court for the District of Oregon. In no event shall this section be construed as a waiver by the County of any form of defense or immunity, whether sovereign immunity, governmental immunity, immunity based on the Eleventh Amendment to the Constitution of the United States or otherwise, from any claim or from the jurisdiction of any court. CONTRACTOR, BY EXECUTION OF THE CONTRACT, HEREBY CONSENTS TO THE IN PERSONAM JURISDICTION OF THE COURTS REFERENCED IN THIS SECTION.

L.12 SURVIVAL

All warranty, indemnification, and record retention provisions of the Contract, and all of Contractor's other obligations under the Contract that are not fully performed by the time of Final Completion or termination, and all other rights and obligations which by their context are intended to survive, shall survive Final Completion or any termination of the Contract.

L.13 ACCESS TO RECORDS

- L.13.1. Contractor shall keep, at all times on the Work site, one record copy of the complete Contract Documents, including the Plans, Specifications, Construction Change Directives and addenda, in good order and marked currently to record field changes and selections made during construction, and one copy of Shop Drawings, Project Data, Samples and similar submittals, and shall at all times give the Owner access thereto.
- L.13.2 Contractor shall retain and the Owner and its duly authorized representatives shall have access, for a period not less than ten (10) years, to all Record Documents, financial and accounting records, and other books, documents, papers and records of Contractor which are pertinent to the Contract, including records pertaining to Overhead and indirect costs, for the purpose of making audit, examination, excerpts and transcripts. If for any reason, any part of the Work or this Contract shall be subject to litigation, Contractor shall retain all such records until all litigation is resolved and Contractor shall continue to provide Owner and/or its agents with full access to such records until such time as all litigation is recorded and Owner receives a record copy of documentation from Contractor.

L.14 WAIVER

Failure of the Owner to enforce any provision of this Contract shall not constitute a waiver or relinquishment by the Owner of the right to such performance in the future nor of the right to enforce any other provision of this Contract.

L. 15 NO ATTORNEY FEES.

In the event any arbitration, action or proceeding, including any bankruptcy proceeding, is instituted to enforce any term of this Contract, each party shall be responsible for its own attorneys' fees and expenses.



WATER ENVIRONMENT SERVICES PUBLIC IMPROVEMENT CONTRACT

PERFORMANCE BOND

Bond No.: YCN7472126

Solicitation: #2025-05

* If using multiple sureties

Project Name: Chemical Improvement Project at Hoodland Water Resources Recovery Facility

Old Republic Surety Company (Surety #1) (Surety #2)*

\$190,558.00 Bond Amount No. 1: Bond Amount No. 2:* S \$ 190,558.00 Total Penal Sum of Bond:

as Principal, and the above identified We, JQ Construction Incorporated Surety(ies), authorized to transact surety business in Oregon, as Surety, hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns firmly by these presents to pay unto Water Environment Services ("District"), the sum of (Total Penal Sum of Bond) (Provided, that we the Sureties bind ourselves in such \$ 190,558.00 sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety); and

WHEREAS, the Principal has entered into a contract with the District, along with the plans, specifications, terms and conditions of which are contained in the above-referenced Project Contract Documents; and

WHEREAS, the terms and conditions of the contract, together with applicable plans, standard specifications, special provisions, schedule of performance, and schedule of contract prices, are made a part of this Performance Bond by reference, whether or not attached to the contract (all hereafter called "Contract"); and

WHEREAS, the Principal has agreed to perform the Contract in accordance with the terms, conditions, requirements, plans and specifications, and all authorized modifications of the Contract which increase the amount of the work, the amount of the Contract, or constitute an authorized extension of the time for performance, notice of any such modifications hereby being waived by the Surety:

NOW, THEREFORE, THE CONDITION OF THIS BOND IS SUCH that if the Principal herein shall faithfully and truly observe and comply with the terms, conditions and provisions of the Contract, in all respects, and shall well and truly and fully do and perform all matters and things undertaken by Contractor to be performed under the Contract, upon the terms set forth therein, and within the time prescribed therein, or as extended as provided in the Contract, with or without notice to the Sureties, and shall defend, indemnify, and save harmless the District and Clackamas County and their elected officials, officers, employees and agents, against any direct or indirect damages or claim of every kind and description that shall be suffered or claimed to be suffered in connection with or arising out of the performance of the Contract by the Principal or its subcontractors, and shall in all respects perform said contract according to law, then this obligation is to be void; otherwise, it shall remain in full force and effect for so long as any term of the Contract remains in effect.

Nonpayment of the bond premium will not invalidate this bond nor shall the District, be obligated for the payment of any premiums.

Clackamas County Contract Form B-9 (6/2019)

the Principal by the laws of this State, then this obligation shall be void; otherwise, it shall remain in full force and effect for so long as any term of the Contract remains in effect.

Nonpayment of the bond premium will not invalidate this bond nor shall the District be obligated for the payment of any premiums.

This bond is given and received under authority of Oregon Revised Statutes Chapter 279C and the Clackamas County Local Contractor Review Board Rules, the provisions of which hereby are incorporated into this bond and made a part hereof.

IN WITNESS WHEREOF, WE HAVE CAUSED THIS INSTRUMENT TO BE EXECUTED AND SEALED BY OUR DULY AUTHORIZED LEGAL REPRESENTATIVES:

Dated this 7th day of April , 2025.

PRINCIPAL: JO	Q Construction Incorporated
Bv:	-Re
President	Signature
-) 10010100	Official Capacity
Attest:	Corporation Secretary

SURETY: Old Republic Surety Company [Add signatures for each if using multiple bonds]

BY ATTORNEY-IN-FACT: [Power-of-Attorney must accompany each bond]

Nathan N. Hurst

Name Signature

8705 SW Nimbus Street, Suite 100 Address

Beaverton	Oregon	97008
City	State	Zip

(503) 639-4220 (503) 639-4449 Phone Fax

Clackamas County Contract Form B-10 (6/2019)



WATER ENVIRONMENT SERVICES PUBLIC IMPROVEMENT CONTRACT

PAYMENT BOND

Bond No.: YCN7472126 Solicitation: #2025-05

Project Name: Chemical Improvement Project at Hoodland Water Resources Recovery Facility

Old Republic Surety Company (Surety #1)	Bond Amount No. 1:	\$ 190,558.00
(Surety #2)*	Bond Amount No. 2:*	\$
* If using multiple sureties	Total Penal Sum of Bond:	\$ 190,558.00

We, JQ Construction Incorporated ... as Principal, and the above identified Surety(ies), authorized to transact surety business in Oregon, as Surety, hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns firmly by these presents to pay unto Water Environment Services ("District"), the sum of (Total Penal Sum of Bond) One Hundred Ninety Thousand Five Hundred Fifty-Eight Dollars and Zero Cents (Provided, that we the Sureties bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety); and

WHEREAS, the Principal has entered into a contract with the District, along with the plans, specifications, terms and conditions of which are contained in above-referenced Project Contract Documents; and

WHEREAS, the terms and conditions of the contract, together with applicable plans, standard specifications, special provisions, schedule of performance, and schedule of contract prices, are made a part of this Payment Bond by reference, whether or not attached to the contract (all hereafter called "Contract"); and

WHEREAS, the Principal has agreed to perform the Contract in accordance with the terms, conditions, requirements, plans and specifications, and schedule of contract prices which are set forth in the Contract and any attachments, and all authorized modifications of the Contract which increase the amount of the work, or the cost of the Contract, or constitute authorized extensions of time for performance of the Contract, notice of any such modifications hereby being waived by the Surety:

NOW, THEREFORE, THE CONDITION OF THIS BOND IS SUCH that if the Principal shall faithfully and truly observe and comply with the terms, conditions and provisions of the Contract, in all respects, and shall well and truly and fully do and perform all matters and things by it undertaken to be performed under said Contract and any duly authorized modifications that are made, upon the terms set forth therein, and within the time prescribed therein, or as extended therein as provided in the Contract, with or without notice to the Sureties, and shall defend, indemnify, and save harmless the District and Clackamas County and their elected officials, officers, employees and agents, against any claim for direct or indirect damages of every kind and description that shall be suffered or claimed to be suffered in connection with or arising out of the performance of the Contract by the Contractor or its subcontractors, and shall promptly pay all persons supplying labor, materials or both to the Principal or its subcontractors in connection with the performance of the Contract; and shall promptly pay all contributions due the State Industrial Accident Fund and the State Unemployment Compensation Fund from the Principal or its subcontractors pursuant to ORS 316.167, and shall permit no lien nor claim to be filed or prosecuted against the District on account of any labor or materials furnished; and shall do all things required of

Clackamas County Contract Form B-10 (6/2019)

This bond is given and received under authority of Oregon Revised Statutes Chapter 279C and the Clackamas County Local Contractor Review Board Rules, the provisions of which hereby are incorporated into this bond and made a part hereof.

IN WITNESS WHEREOF, WE HAVE CAUSED THIS INSTRUMENT TO BE EXECUTED AND SEALED BY OUR DULY AUTHORIZED LEGAL REPRESENTATIVES.

Dated this 7th day of April , 2025.

PRINCIPAL:	JQ Construction Incorporated
Ву:	()
Presiden	Signature
1	Official Capacity
Attest:	
	Corporation Secretary

SURETY: Old Republic Surety Company [Add signatures for each if using multiple bonds]

BY ATTORNEY-IN-FACT: [Power-of-Attorney must accompany each bond]

Nathan N. Hurst Name cth Signature 8705 SW Nimbus Street, Suite 100 Address 97008 Beaverton Oregon Zip State City (503) 639-4449 (503) 639-4220 Fax Phone

Clackamas County Contract Form B-9 (6/2019)



POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That OLD REPUBLIC SURETY COMPANY, a Wisconsin stock insurance corporation, does make, constitute and appoint:

Rick Zarosinsk, Nathan N. Hurst, Adam Nicholas Sinclair, Joseph P. Riter, Guadalupe Martinez-Luna of Beaverton, OR

its true and lawful Attorney(s)-in-Fact, with full power and authority for and on behalf of the company as surety, to execute and deliver and affix the seal of the company thereto (if a seal is required), bonds, undertakings, recognizances or other written obligations in the nature thereof, (other than bail bonds, bank depository bonds, mortgage deficiency bonds, mortgage guaranty bonds, guarantees of installment paper and note guaranty bonds, self-insurance workers compensation bonds guaranteeing payment of benefits, or black lung bonds), as follows:

ALL WRITTEN INSTRUMENTS

and to bind OLD REPUBLIC SURETY COMPANY thereby, and all of the acts of said Attorneys-in-Fact, pursuant to these presents, are ratified and confirmed. This appointment is made under and by authority of the board of directors at a special meeting held on February 18, 1982.

This Power of Attorney is signed and sealed by facsimile under and by the authority of the following resolutions adopted by the board of directors of the OLD REPUBLIC SURETY COMPANY on February 18,1982.

RESOLVED that, the president, any vice-president or assistant vice president, in conjunction with the secretary or any assistant secretary, may appoint attorneys-in-fact or agents with authority as defined or limited in the instrument evidencing the appointment in each case, for and on behalf of the company to execute and deliver and affix the seal of the company to bonds, undertakings, recognizances, and suretyship obligations of all kinds; and said officers may remove any such attorney-in-fact or agent and revoke any Power of Attorney previously granted to such person.

RESOLVED FURTHER, that any bond, undertaking, recognizance, or suretyship obligation shall be valid and binding upon the Company

- when signed by the president, any vice president or assistant vice president, and attested and sealed (if a seal be required) by any secretary or assistant secretary; or
- (ii) when signed by the president, any vice president or assistant vice president, secretary or assistant secretary, and countersigned and sealed (if a seal be required) by a duly authorized attorney-in-fact or agent; or
- (iii) when duly executed and sealed (if a seal be required) by one or more attorneys-in-fact or agents pursuant to and within the limits of the authority evidenced by the Power of Attorney issued by the company to such person or persons.

RESOLVED FURTHER that the signature of any authorized officer and the seal of the company may be affixed by facsimile to any Power of Attorney or certification thereof authorizing the execution and delivery of any bond, undertaking, recognizance, or other suretyship obligations of the company; and such signature and seal when so used shall have the same force and effect as though manually affixed.

IN WITNESS WHEREOF, OLD REPUBLIC SURETY COMPANY has caused these presents to be signed by its proper officer, and its corporate seal to be affixed this ______29th _____day of ______August _____2024 ___.



OLD REPUBLIC SURETY COMPANY

President

STATE OF WISCONSIN, COUNTY OF WAUKESHA - SS

_ day of

August

29th On this _

2024 , personally came before me,

Alan Pavlic

and Karen J Haffner , to me known to be the individuals and officers of the OLD REPUBLIC SURETY COMPANY who executed the above instrument, and they each acknowledged the execution of the same, and being by me duly sworn, did severally depose and say: that they are the said officers of the corporation aforesaid, and that the seal affixed to the above instrument is the seal of the corporation, and that said corporate seal and their signatures as such officers were duly affixed and subscribed to the said instrument by the authority of the board of directors of said corporation.



My Commission Expires: <u>September 28, 2026</u> (Expiration of notary's commission does not invalidate this instrument)

CERTIFICATE (Expiration of notary's commission does not invalidate this instrumen I, the undersigned, assistant secretary of the OLD REPUBLIC SURETY COMPANY, a Wisconsin corporation, CERTIFY that the foregoing and attached Power of Attorney remains in full force and has not been revoked; and furthermore, that the Resolutions of the board of directors set forth in the Power of Attorney, are now in force.



Signed and sealed at the City of Brookfield, WI this _

2025

Zarosnski-Leavitt Ins Agency OR



CLACKAMAS COUNTY PUBLIC IMPROVEMENT CONTRACT PROJECT INFORMATION, PLANS, SPECIFICATIONS AND DRAWINGS

PROJECT: 2025-05 Chemical Improvement Project at Hoodland Water Resources Recovery Facility

Background

The Chemical Improvement Project at Hoodland Water Resources Recovery Facility (Hoodland WRRF, plant) will upgrade mechanical and electrical systems that dose chemicals. Two chemical feed systems, one for sodium hypochlorite and the other for sodium bisulfite, operate continuously and in concert with each other to disinfect wastewater of human pathogens. While the hypochlorite system has been upgraded recently, this project upgrades the sodium bisulfite storage and feed system and its communications with the plant's existing Supervisory Control and Data Acquisition (SCADA) system. The Work on the plant's SCADA system, in particular, must be built and installed by qualified persons, as defined in the Specifications. The Work under this Contract must also be coordinated with WES's third-party system integrator (software programmer), contracted separately.

Project Scope:

This project includes the following Work:

- Remove and salvage to Owner existing bisulfite chemical feed pump skid and demolish other items.
- Furnish and install new bisulfite chemical feed system, including associated storage, piping, and appurtenances.
- Furnish and install improvements to the Chlorine Contact Chamber, including modifications to bisulfite injection and reclaimed water pump system improvements.
- Furnish and install remote input/output panel as an extension to existing Siemens-based SCADA system, including instruments, hardware and wiring of connections. System integration (programing) of new I/O Panel with existing logic controller is to be completed by others.
- All other work defined in the drawings and specifications.

Engineers Estimate: \$70,000.00

Key Dates:

All Basic Bid Work may begin as soon as the Notice to Proceed ("NTP") is issued Substantial Completion: 5 months from issuance of NTP Final Completion: 6 months from issuance of NTP

The Scope further includes the following Plans, Specifications and Drawings:

• Hoodland Water Resources Recovery Facility Chemical Improvement Project- Drawing set (19 Pages)

• Project Manual Drawings and Technical Specifications Hoodland Chemical Improvement Project (132 Pages)



DRAWING INDEX

DRAWING TITLE
COVER, LOCATION & VICINITY MAPS, DRAWING INDEX
GENERAL ABBREVIATIONS
GENERAL NOTES AND LEGEND
GENERAL EQUIPMENT DESIGNATIONS AND PROCESS IDENTIFICATION CODES
GENERAL PROCESS SYMBOLS
EXISTING CONDITIONS AND SITE IMPROVEMENT PLAN
INSTRUMENTATION LEGEND AND NOTES
P&ID - SODIUM BISULFITE SYSTEM
MECHANICAL ABBREVIATIONS AND NOTES
SODIUM BISULFITE EXISTING CONDITIONS AND DEMO PLANS AND DETAILS
SODIUM BISULFITE AREA IMPROVEMENT PLANS AND SECTIONS
CHLORINE CONTACT CHAMBER IMPROVEMENTS PLAN
CHEMICAL SYSTEM DETAILS - I
ELECTRICAL ABBREVIATIONS AND NOTES
ELECTRICAL LEGEND - I
ELECTRICAL LEGEND - II
CABLE BLOCK DIAGRAMS - I
SODIUM BISULFITE SIGNAL PLAN, SECTIONS AND DETAILS
PANELBOARD SCHEDULE

ΤY	COVER, LOCATION & VICINITY MAPS, DRAWING INDEX	SCALE NTS JOB NO 2376011.00 DATE DECEMBER 2024
		SHEET 1 OF 19 G-001

₽	ABI	BREVIATIONS											
024 1:52	, ,,	FOOT, FEET INCH, INCHES	BTWN BVC	BETWEEN BEGINNING OF VERTICAL CURVE	DPDT DPST	DOUBLE POLE, DOUBLE THROW DOUBLE POLE, SINGLE THROW	GND GPD	GROUND GALLONS P	ER DAY	LL LLBB	LIVE LOAD LONG LEG BACK-TO-BACK	ORIG OS&Y	ORIGINAL OUTSIDE SCREW AND YOKE (RISING STEM
2/5/2	# %	POUND, NUMBER PERCENT	C C/C	CURVE, CONDUCTOR, CONTACT CENTER-TO-CENTER	DR DRG	DOOR, DRAIN, DRYER DOUBLE RUBBER GASKET JOINT	GPH GPM	GALLONS P GALLONS P	ER HOUR ER MINUTE		LONG LEG HORIZONTAL LONG LEG VERTICAL	OSA	GATE VALVE) OUTSIDE AIR
ite: 1	& @	AND AT	C/S CAB	CONSTANT SPEED CABINET	DS DTL(-S)	DOWN SPOUT DETAIL(-S)	GPR GR	GROUND PE GRATE	ENETRATING RADAR	LO LOC	LOW LOCATION	OSC OSHA	OPEN/STOP/CLOSE OCCUPATIONAL SAFETY AND HEALTH
ot Da	ዓ ዊ	CENTERLINE PLATE	CALC(S) CAT	CALCULATION(S) CATEGORY	DUP DWG(-S)	DUPLEX DRAWING(-S)	GRL GRS	GUARDRAIL GALVANIZE	D RIGID STEEL	LONGIT LOR	LONGITUDINAL LOCAL-OFF-REMOTE	ОТ	ADMINISTRATION OVER TEMPERATURE
<u>a</u>	± <	APPROXIMATELY LESS THAN	CATV CB	CABLE TV CATCH BASIN, CIRCUIT BREAKER	E EA	EAST EACH, EXHAUST AIR	GS GYP (BD)	GALVANIZE	D STEEL OARD)	LOTO LP	LOCK-OUT, TAG-OUT LOW POINT, LIGHTING PANELBOARD	OZ P	OUNCE(-S) PNEUMATIC, PIPE, POLE
	= >	EQUALS GREATER THAN	CC CCT	CUBIC CENTIMETER(-S) CHLORINE CONTACT TANK	EC ECC	END OF HORIZONTAL CURVE ECCENTRIC	H H2O2	HIGH, HEIGH HYDROGEN	HT PEROXIDE	LPG	LIQUIFIED PETROLEUM GAS (PROPANE OR BUTANE AS NOTED)	P/L PA	PROPERTY LINE PUBLIC ADDRESS
	l	DEFLECTION ANGLE	CCTV CD	CLOSED-CIRCUIT TELEVISION CONTROL DAMPER	ECD ECR	EPOXY COATED END CURB RETURN	H2S H2SO4	HYDROGEN SULFURIC A		LR L-R	LONG RADIUS LOCAL-REMOTE	PACP PAF	PERFORATED ASBESTOS CEMENT PIPE POWDER/POWER ACTUATED FASTENER
	А	DEGREE(-S) (ANGULAR) AMPERE(-S)	CEM CEN	CEMENT CENTRAL	EER EF	ENERGY EFFICIENCY RATIO EACH FACE	HB HD	HOSE BIBB HEAVY DUT	Y, HEAT DETECTOR	LS LT	LIMIT SWITCH LEFT, LIGHT, LEFT TURN	PB PC(-S)	PULLBOX, PUSHBUTTON PIECE(-S), PHOTOCELL, POINT OF CURVE
	A/C A/D	AIR CONDITIONING ANALOG TO DIGITAL	CENT CER	CENTRIFUGAL CEILING EXHAUST RETURN	EFFIC EFFL	EFFICIENCY EFFLUENT	HDG HDPE	HOT DIP GA HIGH DENSI	LVANIZE(-D) TY POLYETHYLENE	LTG LV	LIGHTING LOW VOLTAGE		(BEGIN CURVE), PROGRESSIVE CAVITY
1-	A/M AASHTO	AUTO/MANUAL AMERICAN ASSOCIATION OF STATE HIGHWAY	CFH CFM	CUBIC FEET PER HOUR CUBIC FEET PER MINUTE	EG EGL	EXISTING GRADE ENERGY GRADE LINE	HDWD HGL	HARDWOOD HYDRAULIC) GRADE LINE	LW LWL	LIGHT WEIGHT LOW WATER LEVEL	PCC	POINT OF COMPOUND CURVE, POINT OF COMMON COUPLING
	AB	TRANSPORTATION OFFICIALS AGGREGATE BASE, ANCHOR BOLT(-S)	CFS CH	CUBIC FEET PER SECOND CHAMBER	EL EL&C	ELEVATION, EPOXY LINED EPOXY LINED AND COATED	HGR HH	HANGER HANDHOLE		LWT M	LEAVING WATER TEMPERATURE METER(-S)	PCCP PCF	PRESTRESSED CONCRETE CYLINDER PIPE POUNDS PER CUBIC FOOT
	ABAN(-D) ABS) ABANDON(-ED) ABSOLUTE, ACRYLONITRILE-	CHAN CHEM	CHANNEL CHEMI(-CALSTRY)	ELEC ELEM	ELECTRIC(-AL) ELEMENTARY	HI HM	HYDRAULIC HOLLOW ME	INSTITUTE ETAL	mA MACH	MILLIAÌPÉRE(-S) MACHINE	PCO PCOTG	PRESSURE CLEANOUT PRESSURIZED CLEANOUT TO GRADE
OVE	AC	BUTADIENE-STYRENE ASPHALTIC CONCRETE, ALTERNATING	CHK CHKD	CHECK	ELL EMBED	ELBOW EMBEDMENT	HMI HOA	HUMAN MAC HAND-OFF-A	CHINE INTERFACE AUTOMATIC	MATL MAX	MATERIAL MAXIMUM	PD PE	PRESSURE DROP, POSITIVE DISPLACEMENT PHOTOELECTRIC, PLAIN END, POLYETHYLEI
3YLI	ACH	CURRENT AIR CHANGES PER HOUR	CI CID1	CAST IRON CLASSIFICATION I. DIVISION 1	EMERG EN	EMERGENCY EDGE NAILING	HOR HORZ	HAND-OFF-F	REMOTE	MB MBH	MACHINE BOLT BTU PER HOUR (THOUSANDS)	PEMB PEN	PRE-ENGINEERED METAL BUILDING PENETRAT(-EION)
CHEI	ACI ACK	AMERICAN CONCRETE INSTITUTE	CID2 CIP	CLASSIFICATION I, DIVISION 2 CAST IRON PIPE, CAST IN PLACE, CLEAN IN	ENCL	ENCLOSURE	HP H-P	HORSEPOW	/ER IT	MBR MC	MEMBRANE BIOREACTOR MOISTURE CONTENT, MISCELLANEOUS	PER	PERIODIC PERCOLAT(-EION)
ser:	ACOUS ACP	ACOUSTIC(-AL) ASBESTOS CEMENT PIPE	CIRC	PLACE CIRCULA(-RTION)	ENGR	ENGINEER	HPT HR(S)	HIGH POINT HOUR(-S)		MCA	CHANNEL MINIMUM CIRCUIT AMPACITY	PERF	PERFORAT(-E, -ED, -ES, -ATION) POWER FACTOR, PROFILE
	ADA ADDIT	AMERICANS WITH DISABILITIES ACT	CIRCUM	CIRCUMFERENCE CAST IRON SOIL PIPE	EP	EDGE OF PAVEMENT	HRL	HANDRAIL HEATING SE	ASONAL PROFICIENCY	MCB		PFAS	PER- AND POLYFLUOROALKYL SUBSTANCES
	ADJ ADJT	ADJUST(-ED,-MENT,-ABLE)	CJ		EQ	EQUAL (-LY, -IZATION)	HSS	FACTO HOLLOW ST	DR TRUCTURAL SECTION	MCP		PFOS	PERFLUOROOCTANESULFONATE
	ADWF	AVERAGE DRY WEATHER FLOW	CKT	CIRCUIT CHI ORINE	ES ES/EW/	EACH SIDE	HST	HOIST		MEON		PH	PIPE HANGER, PHASE
	AFCI		CLASS	CLASSIFICATION	ESP	EXTERNAL STATIC PRESSURE	HTG			MFRD	MANUFACTURED	PHMS	PAN HEAD SHEET METAL SCREW
	AFF	ABOVE FINISHED FLOOR ABOVE FINISHED GRADE	CLOS	CLOSET	E-STOP	EMERGENCY STOP	HVAC	HEATING, V	ENTILATING, AND AIR	MG/L	MILLIGRAM(-S), MILLION GALLON(-S) MILLIGRAMS PER LITER	PHSMS PI	PAIN HEAD SHEET METAL SCREW POINT OF INTERSECTION
	AGG		CLR CLSM		ETC ETM	ELAPSED TIME METER	HVY	HEAVY		MGD MH	MILLION GALLONS PER DAY MANHOLE	PID PIV	PROPORTIONAL-INTEGRAL-DERIVATIVE POST INDICATOR VALVE
5 2-	AIC	AMPERES INTERROPTING CAPACITY AMERICAN INSTITUTE OF STEEL	CMC	CENTIMETERS CEMENT MORTAR COATED	EUSERC	ELECTROLYSIS TEST STATION ELECTRIC UTILITY SERVICE EQUIPMENT	HWL HWY	HIGH WATE	RLEVEL	MHZ MIL(-S)	ONE-THOUSANDTH OF AN INCH	PLAS PLC	PLASTER PROGRAMMABLE LOGIC CONTROLLER
0.11.0	AISI	AMERICAN IRON AND STEEL INSTITUTE	CML CML&C	CEMENT MORTAR LINED CEMENT MORTAR LINED AND COATED	EVC	EQUIREMENTS COMMITTEE	HYD HZ	HYDRAULIC HERTZ (CYC	CLES PER SECOND)	MIN MISC	MINIMUM, MINUTE(-S) MISCELLANEOUS	PLF PM	POUND PER LINEAL FOOT PROJECT MANAGER, POWER MONITOR
23/0	AITC	AMERICAN INSTITUTE OF TIMBER CONSTRUCTION	CMP CMU	CORRUGATED METAL PIPE CONCRETE MASONRY UNIT	EW EWT	EACH WAY ENTERING WATER TEMPERATURE	1&C I/O	INSTRUMEN	ITATION AND CONTROL	MJ ML	MECHANICAL JOINT MILLILITER(-S)	PNL PNLBD	PANEL PANELBOARD
neraiv	ALT ALTD	ALTERNAT(-E, -OR) ALTITUDE	CNJ CNTR	CONTROL JOINT CENTER	EXC EXH	EXCAVATE EXHAUST	IBC ICC	INTERNATIC INTERNATIC	DNAL BUILDING CODE	MLO MM	MAIN LUGS ONLY MILLIMETER(-S), MULTIMODE (FIBER)	POE POT	POWER OVER ETHERNET POTABLE
non sveer	ALUM AMB	ALUMINUM AMBIENT	CNTRSK CO	COUNTERSUNK CLEANOUT, CONDUIT ONLY	EXIST EXP	EXISTING EXPANSION	ID IE	INSIDE DIAN	IETER VATION	MMBH MOCP	BTU PER HOUR (MILLIONS) MAXIMUM OVERCURRENT PROTECTION	PP PPB	PARTIAL PENETRATION, POWER POLE, PAGI PARTS PER BILLION
wings	ANC ANN	ANCHOR ANNUNCIATOR	CO2 COAX	CARBON DIOXIDE COAXIAL	EXT FA	EXTERNAL, EXTERIOR FIRE ALARM	IEEE	INSTITUTE (ELECT	DF ELECTRICAL AND FRONICS ENGINEERS	MOD(-S) MON	MODIF(-Y, -ICATIONS) MONUMENT	PPE PPM	PERSONAL PROTECTIVE EQUIPMENT PARTS PER MILLION
-Ura	ANSI ANT	AMERICAN NATIONAL STANDARDS INSTITUTE ANTENNA	COD COL	CHEMICAL OXYGEN DEMAND COLUMN	FAB FAC	FABRICATE(-D) FACTORY	IEER IF	INTEGRATE	D ENERGY EFFICIENCY RATIO E	MOV MPH	MOTOR OPERATED VALVE MILES PER HOUR	PR PRE-ENG	PAIR PRE-ENGINEERED
on.u	AO APA	ANALOG OUTPUT AMERICAN PLYWOOD ASSOCIATION	COM COMM	COMMON COMMUNICATION	FACIL FAI	FACILIT(-Y, -IES) FRESH AIR INTAKE	IL IN	INDICATING INCH(-ES)	LIGHT	MR MSE	MOISTURE-RESISTANT MECHANICALLY STABILIZED EARTH	PRESS PRI	PRESSURE PRIMARY
Nubis	APPROX ARCH	APPROXIMATE(-LY) ARCHITECT(-URAL)	COMP CONC	COMPRESSOR CONCRETE	FB FC	FLAT BAR FLEXIBLE COUPLING	INFL INST	INFLÜENT INSTANTAN	EOUS	MT(-D, -G) MTL	MOUNT(-ED, -ING) METAL	PROJ PROP	PROJECT(-ION) PROPERTY, PROPOSED, PROPELLER
n-ne:	AS ASB	AMMETER SWITCH ASBESTOS	COND CONN	CONDENSATE, CONDUIT CONNECT (-ED, -S, -ION)	FCA FCO	FLANGE COUPLING ADAPTER FLOOR CLEANOUT	INSTR INSUL	INSTRUMEN	IT(-ATION) I	MTR MTS	MOTOR MANUAL TRANSFER SWITCH	PROT PRS	PROTECT(-OR) PRESSURE SNUBBER
L\nn.	ASCE ASD	AMERICAN SOCIETY OF CIVIL ENGINEERS ADJUSTABLE SPEED DRIVE (DC)	CONST CONT	CONSTRUCTION CONTINU(-ED, -OUS, -ATION)	FD FDC	FLOOR DRAIN, FIRE DAMPER FIRE DEPARTMENT CONNECTION	INT INV	INTERIOR, II INVERT	NTERNAL	MUL MV	MULLION MEDIUM VOLTAGE	PRV	PRESSURE RELIEF VALVE, PRESSURE REDUCING VALVE
LLOO	ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-	COORD COP	COORDINATE COEFFICIENT OF PERFORMANCE	FDR FE	FEEDER FIRE EXTINGUISHER	IP IPS	INTERNET P	ROTOCOL NAL PIPE STANDARD. INCHES	N N/A	NORTH, NEUTRAL (ELECTRICAL) NOT APPLICABLE	PS PSF	PIPE SUPPORT, POWER SUPPLY POUNDS PER SQUARE FOOT
ν 2- 27	ASME	CONDITIONING ENGINEERS AMERICAN SOCIETY OF MECHANICAI	COR	CORPORATION	FF FFF	FAR FACE, FINISHED FLOOR	IR	PER S	ECOND, IRON PIPE SIZE	NAD	NORTH AMERICAN DATUM	PSI	POUNDS PER SQUARE INCH POUNDS PER SQUARE INCH ABSOLUTE
ents	ASPH		CORR	CORRUGATED CLEANOUT TO GRADE	FG FH	FINISHED GRADE	IRRG	IRRIGATION	LLY SAFE	NAOH	SODIUM HYDROXIDE	PSIG	(PRESSURE ABOVE VACUUM) POUNDS PER SQUARE INCH GAUGE
Dvem	ASSY	ASSEMBLY	CP CPIG	CONTROL POINT, CATHODIC PROTECTION	FIG	FIGURE FINISH(-FD)	ISA		NAL SOCIETY OF AUTOMATIO	N NC	NORMALLY CLOSED	PSI	(PRESSURE ABOVE ATMOSPHERE)
		MATERIALS	CPT		FL	FLOW LINE	ISR INV		LLY SAFE RELAY	NE	NORTHEAST	PSTA PSV	PUMP STATION
nical	ATM	AMERICA TRIF ATMOSPHERE (14.7 LB/IN2)	CR	CONTROL RELAY, CRUSHED ROCK	FLASH		IX		NGE	NECA	NATIONAL ELECTRICAL CODE (NFFA 70) NATIONAL ELECTRICAL CONTRACTORS	PT(-S)	POINT OF TANGENT (END CURVE), PRESSUR
Chen	AUTO	AUTOMATIC TRANSPER SWITCH	CSD	COURT, CURRENT TRANSFORMER,	FLEA	FLANGE(-D)	JST	JOIST		NEMA	NATIONAL ELECTRICAL MANUFACTURER'S	S	POINT(-S)
and	AUX AVE	AUXILIARY AVENUE	CTRL	CONTROL	FLOC	FLOCEOLATION	KA	KILOAMPER		NETA	INTERNATIONAL ELECTRICAL TESTING	PU PVC	POLYURE HANE POLYVINYL CHLORIDE, POINT OF VERTICAL
	AWG	AVERAGE AMERICAN WIRE GAGE	CU FT	CUBIC FOOT, CUBIC FEET	FM FN	FLOW METER FIELD NAILING	KCMIL KG	KNIFE GATE	S OF CIRCULAR MILS E, KILOGRAM(-S)	NF	NEAR FACE, NANOFILTRATION	PVI	POINT OF VERTICAL INTERSECTION
ects/I	AWS AWT	AIVIERICAN WELDING SOCIETY ADVANCED WATER TREATMENT		CUBIC INCH(-ES) CUBIC METER(-S)	FNDN FO	FOUNDATION FIBER OPTIC	KHZ KIP	KILOHERTZ ONE THOUS		NFC NFPA	NOT FOR CONSTRUCTION NATIONAL FIRE PROTECTION ASSOCIATION	PVMT N PVT	PAVEIVIENT POINT OF VERTICAL TANGENCY
	AWWA B/W	AMERICAN WATER WORKS ASSOCIATION BOTTOM OF WALL	CU YD CUR	CUBIC YARD(-S) CURRENT	FOS FPS	FACE OF STUD FEET PER SECOND	KM KSI	KILOMETER KIPS PER SO	(-S) QUARE INCH	NG NH3	AMMONIA	PW PWR	POTABLE WATER POWER
vices	BARM BATT	BARMINUTOR BATTERY	CV CWT	VALVE FLOW COEFFICIENT ONE HUNDRED POUNDS	FREQ FRP	FREQUENCY FIBERGLASS REINFORCED PLASTIC	KV KVA	KILOVOLT(-S KILOVOLT-A	S) MPERE(-S)	NIC NO	NOT IN CONTRACT NORMALLY OPEN, NUMBER	PWWF Q	PEAK WET WEATHER FLOW FLOW OR DISCHARGE
	BB(S) BC	BEARING BAR(-S) BEGINNING OF HORIZONTAL CURVE,	DB DBL	DRY BULB DOUBLE	FRT FS	FIRE-RETARDANT FLOOR FINISHED SURFACE, FAR SIDE	KVAR KVARH	KILOVOLT-A KILOVOLT-A	MPERE(-S) REACTIVE MPERE REACTIVE HOUR(-S)	NOM NORM	NOMINAL NORMAL	R, RAD R/W	RADIUS RIGHT OF WAY
uəu 4-	BCR	BARE COPPER BEGIN CURB RETURN	DC DCA	DIRECT CURRENT DOUBLE CHECK ASSEMBLY (TWIN	FSD FT	FIRE/SMOKE DAMPER FOOT, FEET	KW KWH	KILOWATT(- KILOWATT H	S) HOUR(-S)	NPT NRS	NATIONAL PIPE THREAD NON-RISING STEM GATE VALVE	RA RAS	RETURN AIR RETURN ACTIVATED SLUDGE
MILON	BD BDD	BOARD, BELT DRIVE BACKDRAFT DAMPER	DCS	ELEMENT CHECK VALVE) DISTRIBUTED CONTROL SYSTEM	FTG FU	FOOTING FUSE	L L/D	LITER(-S), LI LITERS PER	ENGTH, LINE DAY	NS NSG	NEAR SIDE NON-SHRINK GROUT	RC RCCP	REINFORCED CONCRETE REINFORCED CONCRETE CYLINDER PIPE
	BF BFP	BLIND FLANGE BELT FILTER PRESS, BACKFLOW PREVENTER	DEFL DEG	DEFLECTION DEGREE(-S)	FURN FURR	FURNITURE, FURNISHINGS FURRING	LA LAB	LIGHTNING LABORATOF	ARRESTER RY	NT NTS	NORMALLY THROTTLED NOT TO SCALE	RCP RCPT	REINFORCED CONCRETE PIPE RECEPTACLE
Wat	BHP BITUM	BRAKE HORSEPOWER BITUMINOUS	DEG C DEG F	DEGREES CELSIUS DEGREES FARENHEIT	FUT FVNR	FUTURE FULL VOLTAGE, NON REVERSING	LAM LAN	LAMINATE	A NETWORK	NW NWL	NORTHWEST NORMAL WATER LEVEL	RCT RD	REPEAT CYCLE TIMER ROAD
	BKR BL	BREAKER BUILDING LINE	DEMO DEPT	DEMOLISH DEPARTMENT	FVR FWD	FULL VOLTAGE, REVERSING FORWARD	LAT LAV	LATERAL LAVATORY		O/C O3	OPEN/CLOSE OZONE	REC RECIRC	RECEIVING RECIRCULAT(-E, -ION)
ount	BLDG BLK	BUILDING BLOCK(-S)	DH DI	HEAD LOSS (IN FEET), DOWNHOLE DUCTILE IRON, DROP INLET, DISCRETE	G GA	GRAMS, GROUND (ELECTRICAL) GAUGE	LB(-S) LB(-S)/SF	POUND(-S) POUND(-S) I	PER SQUARE FOOT	OA OBD	OVERALL OPPOSED BLADE DAMPER	RECT RED	RECTANG(-LÈ, -ÚLAR) REDUCE(-R)
as	BLKG BM	BLOCKING BEAM, BENCH MARK	DIA	INPUT	GAC GAL	GRANULAR ACTIVATED CARBON GALLON(-S)	LCP	LOCAL CON	TROL PANEL TROL STATION	OC OD	ON CENTER OUTSIDE DIAMETER	REF REFR	REFERENCÉ REFRIGERATOR
скап	BM-1 BN	BEAM MEMBER 1 BOUNDARY NAILING	DIAG DIAPH	DIAGONAL, DIAGRAM DIAPHRAGM	GALV GAS	GALVANÌZÉD GASOLINE	LD LDG	DEVELOPMI	ENT LENGTH	ODP OF	OPEN DRIP PROOF OVERFLOW, OUTSIDE FACE	REG REINF	REGULAT(-E, -OR, -ION, -ING) REINFORC(-E, -ED, -INGEMENT)
svcia	BO BOC	BLOWOFF BACK OF CURB	DIM(-S) DIP	DIMENSION(-S) DUCTILE IRON PIPE	GB GC	GRADE BREAK GROOVED COUPLING	LE LEED	LIFTING EYE	E P IN ENERGY AND	OFCI	OWNER FURNISHED, CONTRACTOR	REL REOD	RELATIVE REQUIRED
lient	BOD 5 BOT	BIOCHEMICAL OXYGEN DEMAND (5 DAY) BOTTOM	DIR DISC	DIRECTION DISCONNECT	GDL GFCI	GROUND LEVEL GROUND-FAULT CIRCUIT INTERRUPTER	LEL		CONMENTAL DESIGN	OFS OG	OUTSIDE FACE OF STUD ORIGINAL GROUND	REQT RESII	REQUIREMENT RESILIENT
ents/L	BP	BASE PLATE BEARING	DISCH	DISCHARGE	GI GL	GALVANIZED IRON GLASS	LF LG	LINEAR FEE	Τ	OH OIT	OPPOSITE HAND, OVERHEAD OPERATOR INTERFACE TERMINAL	RESV	RESERVOIR REVISION
201116	BS	BLACK STEEL, BOTH SIDES		DEAD LOAD DOWN	GLAZ	GLULAM BEAM			TER	OL ODNICI SI	THERMAL OVERLOAD RELAY	RH	
	BTU	BRITISH THERMAL UNIT	DO	DISSOLVED OXYGEN, DISCRETE OUTPUT	GLL	GLASS LINED	LIQ		· _ · ·	OPP	OPPOSITE	RM	ROOM
vd-eol									ERED PROFESSO	DESIGNED	WATER	ENVIRONME	NT SERVICES
in the second se	ı	ISSUED FOR BID					SCA	ALES	T6443PE	BK	CLACI	KAMAS COUNT	ΓΥ, OREGON
liey.c							0	25mm		DRAWN	HOODLAND WATER	RESOUR	CE RECOVERY FACILITY
v.pen		TS NOT BEARING THIS STAMP MAY HAVE BEEN PI RTISING AND CANNOT BE CONSIDERED AS BUD D					IF THIS B	BAR IS NOT		CEC	CHEMICAL I	MPROVE	MENT PROJECT
ve-pv	USERS C CAUTIO	OF THIS DOCUMENT IN EDITABLE ELECTRONIC FO	ORMATS ARE					T SCALES	100 AN 08, 20 HUM	CHECKED			
W://K]	CHANGE	S MAY HAVE BEEN MADE SUBSEQUENT TO ITS PR	REPARATION		ON	DATE RV	ACCOR	KDINGLY.		DMH		Kennec	ay Jenks
o 1					-··						1	1	

D)		
1			

В

С

Е

RMT

RPM

RPP RPS RR RST RT RTE RTE

RND RO

REMOTE ROUND

REVERSE OSMOSIS

REVOLUTIONS PER MINUTE REDUCED PRESSURE PRINCIPLE REVOLUTIONS PER SECOND

TMV TNK TOD

TOPO TOT TP TR T-R

TANK

THERMOSTATIC MIXING VALVE

TOTAL OXYGEN DEMAND TOPOGRAPHY TOTAL, TOTALIZE(R)

	RPS	REVOLUTIONS PER SECOND	TP		
	RST	RESET	T-R	THROUGH ROOF	
	RT RTE	RIGHT TURN, RESET TIMER ROUTE	TRTMT TS	TREATMENT STRUCTURAL TUBING	6
	RTN		TSS TSTAT	TOTAL SUSPENDED S	SOLIDS
E			TURB	TURBIDITY	
:R	RVSS S	SEWER, SOUTH	U	TYPICAL URINAL	
VE	S/S S/M	START/STOP SIDEWALK		UNIFORM BUILDING C	ODE
~-	SA	SUPPLY AIR	UF	ULTRAFILTRATION	
JF	SAN SCADA	SANITARY SUPERVISORY CONTROL AND DATA	UG UL	UNDERGROUND UNDERWRITERS LAB	ORATORIES
PIPE	SCEM	ACQUISITION STANDARD CUBIC FEET PER MINUTE		UNKNOWN	NOTED
	SCH	SCHEDULE	UPS	UNINTERRUPTIBLE P	OWER SUPPLY
MENT	SCR SD	SILICON CONTROLLED RECTIFIER STORM DRAIN, SMOKE DETECTOR	USGBC UT	UNITED STATES GRE	EN BUILDING COUNCIL
HYLEN	E SDMH SE	STORM DRAIN MANHOLE	UTP	UNSHIELDED TWISTE	D PAIR
	SEC	SECONDARY, SECOND(-S)	V	VOLTS	
	SECT	SECTION SEDIMENTATION	V/S VA	VOLT-AMPERES	
	SEER	SEASONAL ENERGY EFFICIENCY RATIO	VAC VAR	VACUUM VARIES, VARIABLE, V	OLT-AMPERES
ANCES	SER	SERVICE ENTRANCE RATED			_
	SH	SHOWER	VC	VERTICAL CURVE	
	(SH) SHT	SHIELDED SHEET	VCP	VITRIFIED CLAY PIPE PANEL	, VENDOR CONTROL
	SI SIM	SIDE INLET SIMILAR	VD VEI	VOLUME DAMPER	
	SK	SINK	VERT	VERTICAL	
E	SLBB	SLODGE SHORT LEGS BACK-TO-BACK	VERIS	VARIABLE FREQUEN	CY DRIVE (AC)
	SLH SLV	SHORT LEG HORIZONTAL SHORT LEG VERTICAL	VFI VIF	VACUUM FAULT INTE VERIFY IN FIELD	RRUPTER
1	SM	SINGLEMODE (FIBER)	VOL		NTERSECTION
२	SMACNA	CONTRACTORS NATIONAL	VPI VS	VOLTMETER SWITCH	NTERSECTION
	SMS	ASSOCIATION SHEET METAL SCREW	VT VTP	VENT VERTICAL TURBINE P	UMP
	SO2	SULFUR DIOXIDE	VTR	VENT TO ROOF	
, PAGE	S SP GR	SPECIFIC GRAVITY	W	WIDE, WIDTH, WIRE, V	WATTS, WELDED, WEST
	SPC(-S, -D) SPD) SPACE(-S, -D) SURGE PROTECTIVE DEVICE	W/ W/O	WITH WITHOUT	
	SPDT SPEC(-S)	SINGLE POLE, DOUBLE THROW	WAN WAS	WIDE AREA NETWOR	K
	SQ SQ CM	SQUARE	WB	WATER BAR, WET BU	
	SQ CM SQ FT	SQUARE CENTIMETERS SQUARE FEET	WCLIB	WATER CLOSET, WAT WEST COAST LUMBE	R INSPECTION BUREAU
	SQ IN SQ M	SQUARE INCHES SQUARE METER(-S)	WCO WD	WALL CLEANOUT WOOD	
	SQ MI		WEF WER	WATER ENVIRONMEN	IT FEDERATION
	SRG	SINGLE RUBBER GASKET JOINT	WF	WIDE FLANGE	
	55	SOLID STATE	WH	WATER GAUGE	
	SSD ST	SATURATED SURFACE DRY STREET	WHDM WHM	WATT-HOUR DEMANE WATT-HOUR METER	DMETER
E	STA STAG	STATION	WM WMH	WATER METER	
-	STB	SHORTING TERMINAL BLOCK	WNDW	WINDOW	
E)	STD(-S) STIFF	STANDARD(-S) STIFFEN(-ER)	WP	POINT, WEATHER	ER PROTECTED
	STL STM	STEEL	WR WS	WEATHER RESISTAN	T FR SURFACE
	E- STOR		WSD	WALL SUPPLY DIFFUS	SER
	STRC	STRUCTUR(-E, -AL)	WSP	WATERSTOP	
FICAL	SUB SUBM	SUBNATANT SUBMISSION, SUBMIT	WT WTP	WEIGHT, WALL THICK WATER TREATMENT	NESS PLANT
	SUP	SUPERNATANT SUPPORT(-S)	WTR WV	WATER WATER VALVE	
	SURF	SURFACE	ŴŴ	WASTEWATER	0
	SUSP SW	SOUTHWEST, SWITCH	WWM	WELDED WIRE FABRI	C
	SWBD SWGR	SWITCHBOARD SWITCHGEAR	WWTP XFMR	WASTEWATER TREAT	IMENT PLANT
	SYM	SYMMETRICAL	XP	EXPLOSION PROOF	
	SYS	SYSTEM	YR	YEAR	
	I T&B	TIME(-R) TOP AND BOTTOM			
IPE	T&G T/C	TONGUE AND GROOVE	SEE DRA DESIGNA	WING G-5 FOR A LIST O TIONS AND PROCESS II	F EQUIPMENT DENTIFICATION CODES.
	T/P T/S	TOP OF PAVEMENT			
	T/W	TOP OF WALL	PRO.	JECT-SPECIFI	C
	ТР ТS				
	TA TAN	TRANSFER AIR TANGENT(-IAL)			
	TB	THRUST BLOCK, TERMINAL BLOCK			
		BORING MACHINE			
	TCP	TRAY CABLE TRANSMISSION CONTROL PROTOCOL			
	TDH TDS	TOTAL DYNAMIC HEAD TOTAL DISSOLVED SOLIDS			
		TOTALLY ENCLOSED FAN COOLED			
	TEMP	TEMPERATURE, TEMPORARY			
	I MPTNK TENV	TEMPERING TANK TOTALLY ENCLOSED NON-VENTILATED			
	THK THRU	THICK(-ENED, -ENER, -NESS)			
					SCALE
					NTS
				0	JOB NO
Υ		GENERAL ABBREVI	ATION	3	2376011.00
					SHEFT 2 OF 10
					G-002

A	A B	C	
∑ N	NOTES	NOTES (CONTINUED)	
User: CHERYL LOVE Plot Date: 12/5/2024 1:52	 GENERAL ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH WATER ENVIRONMENT SERVICES STANDARDS AND APPLICABLE AWWA STANDARDS. A PRE-EXISTING SITE CONDITION VIDEO SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL SHOW EXISTING CONDITIONS OF ALL CONCRETE, ASPHALT, LANDSCAPED AREAS, BUILDING EXTERIOR, ETC. SURROUNDING THE CONSTRUCTION AREAS. VIDEO SHALL BE SUBMITTED TO THE OWNER PRIOR TO BREAKING GROUND. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE FROM DAMAGE. ALL IMPROVEMENTS DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE EXPEDITIOUSLY REPAIRED OR RECONSTRUCTED AT THE CONTRACTOR SEXPENSE WITHOUT ADDITIONAL COMPENSATION. OBSERVATIONS OF WORK IN PROGRESS DURING SITE VISITS SHALL NOT ALTER THE REQUIREMENTS OF THE CONTRACT DOCUMENTS. CONTRACTOR SHALL CONDUCT THE WORK SUCH THAT ALL PLANT FACILITIES, ESPECIALLY CHEMICAL DELIVERY SYSTEMS REMAIN IN OPERATION CONTINUOUSLY THROUGHOUT CONSTRUCTION. UTILITIES LOCATIONS OF UNDERGROUND UTILITIES SHOWN ON THE DRAWINGS WERE OBTAINED FROM AVAILABLE RECORDS AND ARE SHOWN IN THEIR APPROXIMATE LOCATION. THERE IS NO GUARANTEE THAT ALL EXISTING PIPELINES AND OBSTRUCTIONS ARE SHOWN OR THAT LOCATIONS INDICATED ARE ACCURATE. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR SHALL POTHOLE TO DETERMINE ACTUAL LOCATION AND ELEVATION OF ALL EXISTING UTILITIES IN AND AROUND THE AREAS OF NEW CONSTRUCTION. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT ALL REMAINING EXISTING UTILITIES WHETHER SHOWN OR NOT SHOWN. PRIOR TO ANY CONNECTION TO AN EXISTING UTILITY, THE CONTRACTOR SHALL COORDINATE WITH THE UTILITY OWNER. 	PERMITTING	
ces\Projects\Hoodland Chemical Improvements_2376011.00\10-Design\10.06-Drawings\General\2376011.00-G-003 ຜ 		CALLOUTS AND SHOR (A) Q P 0 ± (1) (####) XXX	THAND SY DIRECTION OF SHEET KEYNC CENTERLINE PLATE DIAMETER APPROXIMATE ANGLE WATER/FLUID BUILDING GRII DOOR ROOM
ww.bentley.com:kjce-pw\Documents\Clients\Clackamas County, OR\Water Environment Servic	ISSUED FOR BID	Image: state of the symbols REVISION SYMBOLS Image: state of the symbols	
pw:\\kjce-p	USERS OF THIS DOCUMENT IN EDITABLE ELECTRONIC FORMATS ARE CAUTIONED AGAINST USE WITHOUT FIRST DETERMINING WHETHER CHANGES MAY HAVE BEEN MADE SUBSEQUENT TO ITS PREPARATION. NO	REVISION	DATE

- UTILITY CROSSING

OVER

DESIGNED

DRAWN

CHECKED

ΒK

CEC

MDH

AGINEED

P

76443PE

OREGON

EL DAVID

EXPIRATION DATE: 06/30/2025

IF THIS BAR IS NOT _____ DIMENSION SHOWN, ADJUST SCALES ACCORDINGLY. ΒY

SCALES

WATER ENVIRONMENT SERVICES CLACKAMAS COUNTY, OREGON HOODLAND WATER RESOURCE RECOVERY FACILI CHEMICAL IMPROVEMENT PROJECT

Kennedy Jenks

	H
ING SYMBOLS	
WING WHERE DETAIL, VATION IS CALLED OUT	FOUND ON DRAWING WHERE DETAIL, SECTION, OR ELEVATION IS DRAWN
LNUMBER	
ON WHICH IS DRAWN, N SAME SHEET	C-4 SCALE SHEET ON WHICH DETAIL IS CALLED OUT, "-" IF ON SAME SHEET
ON LETTER	A SECTION LETTER
T ON WHICH ON IS DRAWN, DN SAME SHEET	A-5 SCALE SHEET ON WHICH SECTION IS CUT, "-" IF ON SAME SHEET
ERS USED WHEN MORE THAN ONE ATION IS DRAWN WITHIN A SINGLE – ELEVATION NUMBER 2 A-9 SHEET ON WHICH ELEVATION IS DRAWN, "-" IF ON SAME SHEET	ELEVATION NUMBER 2 A-3 SCALE SHEET ON WHICH ELEVATION IS CALLED OUT, "-" IF ON SAME SHEET
TANDARD DETAIL NUMBER	STANDARD DETAIL NUMBER
STAND	ARD DETAIL TITLE C-5605

TY	GENERAL NOTES AND LEGEND	SCALE NTS JOB NO 2376011.00
		DATE DECEMBER 2024
		SHEET 3 OF 19 G-003

EQUIPMENT PREFIXES (CONT)

'VV	REDUCED VOLTAGE, PART WINDING MOTOR STARTER
S	REDUCED VOLTAGE, SOLID STATE MOTOR STARTER
	SCREW COMPRESSOR
L	WEIGHT SCALE
2N	SCREEN (BAR, ROTARY, ETC.)
1	SEPARATOR (SEDIMENTATION, TRAP, DRIP TRAP,
	CYCLONE, STRAINER, ETC.)
R	SLUDGE GRINDER
	SILENCER
)	SAMPLER
Т	SEPTAGE RECEIVING TANK
	HVAC FAN (SUPPLY)
	SOLENOID VALVE OPERATOR
3D	SWITCHBOARD
GR	SWITCHGEAR
	TANK - SEE NOTES
	TRAP PRIMER
	HVAC UNIT HEATER
)	
1D	
	TRANSFORMER
ES	

D

THE EQUIPMENT PREFIXES LISTED ABOVE ARE USED TO UNIQUELY IDENTIFY EACH PIECE OF EQUIPMENT. PREFIXES SHOWN WITH AN ASTERISK (*) MAY BE FURTHER REFINED BY SYMBOL, AND IDENTIFIED IN GREATER DETAIL IN EQUIPMENT SCHEDULES AND SPECIFICATIONS WITH THE ABBREVIATIONS SHOWN BELOW.

ΑΡ	FLAP
.T	TILTING WEIR
CH	MECHANICAL
ATIC	STATIC
NK	IN TANK (MOTORIZED)
IOP HM DSE BE RI BM MP ELL	CHOPPER DIAPHRAGM HOSE LOBE (ROTARY LOBE) PROGRESSIVE CAVITY POSITIVE DISPLACEMENT PERISTALTIC SUBMERSIBLE SUBMERSIBLE SUMP VERTICAL TURBINE SUBMERSIBLE WELL
RS	NON-PRESSURIZED (DIGESTER, STORAGE, ETC.)
S	PRESSURE VESSEL (AIR RECEIVER, ETC.)
TD VR LL LY K TL OB DL TL OB DL TL UG ED EL US	ALTITUDE AIR RELEASE AIR RELEASE VACUUM RELIEF VACUUM RELIEF/AIR INLET BALL BUTTERFLY COMBINATION AIR/VACUUM CHECK FLOW CONTROL GATE GLOBE NEEDLE PUMP CONTROL PINCH PLUG PRESSURE REDUCING PRESSURE RELIEF PRESSURE SUSTAINING

DATE	

PIPING DESIGNATIONS	PIPE SCHEDULE	
NEW PIPING CENTERLINE ELEVATION (UNLESS OTHERWISE NOTED) XXX.X G"-RW G"-RW PROCESS CODE, SEE PIPE SCHEDULE NOMINAL PIPE DIAMETER EXISTING PIPING G"-RW G"-RW G"-RW G"-RW G"-RW	ABBREVIATION SYSTEM SIZE SERVICE FLOW PIF SBS SODIUM BISULFITE ALL E P PVC V VENT ALL E G/P PVC W3 THREE WATER ALL E P GS NOTES 1. SEE SECTION 40 27 00 FOR DESIGNATED VALVE SYSTEMS 'A' AND 'C'.	FeMATERIALLININGVALVE SYSTEMTEST PRESSUETEST MEDIUMALLOWABLE LEAKAGETEST DURATION>-1PVCN/AC150WATERNONE4 HOURS>-1PVCN/AA10WATERNONE4 HOURSPGAL STLN/AA150WATERNONE4 HOURSIIIIIIII
PROCESS CODES	PROCESS CODES (CONT)	
AA. AERATION AIR ALUM AMM AM ADMONIA AS ACTIVATED SULCA BA BUBBLER AIR BWS BACKWASH SUPPLY BWWS BACKWASH WASTE CA COMPRESSED AIR CCBNCC CHORNE CONTACT BASINCHAMBER CEN CENTRATE CHWR HVAC CHILLED WATER RETURN CHWR HVAC CHILLED WATER RETURN CHWR HVAC CHILLED WATER RETURN CLI CHORNE - GAS CLI CHORNE - GAS CLI CHORNE - GAS CLI CHORNE - GAS CLI CHORNE - MACONING CLV CHORNE - GAS CLI CHORNE - GAS CRI CORROSION RESISTANT DANIN CRO CHEMICA RESISTANT DANIN CRO CHEMICA RESISTANT DANIN CRO CHULLED WATER RETURN CWS CHILLED WATER RETURN CWS CHILLED WATER RETURN DWN PLUMBING DOMESTIC HOT WATER RETURN <	MC MEMBRANE CONCENTRATE SUPPLY MCCR MEMBRANE CONCENTRATE RETURN MCP MEMBRANE CONCENTRATE RETURN MCR MEMBRANE CLEANING PERMEATE SUPPLY MCR MEMBRANE CLEANING RETURN MCR MEMBRANE CLEANING RETURN MCR MEMBRANE CLEANING NATE MCR MEMBRANE CLEANING WARTE MCR MEMBRANE PERMEATE MGOH MEMBRANE PERMEATE MGOH MEMBRANE PERMEATE MUA MURIATIC ACID NAOH SODIUM HYDROXIDE NG NATURAL GAS NAOH SODIUM HYDROXIDE NG NATURAL GAS NPW NON-POTABLE WATER PA PLANTAIR PAC POLYALUMINIM CHLORIDE PAC POLYALUMINIM CHLORIDE PD PLANTAIR PAC POLYALUMINIM CHLORIDE PD PLANTAIR PAC POLYALUMINIM CHLORIDE PD PLANTAIR PLEFF PRIMARY EFFLUENT PHOS PHOSPHATE PUDGE PW POTABLE WATER RAS RETURN ACTIVATED SUDGE RW RECLIMED WATER PSL PRIMARY EFFLUENT POL DUMER SODIUM SUDCE	
SCALES 0 1" 0 25mm IF THIS BAR IS NOT DIMENSION SHOWN, ADJUST SCALES ACCORDINGLY. IF VOIDATION DATE: 05/20/0025	WATER ENVIRONMENT SERVICES CLACKAMAS COUNTY, OREGON OODLAND WATER RESOURCE RECOVERY FACILITY CHEMICAL IMPROVEMENT PROJECT Kennedy Jenks	, GENERAL EQUIPMENT DESIGNATIONS AND PROCESS IDENTIFICATION CODES DATE DECEMBER 2024 SHEET 4 OF 19 G-004

F

PIPE ГҮРЕ	MATERIAL	LINING	VALVE SYSTEM	TEST PRESSUE	TEST MEDIUM	ALLOWABLE LEAKAGE	TEST DURATION
PVC-1	PVC	N/A	С	150	WATER	NONE	4 HOURS
PVC-1	PVC	N/A	A	10	WATER	NONE	4 HOURS
GSP	GAL STL	N/A	A	150	WATER	NONE	4 HOURS

	G		H			
		PIPING ACCE	SSORIES AND	FITT	ING	iS
N	IOTOR	 工	FLANGE UNION TEE			
S	SUBMERSIBLE		Y STRAINER FLOW STRAIGHTENING SCREWED CAP WELDED CAP	VANE		
۲	/ERTICAL TURBINE PUMP T-HEAD		BLIND FLANGE QUICK DISCONNECT REDUCER (CONCENTRIC REDUCER (ECCENTRIC)	C)		
۲	/ERTICAL TURBINE PUMP INTAKE	— ≻Д нв ⊦√~ч гЧ	HOSE BIBB CONNECTION CHEMICAL PIPING FLEXI FLEXIBLE HOSE FLEXIBLE TANK CONNEC	N IBLE COI CTION	NNECT	ΓΙΟΝ/
S] N S	/ETERING SOLENOID		BRAIDED METAL HOSE METAL BELLOWS EXPANSION JOINT FLEXIBLE COUPLING FLANGED COUPLING AD	DAPTER		
F	ROTARY PUMP		DISASSEMBLING JOINT DRAIN SPRAY NOZZLE			
RS—			THERMOWELL			
F	ĀN		CALIBRATION CYLINDER	8		
Я С	RECIPROCATING COMPRESSOR		DIAPHRAGM SEAL ANNULAR SEAL			
S	SUBMERSIBLE		RUPTURE DISK, PRESSU RUPTURE DISK, VACUUN PURGE	JRE		
		VALVE AND G	ATE OPERATO	DRS		
] 	NCLIINED SCREW				CYLI SOLI	NDER OPERATOR ENOID OR
) (т	GRAVITY BELT THICKENER	NOTES				
	SLUDGE GRINDER	 SEE THE PRECEDIN PROCESS IDENTIFIC THIS IS A GENERAL 	IG DRAWING FOR EQUIPM CATION CODES. IZED LEGEND SHEET. SEE	IENT DE	SIGNA SA S5.	TIONS AND 1, S5.3 AND S7.3.
ΓY	GE	NERAL PROCES	SS SYMBOLS			SCALE NTS JOB NO 2376011.00 DATE DECEMBER 2024 SHEET 5 OF 19 G-005

	SCALES	SUPERED PROFESSION NGINEEPPOT	DESIGNED BK	WATER ENVIRONMENT SERVICES CLACKAMAS COUNTY, OREGON
	0 25mm IF THIS BAR IS NOT DIMENSION SHOWN,		DRAWN CEC	HOODLAND WATER RESOURCE RECOVERY FACILI CHEMICAL IMPROVEMENT PROJECT
BY	ADJUST SCALES ACCORDINGLY.	EXPIRATION DATE: 06/30/2025	CHECKED MDH	K Kennedy Jenks

OB NO							
2376011.00							
ATE							
DECEMBER 2024							
HEET	6	OF	19				
C-001							

1" = 40'

SCALE

INSTRUMENT CALLOUTS AND TAG SCHEMA

TYPICAL TAG FORMAT INSTRUMENT TAG NUMBER LIT-123 LIT FUNCTIONAL IDENTIFICATION FIRST LETTER

IT

SUCCEEDING LETTER(S)

LOOP NUMBER 123

EXPANDED TAG FORMAT 20LIT-123A 20 LIT L IT 123

INSTRUMENT TAG NUMBER AREA NUMBER FUNCTIONAL IDENTIFICATION FIRST LETTER SUCCEEDING LETTER(S) LOOP NUMBER **OPTIONAL SUFFIX**

	FIRST LETTER	(1)	SUCCEEDING LETTERS (15)			
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION		
А	ANALYSIS (2)(3)(4)		ALARM			
В	BURNER, COMBUSTION (2)		USER'S CHOICE (5)	USER'S CHOICE (5)	l	
С	USER'S CHOICE (3a)(5)			CONTROL (23a)(23e)	(
D	DENSITY	DIFFERENTIAL	DAMPER			
Е	VOLTAGE (2)		SENSOR (PRIMARY ELEMENT)			
F	FLOW, FLOW RATE (2)	RATIO (FRACTION) (2b)			Γ	
G	USER'S CHOICE		GLASS, VIEWING DEVICE (16)		Γ	
Н	HAND (2)				Γ	
I	CURRENT (ELECTRICAL)(2)		INDICATE (17)		Γ	
J	POWER (2)		SCAN (18)		Γ	
К	TIME, TIME SCHEDULE (2)	TIME RATE OF CHANGE (12c)(13)		CONTROL STATION (24)	Γ	
L	LEVEL (2)		LIGHT (19)		Γ	
М	MOISTURE	MOMENTARY			1	
Ν	USER'S CHOICE (5)		USER'S CHOICE (5)	USER'S CHOICE (5)	Ī	
0	USER'S CHOICE (5)		ORIFICE, RESTRICTION		(
Р	PRESSURE, VACUUM (2)		POINT (TEST) CONNECTION		Γ	
Q	QUANTITY (2)	INTEGRATE, TOTALIZE	INTEGRATE, TOTALIZE		Γ	
R	RADIATION (2)		RECORD (20)		Γ	
S	SPEED, FREQUENCY (2)	SAFETY (14)		SWITCH (23b)	5	
Т	TEMPERATURE (2)			TRANSMIT	Γ	
U	MULTI VARIABLE (2)(6)		MULTIFUNCTION (21)	MULTIFUNCTION (21)	ſ	
V	VIBRATION, MECHANICAL ANALYSIS (2)(4)(7)			VALVE, DAMPER, OR LOUVER (23c)(23e)		
W	WEIGHT, FORCE (2)		WELL, PROBE		Γ	
Х	UNCLASSIFIED (8)	X AXIS (11c)	ACCESSORY DEVICES (22) UNCLASSIFIED (8)	UNCLASSIFIED (8)	l	
Y	EVENT, STATE, PRESENCE (2)(9)	Y AXIS (11c)		RELAY, COMPUTE, CONVERT	Γ	
Z	POSITION, DIMENSION (2)	Z AXIS (11c), SAFETY INSTRUMENTED SYSTEM (30)		DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	Γ	

NOTE: NUMBERS IN PARENTHESES REFER TO EXPLANATORY NOTES IN ANSI/ISA-5.1-2009, SECTION 4.2

	LOCATED IN FIELD VISIBLE AT LOCATION OPERATOR ACCESSIBLE	LOCATED ON MAIN PANEL VISIBLE ON PANEL FRONT OPERATOR ACCESSIBLE	LOCATED IN MAIN PANEL CABINET NOT VISIBLE ON PANEL FRONT NOT OPERATOR ACCESSIBLE	LOCATED ON SECONDARY PANEL VISIBLE ON PANEL FRONT OPERATOR ACCESSIBLE	LO NOT V NOT
SHARED DISPLAY SHARED CONTROL	A B	A B		A B	
PROGRAMMABLE LOGIC CONTROL	AB	A B		A B	
COMPUTER FUNCTION			A = A = B = D	A B D	
INSTRUMENT	A B D	A B D		A C B D	
PILOT LIGHT	C A B D	C A B D			

ШЩΟ A B L L $/A \setminus$ B В ANALOG MEASURED VARIABLES MAY ALSO

LETTER MAPPING:

A: IDENTIFICATION LETTERS (SEE TABLE OR REFER TO ANSI/ISA-5.1-2009; TABLE 4.1) **B: LOOP NUMBER**

C: USER DESCRIPTOR/FUNCTION DESIGNATION (SEE LIST THIS SHEET) D: MEASUREMENT (REFER TO ANSI/ISA-5.1-2009; TABLE 5.2.2)

E: PROCESS CONTROL DESCRIPTOR LINE 1

F: PROCESS CONTROL DESCRIPTOR LINE 2

INDICATE THE PRESENCE OF DERIVED SETPOINTS USED FOR ALARM GENERATION

DISPLAY AND CONTROL SYMBOLS FOR

G: PROCESS CONTROL DESCRIPTOR LINE 3

ISSUED FOR BID				
ANY PRINTS NOT BEARING THIS STAMP MAY HAVE BEEN PRINTED PRIOR TO ADVERTISING AND CANNOT BE CONSIDERED AS BID DOCUMENTS. USERS OF THIS DOCUMENT IN EDITABLE ELECTRONIC FORMATS ARE CAUTIONED AGAINST USE WITHOUT FIRST DETERMINING WHETHER CHANGES MAY HAVE BEEN MADE SUBSEQUENT TO ITS PREPARATION.	NO	REVISION	DATE	

Α

CHECKED

MDH

L DAV

EXPIRATION DATE: 06/30/2025

_	
	DIMENSION SHOWN,
	ADJUST SCALES
	ACCORDINGLY.

ΒY

Kennedy Jenks

G	H		
	TYPICAL CONNECTIO	ONS	
		IN-LINE DEVICE	
DASH)	$\begin{array}{c} & & & \\ & & & & \\ & & & \\ & & & &$	DIRECT CONNECTION	TO PROCESS
IT CONNECTION SCRETE)	$A \\ B \\ D \\ C \\ A \\ C \\ A \\ C \\ C \\ C \\ C \\ C \\ C$	TEMPERATURE ELEME	ENT WITH WELL
AL		FILLED SYSTEM, DIAPH CONNECTION	IRAGM SEAL
GUIDED SIGNAL UNGUIDED/FREE AIR SIGNAL TION		SONIC SENSING	
		CONDUCTIVE SENSING	3
NET/IP) SIGNAL	$\begin{array}{c} & & \\$	ELECTROMAGNETIC (F	RADAR) SENSING
	$\begin{array}{c} A \\ B \\ D \\ \end{array}$	FLOAT SENSING	
TED		BUBBLER SENSING	
DNS	NOTES		
CTING CTING R OR ED FUNCTION AGE RENT MATIC OG RY RAULIC TROMAGNETIC/SONIC STANCE (ELECTRICAL)	 SEE THE GENERAL AND ELECTR ADDITIONAL SYMBOLS AND ABBI SEE THE GENERAL DISCIPLINE D AND PROCESS IDENTIFICATION (3. THIS IS A GENERALIZED LEGEND 4. FOR INSTRUMENT AIR QUALITY S WHERE LOOP NUMBERS EXCEED THE LOWER HALF OF THE BUBBL FOR THE LOOP NUMBER. SEE SPECIFICATION 17010 FOR (INTERCONNECTION DRAWING SU POWER SUPPLIES FOR INSTRUM PROVIDED BY THE INSTRUMENT, AND CURRENT REQUIREMENTS (SYSTEM. FIELD SWITCHES FOR ELECTRIC. BY THE ELECTRICAL CONTRACTOR PACKAGE. 	ICAL DISCIPLINE DRAWIN REVIATIONS. DRAWINGS FOR EQUIPME CODES. D SHEET. SEE ALSO ISA S STANDARDS, REFER TO I D THE LENGTH AVAILABL LE MAY APPEAR BROKEN COMPLETE DETAILS OF L JBMITTAL REQUIREMENT IENT LOOPS OR SYSTEM ATION SUPPLIER TO MEN OF THE COMPONENTS IN AL MOTOR OPERATION S OR UNLESS THEY ARE P	NGS FOR ENT DESIGNATIONS S5.1, S5.3 AND S7.3. ISA RP7.7. LE WITHIN A BUBBLE, N TO ALLOW SPACE LOOP DRAWING AND TS. IS SHALL BE ET THE VOLTAGE N EACH LOOP OR SHALL BE SUPPLIED ART OF A VENDOR
INSTRUM	ENTATION LEGEND AN	D NOTES	SCALE NTS JOB NO 2376011.00 DATE DECEMBER 2024
			SHEET 7 OF 19

I-001

	E(-S), PROGRESSIVE CAVI ITIVE DISPLACEMENT N END, POLYETHYLENE
S OPERATION PTP ENT IPE SECOND OTHER PEAR DEVELOP A AMPRICE PEAR	HANGER SSURE /ARY PELLER SSURE RELIEE VALVE PRE
Math AUGURES OF IPSACE PROVE	REDUCING VALVE NDS PER SQUARE INCH NDS PER SQUARE INCH AI (PRESSURE ABOVE VACI
AGE DOMESSION DOMESSION PAC PACH ASIM MECHNINGL, MERKERES H High ROUGE 0 F. ROUGE ASIM MECHNINGL, MERKERES HOR HORSEN F. ROUGE P. ROUGE AVS MERCINVICUE, MERKERES HOR HORSEN P. ROUGE P. ROUGE AVS MERCINVICUE, MERKERES HOR HORSEN P. ROUGE P. ROUGE BY BLAND FLANGE H HORSEN P. ROUGE P. ROUGE P. ROUGE BY BLAND FLANGE H HOR HORSEN P. ROUGE P	NDS PER SQUARE INCH G (PRESSURE ABOVE ATM SLEEVE P STATION SSURE SUSTAINING VALVE YURETHANE YVINYL CHLORIDE
MER TESTING AND WATERIAS HER	ABLE WATER /ER W OR DISCHARGE
IPD BELT DRIVE HIGH HARGEN REDUCE REDUCE </td <td>IUS EIVING</td>	IUS EIVING
BHO DRACE (DRSEPTOVER HSID PROVE HSID PROVE HSID PROVE	UCE(-R) ULAT(-E, -OR, -ION, -ING) ERVOIR
BIO BRITISH INERNAL UNIT PVAC HAR, VENTIALING, AND SCADA SUPPORTORY CS CONSTANT SPRED HV HV SCADA SUPPORTORY STANDARD CUE CENT CALCULATION(S) HZ HEIT Z (2VCLES PER SECOND) SEC SECOND(S) CENT CUERC FEET PER NUTE ISC INSTRUMENTATION AND CONTROL SHT SHEET CH CUERC FEET PER NUTE ISC INSTRUMENTATION AND CONTROL SHT SHEET SHEET <t< td=""><td>M OLUTIONS PER MINUTE UCED PRESSURE PRINCIP ET</td></t<>	M OLUTIONS PER MINUTE UCED PRESSURE PRINCIP ET
CENT CENT CENT COUNCY SEC SECOND(2) CFM CUBIC FEET FER NUTTE IKC INSTRUMENTATION AND CONTROL SHE T CFX CUBIC FEET FER SECOND IBC INSTRUMENTATION AND CONTROL SHE T CONTROL CUBIC FEET FER SECOND IBC INSTRUMENTATION AND CONTROL SHE T CONTROL CLASSIFICATION I, DIVISION I INFL INSTRUMENTATION AND CONTROL STRUCTION TO CONTROL CID CLASSIFICATION I, DIVISION 2 ISO ISO ISONETRIC STRUCTION TO CONTROL CID CLASSIFICATION I, DIVISION 2 ISO ISONETRIC STRUCTION TO CONTROL STRUCTION TO CONTROL CLR CLARCANCE) KLAVALTISI STRUCTISIS STRUCTISIS STRUCTISIS COME COMPRESSOR KVA KLAVALTISIS STRUCTISIS STRUCTISIS STRUCTISIS COME COMPRESSOR KVA KLAVALTISIS STRUCTISIS STRUCTISIS STRUCTISIS COME COMPRESSOR KVA KLAVALTISIS STRUCTISIS STRUCTISIS COME COMPRESSOR </td <td>ERVISORY CONTROL AND DATA ACQUISITION NDARD CUBIC FEET PFR M</td>	ERVISORY CONTROL AND DATA ACQUISITION NDARD CUBIC FEET PFR M
Orkk CHECK IN INCH-ES) SP STATUTOPESS CID CLASSIFICATION I, DIVISION 1 INTEL INTERUMENT(-TON) SRG SINULE RUBBER CR CLASSIFICATION I, DIVISION 2 INSTR INSTRUMENT(-TON) SRG SINULE RUBBER CR CAST IRCON-IPPE ISO STANLASSIC STANLASSIC STANLASSIC COL COL COL CONTROL KV KLUOVICIT-S) STANLASSIC STANLASSIC COL COMP COMPRESSOR KW KLUOVICIT-S) SUPP SUPPORT.S) COMP COMPROATION L L LEG FOUND-SNITCO-PAREL TB TRAUST BLOCK COV COMPROATION L L LEG FOUND-SNITCO-PAREL TB TRAUST BLOCK COV COMPROATION L L LEG FOUND-SNITCO-PAREL TB TRAUST BLOCK CUV CUBROTO, CUBRC FEET LCS LOCAL CONTROL STATION TD TOTAL LOTALDY CUV CUBROTO, CUBRC FEET LCS <td>OND(-S) ET ET METAL & AIR CONDITIO</td>	OND(-S) ET ET METAL & AIR CONDITIO
LININ LATLER V/A NLDVULL'SJ STL STL STEL COMP COMPRESSOR KW KLDVATT-SPERE(-S) STRC STRC STRCUTH,E,E,COMPRESSOR COMP CORPROTON L LENGTH SVM SVMMERRC/L CPLC COUPLING L LENGTH SVM SVMMERRC/L CT COUNSTERDED POLYINYL CHLORIDE LEC LOCAL CONTROL FAREL TDH TOTALLY ENDUC CT COUNSTERDER LCS LOCAL CONTROL FAREL TDH TOTALLY ENDUC CU FG CUBIC FOOT. CUBIC FEET LEL LOCAL CONTROL FAREL TTH THEW TEMPERTURE CU GUBC FOOT. CUBIC FEET LEL LOCAL CONTROL FAREL TTH THRUTHROUGH CU GUBC FOOT. CUBIC FEET LEG LOCAL CONTROL FARENT THRUT TRRUGH CU GUBC FOOT. CUBIC FEET LEG LUCATER PAPLOSIVE LIMIT THRUT TRRUGH CU MURE CLEMENT CHECK VALVE) LUCATER PAPLOSIVE LIMIT THRUT TRRUGH TARE DCA DOUBLE CHECK ASSEMBLY LUCATER LUCATER FOOT TOTAL TOTAL TOTAL DCA DOUBLE CHECK ASSEMBLY LUMT SWITCH TTH THRUTHROUGH DEG DEGREES CELSIUS MAX MAXMUM MAXMUM TYP TYPECAL DEGG	FIC PRESSURE CIFICATION(-S) LE RUBBER GASKET JOIN INLESS STEEL NDARD(-S)
CPVC CHILDRINTATED POLYNINUCHLORIDE LB(S) POUND(S) TB THRUST BLOCK CTR COOLING TWORE LCS LOCAL CONTROL STATION TEC TOTAL LYNAULY ENCL CU FT CUBIC FOOT, CUBIC FOOT, CUBIC FFET LE LOCAL CONTROL STATION TERPERATURE CU IN CUBIC FOOT, CU	EL UCTUR(-E, -AL) PORT(-S) IMETRICAL
LPGLlQUIFIED PETROLEUM GASTANKDCADOUBLE CHECK ASSEMBLYLSLIMIT SWITCHTANKDCADOUBLE CHECK ASSEMBLYLSLIMIT SWITCHT.RTHROUGH ROODTTATTHROUGH ROODTWIN LEMENT CHECK VALVE)MAXMAXIMUMTYPDEGDEGREES FARENHEITMCCMOTOR CONTROL CENTERUBCDEG FDEGREES FARENHEITMCCMOTOR CONTROL CENTERUBCUNIFORM BULLDHDUCTILE IRONMGLMGLMCCHANCALUDUNDERWRITERDHDUCTILE IRONMGLMGLMILLIGRAM SPEL ITERUNKUNKNOWNDIADIAMETERMGDMILLIGRAM SPEL ITERUNKUNKNOWNDIADIAMETERMGDMILLIGRAM SPEL ITERUNKUNKNOWNDIADIAMETERMGDMILLIGRAM SPEL ITERUNKUNKNOWNDIADIAMETERMGDMILLIGRAM SPEL ITERUNKUNKNOWNDIADIAMENON(S)MIRMILGAN SPEL ITERUNKUNKNOWNDIADIAMENON(S)MIRMISCELLANEOUSV/SVARIABLE SPEEDIPDUCTILE IRON PIPEMJMECHANICAL JOINTVACVACUMDISCHDISCONNECTMMBHBUT PER HOUR (MILLIONS)VARVARDISCHDISCONNECTMMDHMOON (MOOR OPERATED VALVEVFDVARIABLE SPEEDIPDUCTILE IRON PIPEMIRMOON (MOOR OPERATED VALVEVFDVARIABLE SPEEDISCHDISCONNECTMMDHMOON (MOOR OPE	UST BLOCK AL DYNAMIC HEAD ALLY ENCLOSED FAN COC PERATURE, TEMPORARY ALLY ENCLOSED NON-VEN OUGH
DEG DEGS DEGS DEGS TYP TYP DEG F DEGREES CELSIUS MBH BTU PER HOUR (THOUSANDS) UBC UNIFORM BUILE DEM DEG F DEGREES FARENHEIT MCC MOTOR CONTROL CENTER UBC UNIFORM BUILE DH HEAD LOSS (IN FEET) MFR MAUUFACTURER UL UNKENUWKNOWN DIA DUCTLE IRON MG/L MILLIGANKS PER LITER UNKENUWKNOWN DIA DIMENSION(-S) MIS MILLIGANKS PER LITER UNKENUWKNOWN DIAGONAL MILLS ONE-THOUSANDTH OF AN INCH UU ULTRAVIOLET DIAP DIAPHRAGM MIN MINMIMUM V VOLTS DIMM DIMENSION(-S) MIS BUSCHDUR (MILLIONS) VAR VARIBLE SPEC DIP DUCTLE IRON PIPE MJ MECHANICAL JOINT VEL VELOCITY VENDOR CONT DISC DISCHARGE MOD(-S) MODIF(-Y, -ICATIONS) VCP VENDOR CONT DISC DISTRIBUTION MON MONON MOTOR OPERATED VALVE VFD	K AL, TOTALIZE(R) OUGH ROOF RMOSTAT
DIADIARDIARMGDMICLON GALUVULTRAVIOLETDIAGDIAGONALMILCS)ONE-THOUSANDTHO FAN INCHVVOLTSDIARDAPHRAGMMINMINMUMVVOLTSDIMDIMENSION-S)MISCMISCELLANEOUSVSVARIABLE SPECDIPDUCTILE IRON PIPEMJMECHANICAL JOINTVACVACUUMDISCDISCHARGEMODI-S)MODI-S)VARVARIES VARIABLEDISCDISCHARGEMODI-S)MODI-S)VARVARIES VARIABLEDISCHDISCHARGEMODI-S)MODI-S)VOLVCPVENDOR CONTDISCHDISTRIBUTIONMONMONUMENTVELVELVELDRDOORMOVMOTOR OPERATED VALVEVFDVARIABLE FREDDRDOUBLE RUBBER GASKET JOINTMT(-D, -G)MOUNT(-ED, -ING)VOLVOLLDUPDUPLEXNORTHVTPVERTICAL TUREDUPDUPLEXNORTHVTPVERTICAL TUREECCECCENTRICNANOT APPLICABLEWESTEFFLEFFLUENTNACLSODIUM HYPOCHLORITEWWESTEGLELEVATIONNFCNOT FOR CONSTRUCTIONWBWE TBULBELE LEVATIONNFCNOT NO CONTRACTWSWATER TUREATHER TUREATHER TUREATHER TO ANTERNAL FORTECTION AGENCYNFTELE LEBOWNH3AMMONIAWPWATER TREATHVTPWATER SURFACELLELBOWNRSNORMALLY OPEN, NUMBERWSPWELDED	CAL ORM BUILDING CODE ERDRAIN ERWRITERS LABORATORI NOWN
DISTRDISTRIBUTIONMONMONUMENTVELOCIVINDRDOORMOVMOVO OPERATED VALVEVFDVARIABLE FRECDRDOUBLE RUBBER GASKET JOINTMT(-0,-0)MOUNT(-ED,-ING)VOLVOLUMEDUPDUPLEXMTRMTRMOTORVTVENTDUPDUPLEXMTRMORTHVTPVENTICALTUREECCECCENTRICNAOCLSODIUM HYPOCHLORITEWWESTEFFLEFFLUENTNAOHSODIUM HYPOCHLORITEWWESTEGLENERGY GRADE LINENCNORTHUTOLOSEDW/OWITHUTELECELECTRIC(-AL)NGNATURAL GASWCWATTER COLUMIELLEELECTRIC(-AL)NGNATURAL GASWCWATTER COLUMIELLEELBOWNH3AMONIAWPWEATHER VERATIONELLECELECTRIC(-AL)NGNOT IN CONTRACTWSWATER COLUMIELLEELBOWNH3AMONIAWPWEATHER VERATIONEMERGEMGRERNORNORMALLY OPEN, NUMBERWSPWELDED STEELENGRENGINEERNORNORMALLY OPEN, NUMBERWSPWELDED STEELENGRENGINEERNORNORMALLY OPEN, NUMBERWTPWASTEWATER TREATINEQUAL (-LY12ATION)NRSNORMALLY DPEN, NUMBERWWTPWASTEWATER TEQUAL (-LY12ATION)NRSNORMALLY THROTTLEDWWTPWASTEWATER TEQUAL (-LY12ATION)NRSNOT TO SCALEWTPWASTEWATER T <td< td=""><td>RAVIOLET TS IABLE SPEED UUM IES, VARIABLE DOR CONTROL PANEL</td></td<>	RAVIOLET TS IABLE SPEED UUM IES, VARIABLE DOR CONTROL PANEL
ECCECC ENTRICN/ANOT APPLICABLEVTRVENT TO ROOPEFFICEFFICIENCYNAOCLSODIUM HYPOCHLORITEWWESTEGLENERGY GRADE LINENCNAOHSODIUM HYDROXIDEW/WITHEGLELEVATIONNCNORMALLY CLOSEDW/OWITHOUTELELEVATIONNFCNOT FOR CONSTRUCTIONWBWET BULBELEELECTRIC(-AL)NGNATURAL GASWCWATER COLUMIELLELBOWNICNOT IN CONTRACTWSWATER SURFACENCLENCLOSURENONORMALLY OPEN, NUMBERWSPWELDED STEELENGENGINEERNORMNORMALWTPWATER TREATMEQEQUAL (-LY, -IZATION)NRSNON-RISING STEM GATE VALVEWWWASTEWATEREQEQUAL (-LY, -IZATION)NRSNON-RISING STEM GATE VALVEWWWASTEWATEREQEQUIPMENTNTNORMALLY THROTILEDWWTPWASTEWATERESFEXTERNAL STATIC PRESSUREO/COPEN/CLOSEWWTPWASTEWATER TEXHEXHAUSTO/DPOPEN DRIP PROOFEXHEXIST EXISTINGOFOVERFLOWEXTEXTERNALOFOVERFLOWINSTALLEDINSTALLEDINSTALLEDFABFABRICATE(-D)OS&YOUTSIDE SCREW AND YOKEINSTALLEDFACILLT(-Y, -IES)FACILFACILLT(-Y, -IES)(RISING STEM GATE VALVE)INSTALLEDINSTALLED	CITY IABLE FREQUENCY DRIVE UME T TICAL TURBINE PUMP
LLECLLEC IRIC(-AL)NGNATURAL GASWCWATER COLUMIELLELBOWNH3AMMONIAWPWEATHER PRO'EMERGEMERGENCYNICNOT IN CONTRACTWSWATER SURFACENCLENCLOSURENONORMALLY OPEN, NUMBERWSPWELDED STEELENGRENGINEERNORMNORMALWTPWATER TREATMEPAENVIRONMENTAL PROTECTION AGENCYNPTNATIONAL PIPE THREADWTRWATEREQEQUAL (-LY, -IZATION)NRSNON-RISING STEM GATE VALVEWWWASTEWATEREQPMEQUIPMENTNTNORMALLY THROTTLEDWWTPWASTEWATER TES/EWEMERGENCY SHOWER/EYE WASHNTSNOT TO SCALEWWTPWASTEWATER TESTESTIMATE(-D)O/COPEN/CLOSEETCETCETCETERAO3OZONEEXHEXHAUSTODPOPEN DRIP PROOFEXPEXPANSIONOFCVERFLOWEXTEXTERNALOFCOWNER FURNISHED, CONTRACTORINSTALLEDINSTALLEDFABFABRICATE(-D)ORIGORIG ORIGINALINSTALLEDINSTALLEDFABFABRICATE(-D)ORIGORSAYOUTSIDE SCREW AND YOKEINSTALLEDINSTALLEDFABFACILIT(-Y, -IES)(RISING STEM GATE VALVE)INSTALLEDINSTALLED	ST H HOUT BULB
EQPM EQDIPMENT NT NORMALLY THROTTLED WWTP WASTEWATER ES/EW EMERGENCY SHOWER/EYE WASH NTS NOT TO SCALE WWTP WASTEWATER ESP EXTERNAL STATIC PRESSURE 0/C OPEN/CLOSE Vertice Vertice Vertice EST ESTIMATE(-D) O/C OPEN/CLOSE Vertice Vertice Vertice EXH EXHAUST O3 OZONE Vertice Vertice Vertice EXIST EXISTING OF OVERFLOW Vertice Vertice Vertice EXP EXPANSION OFCI OWNER FURNISHED, CONTRACTOR INSTALLED EXT EXTERNAL ORIG ORIGINAL FAB FABRICATE(-D) OS&Y OUTSIDE SCREW AND YOKE FACIL FACILIT(-Y, -IES) (RISING STEM GATE VALVE)	ER COLUMN THER PROTECTED ER SURFACE DED STEEL PIPE ER TREATMENT PLANT ER STEWATER
EXH EXHAUST ODP OPEN DRIP PROOF EXIST EXISTING OF OVERFLOW EXP EXPANSION OFCI OWNER FURNISHED, CONTRACTOR EXT EXTERNAL INSTALLED FAB FABRICATE(-D) OS&Y OUTSIDE SCREW AND YOKE FACIL FACILIT(-Y, -IES) (RISING STEM GATE VALVE)	IEWAIER IREATMENT PL
FAB FACILIT(-Y, -IES)	
FC FLEXIBLE COUPLING	

A 0-	B I	C D	E	F G	H	
MA	MECHANICAL ABBREVIATIONS		MECHANICAL NOTES			
onment Services/Projects/Hoodland Chemical Improvements_2376011.00/10-Design/10.06-Drawings/Mechanical-Process/2376011.00-M-001 User: CHERYL LOVE Point Plot Date: 12/5/2024 1:54 PM LA C	PO POOL FEET * POOL FEET *	C D P PIPE PC(-S) PIECE(-S), PROGRESSIVE CAVITY PD POSITIVE DISPLACEMENT PE PLAIN END, POLYETHYLENE PH PIPE HANDER PROP PROPELLER PROP PROPELLER PROP PROPELLER PROP PROPELLER PROP PROPELLER PROP PROSSURE ROLARE INCH PSI POUNDS PER SQUARE INCH PSI POUNDS PER SQUARE INCH ASSOLUTE (PRESSURE ABOVE VACUUM) PSI PIPE SLEEVE PSI PUMP STATION PSV PRESSURE ABOVE VACUUM) PSI PUMP STATION PSV PRESSURE SUSTAINING VALVE PW POLYUPETHANE PW POLYUPETHANE PW POLYUPETHANE PWR POLYUPETHANE PWR REGULAT(E, -ON) REG RECIRC RECIVING REC RECULAT(E, -ON, -ING) RED REDUCE(-R) RM ROOM RM ROOM RM ROOM RM ROOM RM REQUCE(-R) RM REQUCE(-R) RM REQUCE(-R) RES </td <td>PIPING INFORMATION PROVIDED ARE MINIMUM REQUIREMENTS. INFORMATION PROVIDED ARE MINIMUM REQUIREMENTS SHALL OGMESEPOID TO ADJACENT STRAIGHT RUN OF PIPE. UNLESS OTHE WISE NOTCATED. TYPE OF JOINT SHALL BE AS SHOWN ON THE DRAWING. APPROXIMATE FINAL SUPPORT REQUIREMENTS SHALL BE PROVIDED IN THE FIELD. SUBMITTED, AND APPROVED BY EXISTING SUPPORT REQUIREMENTS SHALL BE AS SPECIFIED IN SHALL BE PROVIDED WITH THRUST TIES, BLOCKS, OR ANCHORS, UNLESS OTHERWISE NOTED. THRUST PROTECTION SHALL BE PROVIDED WITH THRUST TIES, BLOCKS, OR ANCHORS, UNLESS OTHERWISE NOTED. THRUST PROTECTION SHALL BE PROVIDED WITH THRUST TIES, BLOCKS, OR ANCHORS, UNLESS OTHERWISE NOTED. THRUST PROTECTION SHALD BE SHOWN ARE NOT NECESSARY TO FACILITATE SHEET ARE USED THROUGHOUT THE DRAWINGS ALL OF THE ITEMS SHOWN ARE NOT NECESSARY TO FACILITATE OTHER CONSECTION OF UNIONS SHOWN ON THIS SHEET ARE USED THROUGHOUT THE PRAVINGS ALL OF THE ITEMS SHOWN ARE NOT NECESSARY TO FACILITATE OTHER CONSECTION OF UNIONS SHOWN ON THE SHEET ARE USED THROUGHOUT THE PRAVINGS ARE APPROXIMATE PROVIDE ALL UNIONS NECESSARY TO FACILITATE OTHER CONSECTION OF UNIONS SHOWN ON THE SHEET ARE USED THROUGHOUT THE PRAVINGS ARE APPROXIMATE PROVIDE ALL UNIONS NECESSARY TO FACILITATE SHOWN ARE NOT NECESSARY TO FACILITATE SHOWN ARE NOT NECESSARY TO FACILITATE SHOWN ARE NOT NECESSARY TO FACILITATE APPURTIEMANCES PROVIDED UNDERCTION ARROW AND PIPE USE. PROVIDING AND FACILITIES. ALD PIPING SITO DE LABELED UNLESS NOTED OTHERWINSE. LABELING SHALL INCLUDE FLOW DIRECTION ARROW AND PIPE USE. PIPE UDATIFICATION REQUIREMENTS ARE GIVEN IN SPECIFICATION. STAULCTION. MACCORDANCE WITH THE SPECIFICATIONS. STAULCTION IN ACCORDANCE WITH THE SPECIFICATIONS. STAULCTION IN ACCORDANCE WITH THE SPECIFICATIONS. STAULCTION IN ACCORDANCE WITH THE SPECIFICATIONS. SANGKER STRAPS. SUPPORTS. OR BUILDING CONSTRUCTION. SANGKER STRAPS. SUPPORTS AND HANDERY</td> <td></td> <td></td> <td></td>	PIPING INFORMATION PROVIDED ARE MINIMUM REQUIREMENTS. INFORMATION PROVIDED ARE MINIMUM REQUIREMENTS SHALL OGMESEPOID TO ADJACENT STRAIGHT RUN OF PIPE. UNLESS OTHE WISE NOTCATED. TYPE OF JOINT SHALL BE AS SHOWN ON THE DRAWING. APPROXIMATE FINAL SUPPORT REQUIREMENTS SHALL BE PROVIDED IN THE FIELD. SUBMITTED, AND APPROVED BY EXISTING SUPPORT REQUIREMENTS SHALL BE AS SPECIFIED IN SHALL BE PROVIDED WITH THRUST TIES, BLOCKS, OR ANCHORS, UNLESS OTHERWISE NOTED. THRUST PROTECTION SHALL BE PROVIDED WITH THRUST TIES, BLOCKS, OR ANCHORS, UNLESS OTHERWISE NOTED. THRUST PROTECTION SHALL BE PROVIDED WITH THRUST TIES, BLOCKS, OR ANCHORS, UNLESS OTHERWISE NOTED. THRUST PROTECTION SHALD BE SHOWN ARE NOT NECESSARY TO FACILITATE SHEET ARE USED THROUGHOUT THE DRAWINGS ALL OF THE ITEMS SHOWN ARE NOT NECESSARY TO FACILITATE OTHER CONSECTION OF UNIONS SHOWN ON THIS SHEET ARE USED THROUGHOUT THE PRAVINGS ALL OF THE ITEMS SHOWN ARE NOT NECESSARY TO FACILITATE OTHER CONSECTION OF UNIONS SHOWN ON THE SHEET ARE USED THROUGHOUT THE PRAVINGS ARE APPROXIMATE PROVIDE ALL UNIONS NECESSARY TO FACILITATE OTHER CONSECTION OF UNIONS SHOWN ON THE SHEET ARE USED THROUGHOUT THE PRAVINGS ARE APPROXIMATE PROVIDE ALL UNIONS NECESSARY TO FACILITATE SHOWN ARE NOT NECESSARY TO FACILITATE SHOWN ARE NOT NECESSARY TO FACILITATE SHOWN ARE NOT NECESSARY TO FACILITATE APPURTIEMANCES PROVIDED UNDERCTION ARROW AND PIPE USE. PROVIDING AND FACILITIES. ALD PIPING SITO DE LABELED UNLESS NOTED OTHERWINSE. LABELING SHALL INCLUDE FLOW DIRECTION ARROW AND PIPE USE. PIPE UDATIFICATION REQUIREMENTS ARE GIVEN IN SPECIFICATION. STAULCTION. MACCORDANCE WITH THE SPECIFICATIONS. STAULCTION IN ACCORDANCE WITH THE SPECIFICATIONS. STAULCTION IN ACCORDANCE WITH THE SPECIFICATIONS. STAULCTION IN ACCORDANCE WITH THE SPECIFICATIONS. SANGKER STRAPS. SUPPORTS. OR BUILDING CONSTRUCTION. SANGKER STRAPS. SUPPORTS AND HANDERY			
Documents\Clients\Clackamas County, OR\Water Environment Services\Proj	DTL(-S) DUPDETAIL(-S) DUPLEXMTRMOTORDUPDUPLEXNNORTHECCECCENTRICNAOCLSODIUM HYPOCHLORITEEFFICEFFICIENCYNAOCLSODIUM HYPOCHLORITEEGLENERGY GRADE LINENCNORMALLY CLOSEDEGLELEVATIONNFCNOT FOR CONSTRUCTIONELLCELECTRIC(-AL)NGNATURAL GASELLELBOWNH3AMMONIAEMERGEMERGENCYNICNOT IN CONTRACTENCLENCLOSURENONORMALLY OPEN, NUMBERENGRENGINEERNORMNORMALEPAENVIRONMENTAL PROTECTION AGENCYNPTNATIONAL PIPE THREADEQEQUAL (-LY, -IZATION)NRSNON-RISING STEM GATE VALVEEOPMEQUIPMENTNTNORMALLY THROTTLEDESTESTIMATE(-D)O/COPEN/CLOSEETCET CETERAO3OZONEEXISTEXISTINGOPOPEN DRIP PROOFEXISTEXISTINGOFOVERFLOWEXTEXTERNALOFOVERFLOWEXTEXTERNALOFOVERFLOWFABFABRICATE(-D)OS&YOUTSIDE SCREW AND YOKE (RISING STEM GATE VALVE)FACILLFACILIT(-Y, -IES) (RISING STEM GATE VALVE)ORIG ORIGINAL	VT VENT VTP VERTICAL TURBINE PUMP VTR VENT TO ROOF W WEST W/ WITH W/O WITHOUT WB WET BULB WC WATER COLUMN WP WEATHER PROTECTED WS WATER SURFACE WSP WELDED STEEL PIPE WTP WATER TREATMENT PLANT WTR WATER WW WASTEWATER WW WASTEWATER TREATMENT PLANT				
pw:\\kjce-pw.bentley.com:kjce-pw\l	ANY PRINTS NOT BEARING THIS STAMP MAY HAVE BEEN PRINTED PRIOR TO ADVERTISING AND CANNOT BE CONSIDERED AS BID DOCUMENTS. USERS OF THIS DOCUMENT IN EDITABLE ELECTRONIC FORMATS ARE CAUTIONED AGAINST USE WITHOUT FIRST DETERMINING WHETHER CHANGES MAY HAVE BEEN MADE SUBSEQUENT TO ITS PREPARATION. NO REV	ISION DATE BY	SCALES 1" 25mm S BAR IS NOT SION SHOWN, JST SCALES CORDINGLY. DESIGNED MDH DRAWN HOOD CEC CHECKED MDH CEC	WATER ENVIRONMENT SERVICES CLACKAMAS COUNTY, OREGON LAND WATER RESOURCE RECOVERY FACILITY CHEMICAL IMPROVEMENT PROJECT	MECHANICAL ABBREVIATIONS AND NOTES	SCALE NTS JOB NO 2376011.00 DATE DECEMBER 2024 SHEET 9 OF 19 M-001

G	GENERAL SHEET NOTES									
1.	CONTRACTOR TO PROTECT IN PLACE ALL EXISTING PIPING AND EQUIPMENT NOT BEING DEMOLISHED.									
2.	CONTRACTOR TO COORDINATE WORK WITH OPERATOR BEFORE BEGINNING WORK.									
_										

SHEET KEYNOTES

- A. DEMOLISH PUMPING SKID SYSTEM: 1. CLOSE AND LOCK VALVE PRIOR TO REMOVAL OF PUMP SKID SYSTEM.
- 2. PROTECT IN PLACE AND REUSE EXISTING CONDUIT CONNECTIONS.
- B. DEMOLISH EXISTING 150 GAL SODIUM BISULFITE STORAGE TANK.

DEMOLISH OR SALVAGE TO OWNER WHERE INDICATED

LEGEND

////////

DETAIL

DETAIL

SCALE: NTS

Υ	SODIUM BISULFITE EXISTING CONDITIONS AND DEMO PLANS AND DETAILS	SCALE AS SHOWN JOB NO 2376011.00 DATE DECEMBER 2024
		SHEET 10 OF 19 M-101

GENERAL SHEET NOTES

TEMPORARILY RELOCATED EXISTING BISULFITE SKID AS NEEDED TO MANTAIN SYSTEM OPERATION. BISULFITE DOSING SHALL BE MAINTAINED THROUGHOUT THE WORK.

ΓY	SODIUM BISULFITE AREA IMPROVEMENT PLANS AND SECTIONS	SCALE 1/2" = 1'-0" JOB NO 2376011.00 DATE DECEMBER 2024
		SHEET 11 OF 19 M-102

RED PROP WATER ENVIRONMENT SERVICES NGINEED SCALES MDH CLACKAMAS COUNTY, OREGON 76443PE 图 Ř HOODLAND WATER RESOURCE RECOVERY FACILI DRAWN CHEMICAL IMPROVEMENT PROJECT CEC IF THIS BAR IS NOT OREGON DIMENSION SHOWN, ADJUST SCALES ACCORDINGLY. CHECKED Kennedy Jenks EL DAVID MDH EXPIRATION DATE: 06/30/2025 ΒY

DESIGNED

ΤY	CHEMICAL SYSTEM DETAILS - I	NTS JOB NO 2376011.00 DATE
		SHEET 13 OF 19 M-104

BEEL-THICAL HOTES ELECTRICAL MOTION ELECTRICAL MOTION ELECTRICAL MOTION ACCOUNTS AND ACCOUNT		В	C		D		E	F
	ABBREVIATIONS							ELECTRICAL NOTES
Number Number <td>' FOOT, FEET</td> <td>FLEX</td> <td>FLEXIBLE</td> <td>NEMA</td> <td>NATIONAL ELECTRICAL MANUFACTURER'S</td> <td>VAR</td> <td>VARIES, VARIABLE, VOLT-AMPERES</td> <td>1. THIS IS A GENERALI ED LEGEND SHEET. THIS CONTRACT MAY NOT USE ALL INFORMA</td>	' FOOT, FEET	FLEX	FLEXIBLE	NEMA	NATIONAL ELECTRICAL MANUFACTURER'S	VAR	VARIES, VARIABLE, VOLT-AMPERES	1. THIS IS A GENERALI ED LEGEND SHEET. THIS CONTRACT MAY NOT USE ALL INFORMA
Image: marked biology of the second	" INCH, INCHES NUMBER	FO FREQ	FIBER OPTIC FREQUENCY	NETA	ASSOCIATION INTERNATIONAL ELECTRICAL TESTING	VCP	REACTIVE VENDOR CONTROL PANEL	2. THE INSTALLATION OF ALL EQUIPMENT, RACEWAYS, CONDUCTORS, AND CABLES SHO
Normality Norma	PERCENT AND	FT FU	FOOT, FEET FUSE	NFC	ASSOCIATION NOT FOR CONSTRUCTION	VFD VFI	VARIABLE FREQUENCY DRIVE (AC) VACUUM FAULT INTERRUPTER	THESE DRAWINGS OR DESCRIBED IN THE SPECIFICATIONS SHALL CONFORM TO THE REQUIREMENTS SET FORTH IN THE LATEST EDITIONS OF THE NATIONAL ELECTRICAL
Display		FUT		NFPA	NATIONAL FIRE PROTECTION	VS	VOLTMETER SWITCH	ALL APPLICABLE LOCAL CODES AND UTILITY COMPANY STANDARDS. IT IS THE CONTR
	LESS THAN	FVNR FVR	FULL VOLTAGE, NON REVERSING	NH3	AMMONIA	W	WIDE, WIDTH, WIRE, WATTS, WEST	
Control of Contro	EQUALS GREATER THAN	FWD	FORWARD	NIC NO	NOT IN CONTRACT NORMALLY OPEN, NUMBER	W/ W/O	WITH WITHOUT	 ELECTRICAL CONTRACTOR SHALL VISIT THE SITE PRIOR TO BIDDING THE PROJECT TO SCOPE OF WORK WITH FIELD CONDITIONS. PARTICULAR ATTENTION SHOULD BE GIV
	AMPERE(-S)	G GAC	GROUND (ELECTRICAL) GRANULAR ACTIVATED CARBON	NORM NTS	NORMAL NOT TO SCALE	WAN WHDM	WIDE AREA NETWORK WATT-HOUR DEMAND METER	CONDUIT RUNS IN EXISTING BUILDINGS.
Support of the second	VC AIR CONDITIONING	GAL				WHM	WATT-HOUR METER	4. NOTIFY THE ENGINEER IMMEDIATELY IN WRITING IF CONFLICTS IN EQUIPMENT LOCAT
No. 1. Control of the second secon	ANALOG TO DIGITAL	GND	GROUND	0/0	O ONE	WR	WEATHER RESISTANT	OTHER REASON. NO PAYMENT WILL BE MADE FOR CHANGES WHICH HAVE NOT BEEN
A MARKEN PROPERTY AND	BAN(-D) ABANDON(-ED) .C ALTERNATING CURRENT	GRS	GALVANI ED RIGID STEEL	ODP	OPEN DRIP PROOF OWNER FURNISHED, CONTRACTOR	WTP	WATER TREATMENT PLANT WATER	REVIEWED BY THE ENGINEER.
	NF AMPERE FRAME	H HD	HIGH, HEIGHT HEAT DETECTOR	ΟΙΤ	INSTALLED OPERATOR INTERFACE TERMINAL	WW WWTP	WASTEWATER WASTEWATER TREATMENT PLANT	5. CONDUIT ROUTING SHOWN ON PLAN DRAWINGS IS DIAGRAMMATIC ONLY. RACEWAYS
A Market Description of the second of t	FF ABOVE FINISHED FLOOR	HDPE HGR	HIGH DENSITY POLYETHYLENE	OL ORIG	THERMAL OVERLOAD RELAY	XEMR	TRANSFORMER	EXPOSED RACEWAYS SHALL BE INSTALLED PARALLEL OR PERPENDICULAR TO BEAM
		HH	HANDHOLE	OSC	OPEN/STOP/CLOSE	XP	EXPLOSION PROOF	REFERALSO TO THE CONTRACT SPECIFICATIONS.
 A Second S	ANN ANNUNCIATOR	HOA	HOMAN MACHINE INTERFACE HAND-OFF-AUTOMATIC	01	OVER TEMPERATURE			6. VERIFY THE EXACT LOCATION OF TERMINAL BOXES AND CONDUIT ENTRANCES TO AL AGAINST APPROVED SHOP DRAWINGS BEFORE STUBBING UP CONDUITS. CONDUIT S
	NI ANTENNA O ANALOG OUTPUT	HOR HP	HAND-OFF-REMOTE HORSEPOWER	P PA	POLE PUBLIC ADDRESS			SHALL NOT BE MORE THAN 6 INCHES FROM THE CENTERLINE OF TERMINAL BOXES.
A Province of the provinc	APPROX APPROXIMATE(-LY) ARCH ARCHITECT(-URAL)	HR(S) HTR	HOUR(-S) HEATER	PB PC(-S)	PULLBOX, PUSHBUTTON PIECE(-S), PHOTOCELL			7. CONNECTIONS BETWEEN RIGID CONDUIT AND MOTOR TERMINAL BOXES OR SIMILAR I SUBJECT TO VIBRATION SHALL BE ELEXIBLE LIQUID-TIGHT CONDUIT
	AMMETER SWITCH	HVAC		PCC	POINT OF COMMON COUPLING			
	T AMPERE TRIP	н	HERT (CYCLES PER SECOND)	PF	POWER FACTOR			8. CONDUITS SHALL BE TERMINATED SO AS TO PERMIT NEAT CONNECTION TO MOTORS EQUIPMENT.
	UTO AUTOMATIC TRANSFER SWITCH	ΙC	INSTRUMENTATION AND CONTROL	PFR PH	POWER FACTOR RELAY PHASE			9. CONDUITS FOR FUTURE EQUIPMENT OR EXTENSIONS SHALL BE TERMINATED AS SHO
 market state stat	AUX AUXILIARY AWG AMERICAN WIRE GAGE	I/O IEEE	INPUT/OUTPUT INSTITUTE OF ELECTRICAL AND	PLC PM	PROGRAMMABLE LOGIC CONTROLLER POWER MONITOR			DETAILS OR AS SPECIFIED.
								10. LOCATIONS OF PULLBOXES ARE APPROXIMATE. COORDINATE EXACT LOCATION IN TH
	C BARE COPPER		INCH(-ES)	POE	POWER OVER ETHERNET			ENSURE 6 INCHES (MINIMUM) CLEARANCE FROM MECHANICAL PIPING FLOW LINES.
A MARTIN SALE AND A CONTRACT AN	NK BREAKER	INS I INSTR	INSTANTANEOUS INSTRUMENT(-ATION)	PP PRI	POWER POLE PRIMARY			11. ONLY MAJOR PULLBOXES ARE SHOWN. PROVIDE ADDITIONAL PULLBOXES WHERE RE MAKE A WORKABLE INSTALLATION.
Marcoland State Sta	CONDUCTOR, CONTACT S CONSTANT SPEED	IP IR	INTERNET PROTOCOL	PRV	PRESSURE RELIEF VALVE, PRESSURE REDUCING VALVE			
	AB CABINET	IS		PS PT(S)	POWER SUPPLY			ON THE DRAWINGS.
by order the second secon	AT CATEGORY	100	AUTOMATION	PVC	POLYVINYL CHLORIDE			13. VERIFY ALL COLOR REQUIREMENTS BEFORE ORDERING MATERIALS.
 Michael and Michael And Micha	B CATCH BASIN CTV CLOSED-CIRCUIT TELEVISION	ISO ISR	ISOLAT(-E, -ION) INTRINSICALLY SAFE RELAY	PWR	POWER			14 THE WIRING DIAGRAMS, QUANTITY AND SUE OF WIRES AND CONDUIT REPRESENT A
Control and a control to be address of the control to be address of t	CHEM CHEMI(-CAL, -STRY)	JB	JUNCTION BOX	R, RAD RCPT	RADIUS RECEPTACI E			ARRANGEMENT BASED UPON SELECTED STANDARD COMPONENTS OF ELECTRICAL P
	CID2 CLASSIFICATION I, DIVISION 2	K A		RCT				ACCOMMODATE EQUIPMENT ACTUALLY PURCHASED. THE BASIC SEQUENCE AND M
	LR CLEAR(-ANCE)	KA KCMIL	THOUSANDS OF CIRCULAR MILS	RM	ROOM			CONTROL MUST BE MAINTAINED AS INDICATED ON THE DRAWINGS AND/OR SPECIFIC
	LSM CONTROLLED LOW STRENGTH MATE O CONDUIT ONLY	RIAL KH KV	KILOHERT KILOVOLT(-S)	RMT RPM	REMOTE REVOLUTIONS PER MINUTE			15. REFER TO THE MECHANICAL DRAWINGS FOR CERTAIN CONTROL DIAGRAMS, EXACT L
Marken Links and Link	OAX COAXIAL OM COMMON	KVA KVAR	KILOVOLT-AMPERE(-S) KILOVOLT-AMPERE(-S) REACTIVE	RST RT	RESET RESET TIMER			CIRCUITS.
MINING Control of the according of the accor	OMM COMMUNICATION	KVARH	KILOVOLT-AMPERE REACTIVE HOUR(-S)	RTU	REMOTE TELEMETRY UNIT			16. CONDUIT SI E AND FILL SHALL BE AS INDICATED ON THE CONDUIT AND CABLE SCHEI
	CONDUCTION CONDUCTION	KWH	KILOWATT(-S) KILOWATT HOUR(-S)	KV22	REDUCED VOLTAGE, SOLID STATE			NO SI E IS SHOWN, THE CONDUIT SHALL BE SI ED IN ACCORDANCE WITH THE LATES THE NATIONAL ELECTRICAL CODE ADOPTED BY THE AUTHORITY HAVING JURISDICTIC
	R CONTROL RELAY T CURRENT TRANSFORMER	L	LENGTH, LINE	S/S SCADA	START/STOP SUPERVISORY CONTROL AND			CONDUIT SI E IS 3/4 INCH, EXCEPT WHERE ENCASED OR BURIED. MINIMUM ENCASED
	CTRL CONTROL	LA LAN	LIGHTNING ARRESTER	SCR	DATA ACQUISITION			
		LB(-S)	POUND(-S)	SD	SMOKE DETECTOR			17. PROVIDE EXPANSION OR EXPANSION AND DEFLECTION FITTINGS FOR ALL CONDUIT F CROSSING EXPANSION JOINTS. REFER TO THE STRUCTURAL DRAWINGS FOR LOCAT
	DC DIRECT CORRENT DCS DISTRIBUTED CONTROL SYSTEM	LCS	LOCAL CONTROL PANEL	SER	SECONDARY SERVICE ENTRANCE RATED			EXPANSION JOINTS.
Contrast parter in the contrast part of the control part of t	EG DEGREE(-S) EG C DEGREES CELSIUS	LEL LOC	LOWER EXPLOSIVE LIMIT LOCATION	SGNL (SH)	SIGNAL SHIELDED			18. PROVIDE 3/16 INCH NYLON PULL ROPE IN EACH EMPTY CONDUIT.
Property langer proving the part of the intervent make scales proving the part of	DEG F DEGREES FARENHEIT	LOR LOTO	LOCAL-OFF-REMOTE	SHT SM	SHEET SINGLEMODE			19. FOR LIGHTING AND RECEPTACLE SYSTEMS, ONLY CIRCUIT NUMBERS ARE SHOWN. PR
An DORE AND		LP		SP	SET POINT			NECESSARY CONDUITS, WIRES, FITTINGS, JUNCTION BOXES AND NECESSARY COMP SHOWN OR NOT SHOWN ON THE DRAWINGS, TO MAKE THE ELECTRICAL INSTALLATION
	IAG DIAGRAM	LS	LIMIT SWITCH	SPDT	SINGLE POLE, DOUBLE THROW			AND OPERATIONAL. SI E CONDUITS AND WIRING IN ACCORDANCE WITH THE NATION
g BICRAFE FORMULT LV LOW NOT LOGGE ST BICRAFE FORMULA BICRAFE FORM	ISC DISCONNECT ISTR DISTRIBUTION	LT LTG	LIGHT LIGHTING	SPEC(-S SS) SPECIFICATION(-S) STAINLESS STEEL, SOLID STATE			LOADING SHALL BE AS INDICATED IN THE PANEL SCHEDULES. ALL LIGHTING AND REC
PT DOUBLE PICE SMOLE HEADY AND ADDRESS OF THE STREET ADDRESS OF THE ST	O DISCRETE OUTPUT PDT DOUBLE POLE DOUBLE THROW	LV	LOW VOLTAGE	STB STD(-S)	SHORTING TERMINAL BLOCK STANDARD(-S)			CIRCUITS SHALL INCLUDE GROUND WIRE.
New Difful_EQ All mathematics Since Three difful_EQ All mathematics VP Difful_EQ Mathematics Mathematics </td <td>DPST DOUBLE POLE, SINGLE THROW</td> <td>mA MAX</td> <td>MILLIAMPERE(-S)</td> <td>STL</td> <td>STEEL</td> <td></td> <td></td> <td>20. MOUNT LUMINAIRES ACCORDING TO THE MOUNTING HEIGHT GIVEN ON THE DRAWING DISTANCE BEING MEASURED FROM THE BOTTOM OF THE LUMINAIRE TO THE FINISHE</td>	DPST DOUBLE POLE, SINGLE THROW	mA MAX	MILLIAMPERE(-S)	STL	STEEL			20. MOUNT LUMINAIRES ACCORDING TO THE MOUNTING HEIGHT GIVEN ON THE DRAWING DISTANCE BEING MEASURED FROM THE BOTTOM OF THE LUMINAIRE TO THE FINISHE
UP DUPER With Control of APPER Provide Local Control of APPER Server APPER Provide Local APPER Provid	TL(-S) DETAIL(-S)	MCB	MAXIMUM MAIN CIRCUIT BREAKER	STRC	STRUCTUR(-E, -AL)			PROVIDE APPROPRIATE BRACKETS AND HARDWARE FOR MOUNTING.
FFC EFFCIENCY MECH MECHANICAL 37MC SYNC SYNC<	DUP DUPLEX	MCC MCP	MOTOR CONTROL CENTER MOTOR CIRCUIT PROTECTOR	SWBD SWGR	SWITCHBOARD SWITCHGEAR			21. ALL RECEPTACLES IN OUTDOOR AND ANTICIPATED WET AREAS SHALL BE GROUND F
LEC ELIZITIE CLAD WHILE SALE SALE SALE SALE SALE SALE SALE SA	EFFIC EFFICIENCY EFFL EFFLUENT	MECH MFR	MECHANICAL MANUFACTURER	SYNC	SYNCHRONI ING			INTERRUPTER RECEPTACLES WITH WEATHERPROOF WHILE IN-USE COVERS.
HERE EVERTSHY HERE SHERESHY HERE SHERE SHER	LEC ELECTRIC(-AL)	MH	MANHOLE	T TP				22. ALL FREE STANDING ELECTRICAL EQUIPMENT AND CONTROL PANELS SHALL BE SET HOUSEKEEPING PADS WITH LEVELING CHANNELS EMBEDDED IN THE PAD.
NET HACLOGARDE Million	MERG EMERGENCY	MIL(-S)	ONE-THOUSANDTH OF AN INCH	TC	TRAY CABLE			23 ALL PANELBOARDS SHALL BE MOUNTED SO THAT THE DISTANCE FROM THE CENTER
NAR ENANCER ENANCER NUMBERIAL PROTECTION AGENCY MAIN USS ONLY TELE TELEPHONE	INCL ENCLOSURE INET ETHERNET	MIN MISC	MINIMUM, MINUTE(-S) MISCELLANEOUS	TEFC	TRANSMISSION CONTROL PROTOCOL TOTALLY ENCLOSED FAN COOLED			TOP CIRCUIT BREAKER OPERATING HANDLE IN THE UPPERMOST POSITION TO THE F
Comment and the state of t	NGR ENGINEER	MLO NCY MM	MAIN LUGS ONLY MULTIMODE	TEL TEMP	TELEPHONE TEMPERATURE TEMPORARY			FLOOR SHALL NOT EXCEED 6'-7".
Stop Extendency MOV MOV MODE hyperavites/juve TOT TOTAL TOTAL TOTAL TOTAL		MOCP		TENV	TOTALLY ENCLOSED NON-VENTILATED			24. ALL SURFACE MOUNTED PANELS AND PANELBOARDS ON THE INTERIOR OF EXTERIO ABOVE GRADE OR IN OTHER LOCATIONS CONSIDERED DAMP OR WET SHALL BE MOU
CL ETCRTERA MICU-36 MOUNT(ED, 1-8)	E-STOP EMERGENCY STOP	MOD(-3) MOV	MOTOR OPERATED VALVE	TOT	TOTAL, TOTALI E(R)			TO MAINTAIN A 1/4 INCH (MINIMUM) AIR SPACE BETWEEN THE ENCLOSURE AND THE
USERC ELECTRIC UTITY SERVICE BOUIPMENT MTS MANUAL TRANSPER SWITCH REQUIREMENTS COMMITTEE EVISTING W MEDUW VOLTAGE EXISTING W MORTH, NEUTRAL NOT APPLICABLE W TO ANATONAL ELECTRICAL CODE (NPPA 70) W V VOLTS W V V V V V V V V V V V V V V V V V V V	TM ELAPSED TIME METER	MT(-D, -G MTR	G) MOUNT(-ED, -ING) MOTOR	TYP	THERMOSTAT TYPICAL			25. PROVIDE LOCKOUTS IN STRICT ACCORDANCE WITH OWNER'S REQUIREMENTS.
XIST EXISTING UL UNDERWRITERS LABORATORIES VP EXPANSION NA NORTH-NEUTRAL UNNO VP EXPANSION NO NORTH-NEUTRAL UNNO VI UNDERWRITERS LABORATORIES UNNO UNNOTAPPLOABLE UNNO UNNOTAPPLOABLE UNNO A FIRE ALARM NOOL SODIUM HYDOCHLORITE UNNO UNITERRUPTIBLE POWER SUPPLY UNITERRUPTIBLE POWER SUPPLY ACIL FACILIT(Y, IES) NOOL SODIUM HYDOCHLORITE UV UNITERRUPTIBLE POWER SUPPLY ACIL FACILIT(Y, IES) NOOL SODIUM HYDOCHLORITE UV UNITERRUPTIBLE POWER SUPPLY ACIL FACILIT(Y, IES) NOOL NORMALLY CLOSED VV VOLTA G FIGURE NATIONAL ELECTRICAL CONTRACTORS VS VARIABLE SPEED VOLTAMPERES VPIRITS NOT BEGORING THIS STAMP MAY HAVE BEEN PRINTED PRIOR NATIONAL ELECTRICAL CONTRACTORS VS VARIABLE SPEED SSOCIATION VA VOLTAMPERES ESSOCIATION VATER ENVIRONMENT SERVICES CLACKAMAS COUNTY, OREGON	EUSERC ELECTRIC UTILITY SERVICE EQUIPME REQUIREMENTS COMMITTEE	ENT MTS MV	MANUAL TRANSFER SWITCH MEDIUM VOI TAGE	UG	UNDERGROUND			26. REFER TO THE SINGLE LINE DIAGRAMS, EQUIPMENT ELEVATIONS, PANELBOARD SCH
APPENDIX NA NOT IN PRUTAL UNANDAM UNANDAM UNANDAM UNANDAM NANDA NAND	EXIST EXISTING	N			UNDERWRITERS LABORATORIES			COMPONENT/DEVICE LABELS IN THE CONTROL SCHEMATICS FOR NAMEPLATE INFOR THE CONTRACT SPECIFICATIONS FOR NAMEPLATE SLE. COLOR. MATERIAL, AND PLA
A FIRE ALARM NAOCL SODIUM HYPOCHLORITE UP UNSHIELDED TWISTED PAIR UV ULTRAVIOLET SODIUM HYPOCHLORITE UV ULTRAVIOLET SODIUM HYPOCHLORITE VV ULTRAVIOLET PAIR C NATIONAL LECTRICAL CONTRACTORS V/S VARIABLE SPEED ASSOCIATION V VOLT-AMPERES ISSUED FOR BID V PRINTS NOT BEARING THIS STAMP MAY HAVE BEEN PRINTED PRIOR OCANON BEEN PRINTED PRIOR OCANON BEEN PRINTED PRIOR OCANON BE CONSIDERED AS BID DOCUMENTS. RESSOUTING WHETHER ASSOCIATION V A VOLT-AMPERES V PRINTS NOT BEARING THIS STAMP MAY HAVE BEEN PRINTED PRIOR OCANON BEEN PRINTED PRIOR OCANON BE CONSIDERED AS BID DOCUMENTS. RESSOUTING WHETHER ASSOCIATION V A VOLT-AMPERES V PRINTS NOT BEARING THIS STAMP MAY HAVE BEEN PRINTED PRIOR OCANON BEEN PRINTED PRIOR OCANON BE CONSIDERED AS BID DOCUMENTS. RESSOUTING WHETHER AS DOCUMENTS USE WITHOUT FIRST DETERMINING WHETHER AS DOCUMENTS AND BAGEN STAMP MAY HAVE BEEN PRINTED PRIOR OCANON BE CONSIDERED AS BID DOCUMENTS. REPERANTION V A VOLTA AND PRINTED PRIOR OCANON BE CONSIDERED AS BID DOCUMENTS. REPERANTION V A VOLTA AND PRINTED PRIOR OCANON BE CONSIDERED AS BID DOCUMENTS. REPERANTION V A VOLTA AND PRINTED PRIOR OCANON BE CONSIDERED AS BID DOCUMENTS. REPERANTION V A VOLTA AND PRINTED PRIOR OCANON BE CONSIDERED AS BID DOCUMENTS. REPERANTION V A VOLTA AND PRINTED PRIOR OCANON BE CONSIDERED AS BID DOCUMENTS. REPERANTION V A VOLTA AND PRINTED PRIOR OCANON BE CONSIDERED AS BID DOCUMENTS. REPERANTION V A VOLTA AND PRINTED PRIOR OCAN AND PRINTED PRIOR OCANON BE CONSIDERED AS BID DOCUMENTS. REPERANTION V AND PRINTED PRIOR OCANON BE CONSIDERED AS BID DOCUMENTS. REPERANTION V AND PRINTED PRIOR OCAN AND PRINTED PRIOR OCAN AND PRINTED PRINTED PRIOR OCAN AND PRINTED PRINTED PRINTED PRIOR OCAN AND PRINTED	EXPANSION EXT EXTERNAL	N/A	NOT APPLICABLE	UPS	UNINTERRUPTIBLE POWER SUPPLY			REQUIREMENTS.
ACIL FACILIT(Y,-IES) NORMALLY CLOSED NORMALLY CLOSED NATIONAL ELECTRICAL CODE (NFPA 70) V VOLTS NATIONAL ELECTRICAL CODE (NFPA 70) V VOLTS ASSOCIATION VA VOLT-AMPERES NATIONAL ELECTRICAL CODE (NFPA 70) V VOLTS ASSOCIATION VA VOLT-AMPERES NATIONAL ELECTRICAL CODE (NFPA 70) V VOLTS ASSOCIATION VA VOLT-AMPERES NATIONAL ELECTRICAL CODE (NFPA 70) V V VOLTS ASSOCIATION VA VOLT-AMPERES NATIONAL ELECTRICAL CODE (NFPA 70) V V VOLTS ASSOCIATION VA VOLT-AMPERES NATIONAL ELECTRICAL CONTRACTORS V/S VARIABLE SPEED ASSOCIATION VA VOLT-AMPERES NATIONAL ELECTRICAL CONTRACTORS V/S VARIABLE SPEED ASSOCIATION VA VOLT-AMPERES NATIONAL ELECTRICAL CONTRACTORS V/S VARIABLE SPEED ASSOCIATION VA VOLT-AMPERES NATIONAL ELECTRICAL CONTRACTORS V/S VARIABLE SPEED NATIONAL ELECTRICAL IMPROVEMENT PROJECT SERS OF THIS BOOLIMENTS NOT DIMENSION SHOWT ADJUST SCALES AUTORED MADE SUBSPECTIVE TO TILE PREPARATION NATIONAL ELECTRICAL IMPROVEMENT PROJECT SAK CHECKED NATIONAL ELECTRICAL INPROVEMENT PROJECT NATIONAL ELECTRI	FA FIRE ALARM	NAOCL NAOH	SODIUM HYPOCHLORITE SODIUM HYDROXIDE	UIP UV	UNSHIELDED I WISTED PAIR ULTRAVIOLET			27. "NORMAL" STATUS OF SWITCHES OR CONTACTS SHOWN IN CONTROL SCHEMATICS IS
Image: Series of Superior Log Amperes NECA NATIONAL ELECTRICAL CONTRACTORS V/S VARIABLE SPEED VOLT-AMPERES ISSUED FOR BID WATER ENVIRONMENT SERVICES CLACKAMAS COUNTY, OREGON V PRINTS NOT BEARING THIS STAMP MAY HAVE BEEN PRINTED PRIOR OLD COMMENTS ARE CAUNTOR IN EDITABLE ELECTRICATION FOR THE PRINTED PRIOR CLACKAMAS REPORT Image: Service of the s	FACIL FACILIT(-Y, -IES) FDR FEEDER	NC NFC	NORMALLY CLOSED	V	VOLTS			POSITION.
Issues Association VA Voltamperes Issues Issues <td>FIG FIGURE</td> <td>NECA</td> <td>NATIONAL ELECTRICAL CONTRACTORS</td> <td>V/S</td> <td>VARIABLE SPEED</td> <td></td> <td></td> <td></td>	FIG FIGURE	NECA	NATIONAL ELECTRICAL CONTRACTORS	V/S	VARIABLE SPEED			
ISSUED FOR BID Scales If this bar is not dearing this stamp may have been printed priors or dovertising and cannot be considered as bid documents. Service of this document in editable electronic formats are cannot be considered as bid documents. Service of this document in editable electronic formats are cannot be considered as bid documents. Service of this document in editable electronic formats are cannot be considered as bid documents. Service of this document in editable electronic formats are cannot be considered as bid documents. Service of this document in editable electronic formats are cannot be considered as bid documents. Service of this document in editable electronic formats are cannot be considered as bid documents. Service of this document is bid bocument in editable electronic formats are cannot be considered as bid documents. Service of this document is bid bocument in editable electronic formats are cannot be considered as bid bocuments. Service of this document is document in editable electronic formats are cannot be considered as bid documents. Service of this document is document in editable electronic formats are cannot be considered as bid documents. Service of this document is document in editable electronic formats are cannot be considered as bid documents. Service of the there are the mode of the there are there are the there are the there are the there	LA FULL LUAD AMPERES		ASSOCIATION	VA	VULI-AMPEKES			
ISSUED FOR BID Scales Scale							DESIGNED	
y PRINTS NOT BEARING THIS STAMP MAY HAVE BEEN PRINTED PRIOR O ADVERTISING AND CANNOT BE CONSIDERED AS BID DOCUMENTS. SERS OF THIS DOCUMENT IN EDITABLE ELECTRONIC FORMATS ARE CAUTIONED AGAINST USE WITHOUT FIRST DETERMINING WHETHER HANGES MAY HAVE BEEN MADE SUBSEQUENT TO ITS PREPARATION	ISSUED FOR E	3ID				SCALES	SAK	CLACKAMAS COUNTY, OREGON
Y PRINTS NOT BEARING THIS STAMP MAY HAVE BEEN PRINTED PRIOR O ADVERTISING AND CANNOT BE CONSIDERED AS BID DOCUMENTS. SERS OF THIS DOCUMENT IN EDITABLE ELECTRONIC FORMATS ARE CAUTIONED AGAINST USE WITHOUT FIRST DETERMINING WHETHER HANGES MAY HAVE BEEN MADE SUBSEQUENT TO ITS PREPARATION					0	1"	93347PE	
O ADVERTISING AND CANNOT BE CONSIDERED AS BID DOCUMENTS. SERS OF THIS DOCUMENT IN EDITABLE ELECTRONIC FORMATS ARE CAUTIONED AGAINST USE WITHOUT FIRST DETERMINING WHETHER HANGES MAY HAVE BEEN MADE SUBSEQUENT TO ITS PREPARATION HANGES MAY HAVE BEEN HAVE HAVE HAVE HAVE HAVE HAVE HAVE HAVE	NY PRINTS NOT BEARING THIS STAMP MAY HAVE							
ADJUST SCALES HANGES MAY HAVE BEEN MADE SUBSEQUENT TO ITS PREPARATION	TO ADVERTISING AND CANNOT BE CONSIDERED	AS BID DOCUMENT	S			ENSION SHOW		
	CAUTIONED AGAINST USE WITHOUT FIRST DETE	ERMINING WHETHEF	R		AD. AD.	JUST SCALES	CHECKED	Konnody Jonks

USERS OF THIS DOCUMENT IN EDITABLE ELECTRONIC FORMATS ARE CAUTIONED AGAINST USE WITHOUT FIRST DETERMINING WHETHER CHANGES MAY HAVE BEEN MADE SUBSEQUENT TO ITS PREPARATION. NO

DATE

BY

REVISION

D		
_		

JRM

EXPIRATION DATE: 06/30/2025

K Kennedy Jenks

G	i	H
	E	LECTRICAL DEMOLITION NOTES
SHOWN.	1.	BIDDING CONTRACTORS SHALL VISIT THE SITE TO ASSESS THE SCOPE OF DEMOLITION, REMOVAL AND MODIFICATION WORK.
N AND PR'S	2.	ELECTRICAL CONTRACTOR AND THE OWNER SHALL DE-ENERGI E ALL WIRING PRIOR TO REMOVAL OF EQUIPMENT, DEVICES, MOTORS INSTRUMENTATION, CONTROL PANELS, ETC. CONTRACTOR SHALL OBTAIN PRIOR APPROVAL FROM THE OWNER.
FY THE	3.	EXPOSED RACEWAYS: REMOVE CONDUIT, WIRES, AND BOXES. PATCH TO MATCH EXISTING. FINISH ALL OPENINGS LEFT IN WALLS AND FLOORS.
	4.	CONCEALED CONDUITS IN THE SLAB: REMOVE EXISTING WIRES TO THE EXTENT POSSIBLE AND ABANDON CONDUITS IN THE SLAB. CUT CONDUIT FLUSH AND PATCH THE FLOOR TO MATCH
R ANY RABLY	5.	CONTROL PANELS: ELECTRICAL CONTRACTOR SHALL DE-ENERGI E AND REMOVE ALL CONDUIT AND WIRE AS DESCRIBED IN NOTES 3 AND 4. CONTRACTOR SHALL REMOVE PANELS AS NOTED ON THE CONTRACT DRAWINGS.
l be Ditions. Walls.	6.	MOTOR CONTROL CENTERS: DISCONNECT AND REMOVE ALL CONDUITS AND WIRING TO EXISTING STARTERS AND/OR BREAKERS, PANELBOARDS, BRANCH CIRCUITS, INTERLOCKS AND STATUS WIRING WITHIN MCC.
IPMENT PS	7.	REFER TO THE CONTRACT SPECIFICATIONS FOR ADDITIONAL ELECTRICAL DEMOLITION AND REMOVAL REQUIREMENTS.
MENT		
DTHER		
THE		
LD TO		
ED TO		
INCED		
ESTED IENT.		
OF S.		
ONS OF		
WHERE ION OF NIMUM JRIED		
OF		
E ALL 'S IPLETE CTRICAL - CLE		
TH THE OR.		
CIRCUIT		
NCRETE		
F THE D		
_S SO AS		
S, AND N. SEE		
SHELF		
		SCALE
_{ty}	E	LECTRICAL ABBREVIATIONS AND NOTES
		DATE DECEMBER 2024
		SHEET 14 OF 19 E-001

0-	A	B		C D			E		F	G
PM M M M	SINGLE LIN	IE DIAGRAM SYMBOLS			С	ONTROL SC	CHEMATIC SYMBOL	S		
2024 12:0		BUS	(K)	KEY INTERLOCK		<u> </u>	CONDUCTORS - NOT CONNECT	TED		SINGLE POLE SWITCH NORMALLY OPEN / CLOSED
: 12/5/:		BUS (EXISTING)	(ST)	SHUNT TRIP		_	CONDUCTORS - CONNECTED		-	
Plot Date		FEEDER FEEDER (EXISTING)	SSMP	SOLID STATE MOTOR PROTECTIVE DEVICE			TERMINAL			THREE-POSITION SELECTOR SWITCH X: INDICATES CONTACTS CLOSED H-O-A: HAND-OFF-AUTO
		PS FRAME LOW VOLTAGE THERMAL-MAGNETIC CIRCUIT BREAKER	SPD	SURGE PROTECTIVE DEVICE		**	CONTROL DEVICE COIL TYPE CR CONTROL RELAY			L-O-R: LOCAL-OFF-REMOTE O-S-C: OPEN-STOP-CLOSE
	•) <u>100A</u> •) <u>70A</u>	3-POLE EXCEPT WHERE NOTED X CIRCUIT NUMBER OR LOCATION (SEE ELEVATION)	Ŧ	EARTH GROUND CONNECTION		\bigcirc	ISR INTRINSICALLY SAFE R PC PHOTOCELL	ELAY	L_: oox	
1 –				LIGHTNING ARRESTOR AND SURGE CAPACITOR		ı /				TWO-POSITION SELECTOR SWITCH
' ELUK	•) <u>100A</u> •) <u>MCP</u>	3-POLE EXCEPT WHERE NOTED X CIRCUIT NUMBER OR LOCATION (SEE ELEVATION)					$X, \frac{XXXX}{4}$			L-R: LOCAL-REMOTE O-C: OPEN-CLOSE A-M: AUTO-MANUAL
HAN KOWI	余	LOW VOLTAGE DRAWOUT CIRCUIT BREAKER INCLUDING L-S-I-G SETTINGS UNLESS NOTED OTHERWISE	HP	MOTOR HORSEPOWER AND FULL LOAD AMPERES AS INDICATED		SV-	NORMALLY CLOSED CONTA LINE REFERENCE	.CT	Loox	
er: STEP	•) <u>400AF</u> 200AT	L LONG TIME S SHORT TIME I INSTANTANEOUS	A			<u>م</u> مہ	SOLENOID COIL		o s c	THREE-POSITION SELECTOR SWITCH WITH SPRING-RETURN MOMENTARY
Us		G GROUND FAULT	кw	LOAD (IN KW OR KVA) AND AMPERES AS INDICATED		CR CR ┨┝ ᡨᢏ	CONTACT NORMALLY OPEN / CLOSED		×00	CONTACT
		MEDIUM VOLTAGE DRAWOUT CIRCUIT BREAKER		ELECTRICAL MOTOR OPERATED VALVE WITH INTEGRAL REVERSING STARTER		MCP				
	EVNR	FULL VOLTAGE COMBINATION STARTER	MOV			5A	CIRCUIT BREAKER OR MCP AS 1-POLE / 3-POLE	NOTED	E-STOP E-STOP	
соо- <u>-</u> 2-	#	NEMA SI E FVR REVERSING TYPE FVNR NON-REVERSING TYPE		TERMINATOR / POTHEAD						EMERGENCY PUSHBUTTON NORMALLY OPEN / CLOSED
2376011.	RVSS	REDUCED VOLTAGE STARTER WITH CONTROL POWER TRANSFORMER	uu	POWER OR DISTRIBUTION TRANSFORMER		<u>م</u> کره	OVERLOAD (THERMAL OR SOL	ID STATE)		PUSHBUTTON NORMALLY OPEN / CLOSED
lectrical		RATING IN AMPERES AS INDICATED RVSS SOLID STATE TYPE RVAT AUTO-TRANSFORMER TYPE		CONFIGURATION AND RATING AS INDICATED		070 0-0 010	DISCONNECT SWITCH 1-POLE / 3-POLE		0	MULTI-POSITION
awings\E	VFD A	VARIABLE FREQUENCY DRIVE WITH CONTROL POWER TRANSFORMER RATING IN AMPERES AS INDICATED		DELTA-WYE GROUNDED		0-4-0			o	SELECTOR SWITCH
n\10.06-Dr	% 30A	DISCONNECT SWITCH 3 POLE EXCEPT WHERE NOTED RATING IN AMPERES AS INDICATED		DELTA-DELTA		M	MOTOR			PUSH-TO-TEST INDICATING LIGHT X COLOR A AMBER
10-Desig				GENERATOR		\bigcirc				B BLUE G GREEN R RED W WHITE
76011.00	25A	3 POLE EXCEPT WHERE NOTED RATINGS IN AMPERES AS INDICATED	GEN	RATINGS AS INDICATED			CONTROL POWER TRANSFORM	MER	\bowtie	INDICATING LIGHT
nents_23	480:120	POTENTIAL TRANSFORMER	0	AUTOMATIC OR MANUAL TRANSFER SWITCH RATING AND CONFIGURATION AS INDICATED		°			\frown	
Improver		RATIO AND NUMBER OF PT'S AS INDICATED	⊥ ₅	CAPACITOR			BATTERY		ETM	ELAPSED TIME METER
chemical	\$ ₍₃₎	CURRENT TRANSFORMER RATIO AND NUMBER OF CT'S AS INDICATED		RATING IN KVAR AS INDICATED		5A	5105		б	BU ER
odland C	(*)	METERING DEVICE METER TYPE		NEUTRAL GROUNDING RESISTOR CURRENT RATING IN AMPERES AS NOTED TIME RATING IN SECONDS AS NOTED			FUSE RATING IN AMPERES		\Box	
cts/Hoc		WHMWATT HOUR METERVMVOLTMETERWMWATT METERPFMPOWER FACTOR METERAMAMMETERSSMSOLID STATE METER		CONTACTOR		⊥	EARTH GROUND CONNECTION			BELL
es\Proje			† ₀	NUMBER INDICATES NEMA SI E		-				HORN
nt Servic	(#)	RELAY DEVICE FUNCTION PER ANSI NUMBER C37.2	နိ	OVERLOAD (THERMAL OR SOLID STATE)			(NOT NECESSARILY EARTH GR	OUNDED)	NA M I	RESISTANCE TEMPERATURE DETECTOR (RT
vironmeı - 7	15/25 AUTO SYNC 25 SYNCHRON 27 LINDERVOL	CHRONI ER RELAY 50/51N INST/TIME RESIDUALLY ISM CHECK RELAY CONNECTED GND OVERCURRENT TAGE RELAY 51G	5 A	FUSE SI E AS INDICATED		\Diamond				HEATER
Vater En	27/59 UNDER/OVE RELAY 32 DIRECTION	ERVOLTAGE 52 POWER CIRCUIT BREAKER 55 POWER FACTOR TRIP RELAY AL POWER RELAY 60 VOLTAGE BALANCE	AS	AMMETER SWITCH			DIGITAL INPUT TO PLC/RTU/DC	S		
y, OR\W	37 UNDERCUR 38 HIGH TEMP	RENT RELAY60VOLTAGE DALANGERENT RELAY62TIME DELAY(BEARING)65GOVERNOR LOAD SHARING/SOFTRELAYLANDING CONTROL	vs	VOLTMETER SWITCH		(H)	DIGITAL OUTPUT FROM PLC/RT NORMALLY OPEN	ru/DCS	Ш Ш	(ETHERNET UNLESS INDICATED OTHERWISE)
as Count	40 LOSS OF FI EXCITATION	ELANDING CONTROL ELD/UNDER 66 TIME BETWEEN STARTS RELAY I RELAY 67 DIRECTIONAL REVERSE VAR/KW CACTOR BELAY	Φ	RECEPTACLE, 120V		¢#	DIGITAL OUTPUT FROM PLC/RT	TU/DCS	Ψ	RECEPTACLE, 120V
Clackam	43 SELECTOR 46 CURRENT II 47 PHASE SEC	SWITCH71LLOW OIL LEVEL RELAYMBALANCE RELAY810/UOVER/UNDER FREQUENCY RELAYUENCE/FAILURE83CONTROL POWER TRANSFORMER		SPECIAL RECEPTACLE, 208V OR 240V, 1-PHASE			ANALOG INPUT TO PLC/RTU/DO	cs	R	NEUTRAL GROUNDING RESISTOR
\Clients\	RELAY 48 GROUND F/ SEQUENCE	86 UTILITY LOCKOUT RELAY AULT INCOMPLETE 87TL TRANSFORMER DIFFERENTIAL RELAY RELAY		SPECIAL/WELDING RECEPTACLE, 208V OR 240V, 3-PHASE			4-20 mA (UNLESS INDICATED O	THERWISE)		
Jocuments	49 HIGH TEMP 50/51 INST/TIME (50/51G INST/TIME I GND OVER((OIL OR STATOR)87MMOTOR DIFFERENTIAL RELAYOVERCURRENT RELAY90VAR/PF AND CROSS CURRENTOIRECTLY CONNECTEDCOMPENSATION CONTROLLERCURRENT RELAY0	\otimes	SPECIAL RECEPTACLE, 480V, 3-PHASE			ANALOG OUTPUT FROM PLC/R 4-20 mA (UNLESS INDICATED O	TU/DCS THERWISE)		LEGEND SHOWN ON SCHEMATIC DRAWINGS ALL DEVICES ARE LOCATED IN THE MCC UNLESS INDICATED OTHERWISE
kjce-pw/E	ic		l			ETERED PR	DESIGNED	I WATE	RENVIRONMENT	SERVICES
ey.com:						93347	DRAWN	CLA HOODLAND WATF	CKAMAS COUNTY, C	RECOVERY FACILITY
ow.bentl	ANY PRINTS NOT BE TO ADVERTISING A	ARING THIS STAMP MAY HAVE BEEN PRINTED PRIOR ND CANNOT BE CONSIDERED AS BID DOCUMENTS.		IF DIM	THIS BAR IS NOT			CHEMICA	IMPROVEME	NT PROJECT
w:\\kjce- _f	CAUTIONED AGAI CHANGES MAY HAV	VSINIENT IN EDITABLE ELECTRONIC FORMATS ARE IST USE WITHOUT FIRST DETERMINING WHETHER /E BEEN MADE SUBSEQUENT TO ITS PREPARATION.	REV	ISION DATE BY	ADJUST SCALES ACCORDINGLY.	EXPIRATION DATE:	CHECKED 06/30/2025	K	Kennedy	Jenks

DATE BY EXPIRATION DATE: 06/30/2025 POTENTIOMETER

REACTOR (LINE OR LOAD DEPENDING ON PLACEMENT)

CLOSE ON

FS

رم ا

LS

 \mathcal{O}

PS M

TS

RISING FALLING

FS

م

LS

T

PS

TS

SENSING SWITCHES

FLOW

LEVEL

PRESSURE

SENSED VARIABLE

 \sim

 \sim

OSED			^	م م	TEMF	PERATURE			
			LIMIT SWITCHES						
		S NORMALLY OPEN, CLOSE ON REACH					LIMIT		
			S S	NORMALLY CLOSED, OPEN ON REACHING LIMIT					
ATING LIGHT				TORQUE SWITCH					
			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	NORMALLY CLOSED, OPEN ON INCRE					
				I	TIMED C	ONTACTS			
		s	SYMBOL	NORMAL	OPEN TO	D CLOSED	CLOS	SED TO OPEN	
				OPEN	DEL	AYED	INST	ANTANEOUS	
R			TR	CLOSED	INSTAN	TANEOUS	I	DELAYED	
			TR	OPEN	INSTAN	TANEOUS		DELAYED	
			TR	CLOSED	DEL	AYED	INST	ANTANEOUS	
RATURE DETECT	OR (RTD) ERWISE)								
CATED IN THE M DTHERWISE	WINGS CC								
			SCALE						
			JOB NO						
ACILITY								2376011.00 DATE DECEMBER 2024	
								SHEET 15 OF	19
								E-002	2

![](_page_71_Figure_0.jpeg)

		SCALE		
ΤY	ELECTRICAL LEGEND - II	JOB NO 2376011.00		
		DATE DECEMBER 2024		
		SHEET 16 OF 19		
		E-003		
A 	A B			
------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------			
Plot Date: 12/5/2024 2:32 PM				
User: STEPHAN KOWELUK				
Projects\Hoodland Chemical Improvements_2376011.00\10-Design\10.06-Drawings\Electrical\2376011.00-E-004 & 				
om:kjce-pw\Documents\Clients\Clackamas County, OR\Water Environment Services\F 	ISSUED FOR BID			
v.bentley.co	ANY PRINTS NOT BEARING THIS STAMP MAY HAVE BEEN PRINTED PR TO ADVERTISING AND CANNOT BE CONSIDERED AS BID DOCLIMENT			

-101		-101	102		102	103	
Ċ		Ó	Ч,		Ċ	Ċ	
P-	101		P-	102		PS	H-101

	CONDUIT AND WIRE SCHEDULE								
NUMBER	FROM	то	SIZE (")	POWER	CONTROL	SIGNAL	COMMENTS		
	AREA/GROUP								
P-101	VENDOR SUPPLIED PACKAGE PUMP CP	P-101	3/4"	VENDOR CABLE					
P-102	VENDOR SUPPLIED PACKAGE PUMP CP	P-102	3/4"	VENDOR CABLE					
P-103	PANEL LD	VENDOR SUPPLIED PACKAGE PUMP CP	3/4"	2 10, 10G					
P-104	VENDOR SUPPLIED PACKAGE PUMP CP	LIT-101	3/4"	2 12, 12G					
P-105	VENDOR SUPPLIED PACKAGE PUMP CP	LIT-102	3/4"						
C-101	VENDOR SUPPLIED PACKAGE PUMP CP	P-101	3/4"		VENDOR CABLE				
C-102	VENDOR SUPPLIED PACKAGE PUMP CP	P-102	3/4"		VENDOR CABLE				
C-103	VENDOR SUPPLIED PACKAGE PUMP CP	PSH-101	3/4"		2 14, 14G				
C-104	VENDOR SUPPLIED PACKAGE PUMP CP	PSH-102	3/4"		2 14, 14G				
C-105	VENDOR SUPPLIED PACKAGE PUMP CP	REMOTE I/O RACK	1"		12 14, 14G				
C-106	REMOTE I/O RACK	LTG-101	3/4"		2 14, 14G				
C-107	REMOTE I/O RACK	LTG-102	3/4"		2 14, 14G				
S-101	VENDOR SUPPLIED PACKAGE PUMP CP	FIT-101	3/4"			2/C 16 TSP			
S-102	VENDOR SUPPLIED PACKAGE PUMP CP	REMOTE I/O RACK	1"			2 2/C 16 TSP	FLOW SIGNALS		
S-103	LIT-101	REMOTE I/O RACK	3/4"			2/C 16 TSP			
S-104	PIT-101	REMOTE I/O RACK	3/4"			2/C 16 TSP			
S-105	AIT/AE-101	REMOTE I/O RACK	3/4"			2/C 16 TSP			
S-106	REMOTE I/O RACK	EFM CONTROL PANEL (OPERATOR'S ROOM)	3/4"			ETHERNET			
S-107	LIT-102	REMOTE I/O RACK	3/4"			2/C 16 TSP			
S-108	VENDOR SUPPLIED PACKAGE PUMP CP	FIT-102	3/4"			2/C 16 TSP			

ISSUED FOR BID			
ANY PRINTS NOT BEARING THIS STAMP MAY HAVE BEEN PRINTED PRIOR TO ADVERTISING AND CANNOT BE CONSIDERED AS BID DOCUMENTS. USERS OF THIS DOCUMENT IN EDITABLE ELECTRONIC FORMATS ARE CAUTIONED AGAINST USE WITHOUT FIRST DETERMINING WHETHER CHANGES MAY HAVE BEEN MADE SUBSEQUENT TO ITS PREPARATION.	NO	REVISION	DATE



FIT-102

F

LE/LIT-102

27

യ

LTG-101

PIT-101

LTG-102

LE/LIT-101



REMOTE I/O RACK

REMOTE I/O RACK	3/4"	2/C 16 TSP			
REMOTE I/O RACK 3/4" 2		2/C 16 TSP			
EFM CONTROL PANEL (OPERATOR'S ROOM)	3/4"	ETHERNET			
REMOTE I/O RACK	3/4"	2/C 16 TSP			
FIT-102	3/4"	2/C 16 TSP			
SCALES	DESIGNED SAK	WATER ENVIRONMENT SERVICES CLACKAMAS COUNTY, OREGON			JOB NO
		HOODI AND WATER RESOURCE RECOVERY FACILIT	Y CABLI	E BLOCK DIAGRAMS - 1	2376011.00
IF THIS BAR IS NOT DIMENSION SHOWN.	SAK	CHEMICAL IMPROVEMENT PROJECT			DATE DECEMBER 2024
ADJUST SCALES	CHECKED				SHEET 17 OF 19
BY ACCORDINGLY.	JRM	Kennedy Jenks			E-004

PSH-102

FIT-101





		RED PROFES	DESIGNED	WATER ENVIRONMENT SERVICES		
	SCALES	STENGINEEP	SAK	CLACKAMAS COUNTY. OREGON		
	0 — 1" 0 — 25mm	93347PE	DRAWN	HOODLAND WATER RESOURCE RECOVERY FACILI		
	IF THIS BAR IS NOT		SAK	CHEMICAL IMPROVEMENT PROJECT		
	ADJUST SCALES ACCORDINGLY.	EXPIRATION DATE: 06/30/2025	EXPIRATION DATE: 06/30/2025	EXPIRATION DATE: 06/30/2025	CHECKED	K Kennedy Jenks
BY					JKIM	

	0
ЫΜ	
2:37	
5/2024	
e: 12/5	
ot Date	
ЫС	

	PANEL LD				FED FROM	Л:			
240	/120 VOLTS, SINGLE PHASE, 3 WIRE	BUS: 200A		AIC: 10 KA		MAIN: 200A/2P	MOUNTING: SUI	RFACE	
OKT NO	DECODIDITION	CONNEC	CTED KVA	TRIP		DECODIDITION	CONNEC	CTED KVA	TR
CKI. NO.	DESCRIPTION	A	В	POLES	CKT. NO.	DESCRIPTION	A	В	POL
		2.5		20/2	2	LAB POWER RECEPTS	0.1		20
3	WATER HEATER		2.5	30/2	4	LAB POWER RECEPTS		0.1	30
5	GARAGE RECEPS	0.2		20/1	6	LAB FURNACE	0.2		15
7	TRUCK LOADING CTRLS, ETC		0.2	20/1	8	LAB FURNACE		0.2	15/
)	9A-NEW CONTROL PANEL, 9B-PLANT WATER CTRL	0.1		15/1	10	COFFEE	0.2		20
1	SECURITY, KEYPAD POWER, HYPO ROOM RECEPTS		0.1	20/1	12	MGRS COMP		0.2	20/
3	CONTROL + LAB RECEPTS	0.1		20/1	14		3.0		20/
5	LAB RECEPTS		0.1	20/1	16	- WASH DRY		3.0	30/
17	MCC, HEADWORKS, BLOWER RECEPTS	0.1		20/1	18	LAB UNDER CAB LTS + FAX/COPIER	0.1		15
9	OUTDOOR + ATTIC RECEPTS		0.1	20/1	20	HOT BOX BY ROAD, BACKFLOW BOX		0.2	20/
21	DAYTANK + BATT CHARGER	0.2		20/1	22	HYPO RM HEAT	0.2		201
23			2.5 24	24	HYPO RM HEAT		0.2	20/	
25	LAD DISHWASHER, FIRE + INTRUSION ALARM	2.5		30/2	26	HYPO + TOILET LTS + FAN(X2)	0.1		20/
27	BATH LITE/FAN, HYPO RM LITE, PUMP CONTROL CAB		0.1	20/1	28	LAB FUME HOOD		0.1	20
29	NEW BATT CHGR, PORCH LITE	0.2		20/1	30	MCP POWER RED, EFFLUENT SAMPLER	0.1		20/
31	GEN RM, FUEL XFER, EXIT LTS, GARAGE OPENER		0.1	20/1	32	HYPOTANK VENT, OUTSIDE GFI HYPO RM		0.1	
33	DECHLOR RM HEATER	0.2		20/1	34	HYPOTANK VENT, OUTSIDE GFI HYPO RM	0.1		20
35	TSTAT HEADWORKS HEATER + COIL		0.2	20/1	36	RADIO CTRL CAB, TOILET WH-1, COFFEE, MICRO		0.1	20
37	S WALL CTRL RM HTR, MCC+DECHLOR EF'S	0.1		20/1	38	SHOWER ROOM HTR	0.2		20
39	BLOWER RM EF		0.2	20/1	40			3.0	10
41	VENDOR SUPPLIED PACKAGE PUMP CP	2.2		30/1	42	- 40A GARAGE RECPT FOR WELDING	3.0		40,
PHASE SUBTO	DTALS (KVA):	8.4	6.1				7.3	7.2	
PHASE TOTAL	S (KVA):	· · · · · · · · · · · · · · · · · · ·					15.7	13.3	
FOTAL KVA:								29.0	KVA
	RES:							121	Α

ISSUED FOR BID			
ANY PRINTS NOT BEARING THIS STAMP MAY HAVE BEEN PRINTED PRIOR TO ADVERTISING AND CANNOT BE CONSIDERED AS BID DOCUMENTS. USERS OF THIS DOCUMENT IN EDITABLE ELECTRONIC FORMATS ARE CAUTIONED AGAINST USE WITHOUT FIRST DETERMINING WHETHER CHANGES MAY HAVE BEEN MADE SUBSEQUENT TO ITS PREPARATION.			
	NO	REVISION	DATE



		SCALE		
ΤY	PANELBOARD SCHEDULE	JOB NO 2376011.00		
		DATE DECEMBER 2024		
		SHEET 19 OF 19		
		E-102		

# Kennedy Jenks

1500 NE Irving St., Suite 200 Portland, OR 97232 503-423-4000

Project Manual Drawings and Technical Specifications Hoodland Chemical Improvement Project

12 December 2024

Prepared for

#### Clackamas Water Environment Services

150 Beavercreek Road #430 Oregon City, OR 97045

KJ Project No. 2376011*00

#### HOODLAND CHEMICAL IMPROVEMENTS

#### WATER ENVIRONMENT SERVICES

#### CLACKAMAS COUNTY, OREGON

#### BIDDING REQUIREMENTS AND CONTRACT SPECIFICATIONS

#### for the construction of the

#### HOODLAND CHEMICAL IMPROVEMENTS PROJECT

#### PROFESSIONAL OF RECORD CERTIFICATION(S):



#### HOODLAND CHEMICAL IMPROVEMENTS

#### WATER ENVIRONMENT SERVICES

#### CLACKAMAS COUNTY, OREGON

#### BIDDING REQUIREMENTS AND CONTRACT SPECIFICATIONS

#### for the construction of the

#### HOODLAND CHEMICAL IMPROVEMENTS PROJECT

#### PROFESSIONAL OF RECORD CERTIFICATION(S):



#### PROJECT MANUAL TABLE OF CONTENTS

# **TECHNICAL SPECIFICATIONS**

DIVISION 1	GENERAL REQUIREMENTS
01 87 13	SEISMIC REQUIREMENTS
DIVISION 2	EXISTING CONDITIONS
02 40 00	DEMOLITION
DIVISION 5	METALS
05 05 23	ANCHORS IN CONCRETE AND MASONRY
DIVISION 10	SPECIALTIES
10 40 00	IDENTIFYING DEVICES
DIVISION 11	<u>EQUIPMENT</u>
11 00 00	GENERAL EQUIPMENT AND MECHANICAL REQUIREMENTS
DIVISION 26	ELECTRICAL
26 05 00 26 05 20 26 05 33	GENERAL ELECTRICAL REQUIREMENTS SIGNAL CABLE ELECTRICAL RACEWAY SYSTEMS
DIVISION 40	PROCESS INTERCONNECTIONS
40 27 00 40 60 00	PIPING, VALVES AND ACCESSORIES INSTRUMENTATION AND CONTROLS GENERAL REQUIREMENTS
40 61 96 40 63 00	PROGRAMMABLELOGIC CONTROLLER
40 72 00	LEVEL MEASUREMENT
40 78 00	PANEL MOUNTED AND MISC FIELD INSTRUMENTS
40 91 10	GAS DETECTION DEVICES
DIVISION 43	PROCESS GAS and LIQUID HANDLING, PURIFICATION, and
STORAGE EQUIPMENT	
43 41 43	POLYETHYLENE CHEMICAL STORAGE TANKS
DIVISION 46	WATER AND WASTEWATER EQUIPMENT

46 30 00 CHEMICAL FEED EQUIPMENT

#### **SECTION 01 87 13**

#### SEISMIC REQUIREMENTS

#### PART 1 - GENERAL

#### 1.01 SUMMARY

- This Section is applicable to the following secondary structural system elements, Α. non-structural components, and/or equipment supported by structures.
  - 1. Mechanical, electrical, and plumbing equipment and appurtenances, including, but not limited to:
    - Pumps: a.
    - Electrical equipment including control panels, remote I/O panels; b.
    - **Pipe Supports** C.
    - Anchorage of all deferred design items; d.
    - Anchorage of any equipment weighing more than 400 lbs and mounted e. at floor level or weighing more than 20 lbs mounted more than 4 feet above the ground
  - Conduit, piping, cable trays, raceways, ducts and similar systems. 2.
  - Tanks and vessels (include contents), including support systems, including 3. but not limited to:
    - Sodium Bisulfite Tank: a.
  - All equipment specifically listed in this specification. 4.

#### REFERENCES 1.02

- American Society of Civil Engineers Standard ASCE 7-16, Minimum Design Loads Α. for Buildings and Other Structures
- Β. International Building Code (IBC) Section 1613.
- C. 2022 Oregon Structural Specialty Code (OSSC).

#### **GENERAL DESIGN REQUIREMENTS** 1.03

- The Contractor is responsible for producing structural designs that resist applicable Α. loads including: Dead, Live, Wind, Seismic, Fluid, Snow, Rain, Earth, operational, or other special loads applicable to the component being designed.
- Β. Minimum design loads shall be based on guidelines given in this Section, the Drawings, ASCE 7-16, IBC Chapter 16, equipment manufacturer's recommendations and/or other industry accepted design standard for the component being designed (i.e. AWWA D100, API 650, ANSI MH16.1).

#### 1.04 SEISMIC DESIGN REQUIREMENTS

The Contractor is responsible for producing designs that resist the total seismic Α. forces in accordance with the seismic design criteria. The Contractor is responsible for coordinating any deferred designs with the Engineer of Record. The Contractor is responsible to coordinate the favorably reviewed design in the field, and shall provide the proposed design, including any modifications required to the primary structure, at no additional cost to the owner.

- B. The seismic design for non-structural components and equipment shall be in accordance with the IBC Chapter 16, and the required coefficients and factors for determining the total design seismic forces are provided in the Seismic Design Criteria in Paragraph D below.
- C. Coordinate the layout so that adequate space is provided between items for relative motion. Provide additional supports and restraints between items of different systems when necessary to prevent seismic impacts or interaction.
- D. Total seismic forces shall be determined in accordance with the following seismic design criteria coefficients for elements of structures, non-structural components, equipment supported by structures, and nonbuilding structures:
  - Spectral Acceleration 1-Second Period, SD1 = 0.594 per ASCE 7 1. Supplement 3 11.4.8 Item 1 Exception
  - 2 Spectral Response Acceleration at Short Period, SDS = 0.574
  - 3. Seismic Design Category = III
  - Importance Factor. I = 1.254.
  - 5. Component Importance Factor, Ip per ASCE 7 13.1.3
  - Components Coefficient, a per ASCE 7 Table 13.6-1, 15.4-1, 15.4-2. 6.
  - 7. Components Coefficient, Rp per ASCE 7 Table 13.6-1, 15.4-1, and 15.4-2.
  - Response Modification Factor, R per ASCE 7 Table 15.4-1 and 15.4-2. 8.
- E. Design non-building structures in accordance with chapter 15 of ASCE 7-16; all designs utilizing chapter 15 shall include the design and anchorage of the entire non-building structure.
- F. Design anchorages of all elements of structures, nonstructural components, and equipment supported by structures, to resist static and dynamic operational loads, plus total seismic loads specified in the IBC, ASCE 7 16 Section 13.3.1, and as follows:
  - 1. For suspended equipment, multiply dead load by 1.2 and add 0.2SDS to account for vertical seismic effects in the downward direction.
  - 2. For anchorage uplift, multiply dead load by 0.9 and subtract 0.2SDS if used to reduce vertical seismic effects.
  - 3. Post-installed anchors installed in concrete shall be pregualified for seismic application in accordance with ACI 355.2.
- G. Design Basis and Coordination: Contractor shall note that the layout of the structure and equipment pads is based on the first named manufacturer and model for the equipment to be anchored.
  - Contractor shall coordinate all attachments and related work and shall 1. provide connections as noted in the favorably reviewed shop drawings.
  - 2. For all suppliers, if the dimensions required by the Contractor's submitted anchorage calculations deviate from those provided on the Contract Drawings, Contractor shall note the deviation in the submittal for review and provide the favorably reviewed pad at no additional cost to the Owner.
  - 3. If a model or manufacturer other than the first name supplier is submitted for use by the Contractor, Contractor shall coordinate all related work and deviations from the Contract Drawings.
  - Where Contractor's engineer proposes a deviation from the contract drawings 4. for any manufacturer, and that deviation is favorably reviewed by the Engineer, Contractor shall provide that modification to the structure at no additional cost.

#### 1.05 DESIGN REQUIREMENTS FOR PIPING, CONDUIT, AND DUCTS

A. The Contractor is responsible for producing designs for support of piping, conduit, duct or other systems to resist total seismic forces based on the seismic design criteria coefficients specified above, unless shown on the Contract Documents. Except where the technical specifications give specific exemption from resistance of seismic forces, all supports shall be designed to meet seismic criteria.

#### 1.06 SUBMITTALS

- A. Submit in accordance with Section 01300.
- B. Shop Drawings for non-building structures and contractor designed components: Submit signed and sealed structural calculations and detailed drawings for the following listed elements and their attachments, the secondary structural system and their attachments, permanent non-structural components and their attachments, and the attachments and anchorage for permanent equipment supported by the structure:
  - 1. List items where entire package shall be designed by the Contractor
  - 2. Any components or equipment where Contractor's Engineer had designed using chapter 15 of ASCE 7-16 (i.e. which are non-building structures rather than equipment)
  - 3. For elements designed using chapter 15, Contractor shall submit complete calculations for the element or non-building structure in lieu of seismic certification.
- C. Shop Drawings for Anchorage Calculations: Where required in the equipment specifications in Divisions 2 through 17, submit signed and sealed structural calculations and detailed drawings from the Contractor's Engineer.
- D. Structural calculations and detailed drawings shall be prepared by the Contractor's Engineer.
- E. Structural calculations and detailed drawings shall clearly show the total design seismic forces which will be transferred from the elements of the structural system, non-structural components, and/or equipment and their attachments to the primary structure. Calculations must be reviewed by Engineer of Record for general conformance with the design criteria and building code and therefore calculations shall include:
  - 1. Seismic and wind load criteria used to determine design lateral and uplift forces. For external equipment, a statement should be made as to whether wind controls for all equipment.
  - 2. Derivation of forces used, including at least one complete sample calculation, showing the process used so that Engineer of Record may determine general compliance. Printouts of spreadsheets without explanation of calculations used to determine values are not acceptable.
  - 3. Adequacy of anchorage to concrete and masonry or attachment to the primary structure to transfer the design forces from the element.
  - 4. Detail drawings shall note:
    - a. Required concrete strength,
    - b. Anchor type, dimensions, and materials. Coordinate material selection with Section 05 05 23.
    - c. Edge distance, spacing, embedment depth, substrate thickness and any supplementary reinforcing required for anchors installed in concrete.

- d. Required dimensions of equipment pads based on equipment size and edge distance. The Contractor shall coordinate dimensions of equipment pads, including any revisions required to meet the requirements of the favorably reviewed submittal by the Engineer at no additional cost to the Owner.
- F. The Engineer of Record's review of items within a Specification Section cannot be completed until all related items have been coordinated and submitted for review.
- G. Quality Assurance Submittals
  - 1. Test Reports: Submit test reports for tension testing of anchors.
  - 2. Verification of installation: Submit a letter from the Contractor's Engineer verifying that the installation was performed as required by the Engineer's calculations.
- 1.07 QUALITY ASSURANCE
  - A. Qualifications: The Contractor is responsible for submitting signed and sealed structural calculations and detailed drawings from a Structural or Civil Engineer licensed in the State where the project is being built.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

PART 4 - FIELD QUALITY CONTROL

- A. Site Tests: Tension testing of expansion or adhesive anchors utilized for anchorage shall be done in the presence of the Owner's Representative and a report of the test results shall be submitted. See Specification Section 05 05 23 for additional requirements.
- B. Inspection: Special Inspection shall be provided for high strength bolting or bolts installed in concrete. See Specification Section 05 05 23 for additional requirements.

END OF SECTION

#### SECTION 02 40 00

#### DEMOLITION

#### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Provide all demolition required to perform the work covered under this contract including without limitation:
  - 1. Remove existing construction shown to be removed.
  - 2. Remove and replace existing construction and/or finishes as required to provide access to perform other work included in this contract.
  - 3. Include removal of mechanical and electrical work that is to be abandoned and is contained in construction to be removed whether or not the mechanical and electrical work is shown. Disconnect and cap off utilities in accordance with applicable codes and safety regulations.
  - 4. Where utilities that are not shown pass through construction that must be removed and those utilities serve other areas notify the Owner before disrupting service. If rerouting is required to maintain service, the Owner may issue a Change Order to accomplish the required work.
  - 5. Store and protect items intended for reuse.
  - 6. Assume ownership of debris and unwanted materials, remove from the site and dispose of legally.
    - a. Special requirements for waste management during construction operations.
      - 1) Protect the environment, both onsite and offsite
      - 2) Prevent environmental pollution and damage.
      - 3) Maximize source reduction, reuse, and recycling of solid waste.
  - 7. If illegal electrical wiring is encountered such as "BX" or nonmetallic sheathed cable, notify the Engineer.

#### 1.02 NOISE AND DUST CONTROL

- A. Perform work in accordance with requirements in Division 1. Particular attention is directed without limitation to paragraphs titled: Owner and Contractor's Use of Premises, Cleanup During Construction, Fire Protection During Construction, Maintenance of Exit Routes for Building Users, Temporary Dust Barriers, Noise Control and Care of Existing Facilities.
- B. Provide temporary partitions to control dust and noise and exclude unauthorized persons.
- C. Perform work in a manner to cause least disturbance to building occupants and least damage to work to remain.
- D. Maintain adequate means of safe, clear egress for building occupants.
- E. Employ all available techniques for construction noise abatement. Use remote, well-mufflered air compressors and newest noise suppressed pneumatic and electric tools.

#### 1.03 SUBMITTALS

A. Information to be submitted in accordance with Section 01 33 00.

B. Submit copies of all executed permits.

#### 1.04 PERMITS

A. Owner will submit and pay for Building and Electrical permits. Contractor shall pick up and take responsibility for the permits.

#### PART 2 - PRODUCTS - NOT USED

#### PART 3 - EXECUTION

#### 3.01 REMOVAL OF CONSTRUCTION IN AREAS TO RECEIVE NEW WORK

- A. In areas intended to receive new work and/or finishes, remove all unwanted nonstructural partitions, furred walls, chases, suspended or furred ceilings, doors, windows and finishes.
- B. Remove all unwanted mechanical and electrical work (whether shown or not) that is not wanted and is not needed to serve other areas that is in, on, or concealed behind work being removed. Cap off or terminate all mechanical or electrical work).
- C. Protect mechanical and electrical work that serves other areas. Relocate concealed mechanical and electrical work that is required to preserve service to other areas.
- D. Remove structural work designated for removal. Take precautions not to damage structural work intended to remain. Where temporary shoring is needed, submit a design prepared by an appropriately licensed engineer for review before proceeding.
- E. If structural elements are encountered that were not shown, protect them from damage and report their presence to the Owner

#### 3.02 REMOVAL OF LIMITED PORTIONS OF EXISTING CONSTRUCTION TO PERMIT MODIFICATIONS

- A. Provide careful, selective cutting and removal of existing construction as required to permit relocation or modification of partitions, doors, or openings. Cut and remove the least amount of work possible except when a larger area needs to be removed to permit strengthening existing construction or when required to remove finishes to a natural break line such as a corner or change in material.
- B. Protect existing construction to remain with temporary coverings.
- C. Treat existing mechanical, electrical, or structural work as described in other parts of this Section.
- D. When modifications are complete, replace removed work with new construction and finishes to match adjacent existing work. Standards of material and workmanship shall be in accordance with other portions of this Specification or if not covered then in accordance with current practice for this class of work. Salvaged materials may be used for replacement if in good condition.

- 3.03 REMOVAL OF EXISTING CONSTRUCTION TO PROVIDE ACCESS TO PERFORM WORK
  - A. Provide careful selective cutting and removal of existing construction where required to permit installation of new concealed mechanical or electrical work, or installation of equipment, fixtures or devices.
  - B. Treat existing mechanical, electrical, or structural work as described in other parts of this Section.
  - C. Replace and/or patch removed construction and finishes in accordance with other parts of this Section.
- 3.04 PROTECTION OF WORK TO REMAIN
  - A. Protect all work to remain. Repair damage with materials, workmanship, and finishes matching existing work when new.
  - B. Most existing floor finishes will not be replaced in this contract. It is essential these floors be protected from any damage due to impact, dirt, abrasion, paints, and solvents.

#### 3.05 CUTTING HOLES IN CONCRETE AND/OR CONCRETE MASONRY UNIT (CMU)

- A. The Contractor is cautioned that electrical conduits and reinforcing that are not shown on Drawings may be concealed in concrete CMU construction. Use electronic detection equipment to locate concealed items before cutting holes. Take all required precautions to avoid damage to existing conduits or reinforcing.
- B. New openings in existing concrete walls or slabs may be saw cut to opening perimeter lines where Drawings do not call for adding reinforcing trim bars to strengthen openings. Do not run saw kerfs past corners of openings. Complete concrete removal at opening corners by chipping and grinding. Take all required precautions to avoid water damage to existing construction or the Owner's property.
- C. Where Drawings call for adding reinforcing trim bars to strengthen openings, limit saw cutting to a depth of 3/4 inch to avoid cutting existing reinforcing steel. Carefully chip out concrete to avoid damaging existing reinforcing steel which is to remain.
- D. Use chipping guns to chip out small holes for pipes or conduits. Proceed carefully to avoid damage to concealed conduits. Core drilling is permitted only at the Contractor's risk and only with the Owner's permission. If core drilling is used, the Contractor shall: 1) use electronic detection equipment to locate conduit before drilling, 2) take precaution to avoid water damage to existing construction or the Owner's property, and 3) replace, at its own expense, any damaged electrical or signal wiring or conduits.

#### 3.06 REMOVE UNWANTED FIXED EQUIPMENT

- A. Remove unwanted fixed and built-in equipment, machinery, machinery bases and similar items whether shown or not. Cut off protruding bolts or attachment devices flush with existing surfaces.
- B. If items are designated on the Drawings to be salvaged, remove them carefully without causing damage.

Demolition

C. Store and protect items to be reused until time of need on jobsite.

#### 3.07 IF HAZARDOUS MATERIALS ARE ENCOUNTERED

A. If hazardous materials are discovered, comply with all applicable laws.

#### 3.08 REMOVAL AND DISPOSAL OF MATERIAL

- A. Use debris chutes with covered tops emptying into covered containers.
- B. Use rubber tired covered buggies with rubber bumpers to transport debris through occupied sections of buildings.
- C. Store debris in suitable covered containers located where directed by the Owner and remove from site when full. Burning on the site is not permitted.
- D. Removed material (other than material to be reused) shall become the property of the Contractor who shall remove it from the site and dispose of it in a legal manner.

#### 3.09 UTILITY LOCATES AND DEMOLITION

A. There are electrical conduits that may nor may not be shown on the Drawings. Locate, demolish, and restore as required for the construction.

#### END OF SECTION

#### SECTION 05 05 23

#### ANCHORS IN CONCRETE AND MASONRY

#### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. This section is applicable for anchors, anchor category, anchor groups, anchor systems in concrete AND/OR masonry construction. This includes, but is not limited to:
  - 1. Cast-in-place anchors bolts, welded headed anchors, and anchor studs.
  - 2. Post-installed adhesive anchors.
  - 3. Post-installed adhesive steel reinforcing bars (rebar).
  - 4. Post-installed mechanical anchors.
  - 5. Post-installed screw anchors.
  - 6. Anchors intended to be used as part of a deferred submittal.
- B. All post-installed anchors and adhesive for reinforcement shall be rated for use and installation in cracked concrete AND/OR cracked masonry. Post-installed anchors and adhesives for reinforcement rated only for uncracked concrete AND/OR uncracked masonry will not be permitted for use.

#### 1.02 REFERENCES

- A. American Concrete Institute (ACI):
  - 1. ACI 318 Building Code Requirements for Structural Concrete and Commentary
  - 2. ACI 350 Code Requirements for Environmental Engineering Concrete Structures and Commentary
  - 3. ACI 355.2 Qualification of Post-Installed Mechanical Anchors in Concrete and Commentary
  - 4. ACI 355.4 Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary
- B. American National Standards Institute (ANSI):

1.	ANSI/ASME E	31.1	Unified Inch Screw Threads (UN, UNR, and UNJ
			Thread Forms)
2.	ANSI/ASME E	318.2.2	Square and Hex Nuts
3.	ANSI/ASME E	318.22.1	Plain Washers
4.	ANSI/AMSE E	3212.15	Cutting Tools – Carbide-Tipped Masonry Drills
			and Blanks for Carbide-Tipped Masonry Drills
Ar	nerican Society	for Testing an	d Materials (ASTM), Standard Specification for:
1.	ASTM A29	General Requ Wrought	irements for Steel Bars, Carbon and Alloy, Hot-
2.	ASTM A108	Steel Bar, Ca	rbon and Alloy, Cold-Finished
3.	ASTM A153	Zinc Coating	(Hot-Dip) on Iron and Steel Hardware
4.	ASTM A193	Alloy-Steel an	d Stainless Steel Bolting Materials for High-
		Temperature	or High-Pressure Service and Other Special
		Purpose Appl	ications

5. ASTM A563 Carbon and Alloy Steel Nuts (Inch and Metric)

C.

- 6. ASTM A615 Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- 7. ASTM A706 Deformed and Plain Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
- 8. ASTM A1044 Steed Stud Assemblies for Shear Reinforcement of Concrete
- 9. ASTM B633 Electrodeposited Coatings of Zinc on Iron and Steel
- 10. ASTM B695 Coatings of Zinc Mechanically Deposited on Iron and Steel
- 11. ASTM C881 Epoxy-Resin-Base Bonding Systems for Concrete
- 12. ASTM F436 Hardened Steel Washers Inch and Metric Dimensions
- 13. ASTM F593 Stainless Steel Bolts, Hex Cap Screws, and Studs
- 14. ASTM F594 Stainless Steel Nuts
- 15. ASTM F844 Washers, Steel, Plain (Flat), Unhardened for General Use
- 16. ASTM F1554 Anchors Bolts, Steel, 36, 55, and 105-ksi Yield Strength
- 17. ASTM F1941 Electrodeposited Coatings on Mechanical Fasteners, Inch and Metric
- 18. ASTM F2329 Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
- D. Federal Specifications A-A-1922A Type 2 only, A-A01923A Type 4 only and A-A-55614 for Expansion and Shield-Type Anchors
- E. International Code Council (ICC) Evaluation Service, Acceptance Criteria (AC) for:
  - 1. AC 01 Mechanical Anchors in Cracked and Uncracked Masonry Elements
  - 2. AC 58 Adhesive Anchors in Cracked and Uncracked Masonry Elements
  - 3. AC 60 Anchors in Unreinforced Masonry Elements
  - 4. AC 106 Predrilled Fasteners (Screw Anchors) in Masonry
  - 5. AC 193 Acceptance Criteria for Mechanical Anchors in Concrete Elements
  - 6. AC 308 Post-Installed Adhesive Anchors in Concrete Elements
  - 7. AC 510 Seismic Qualification of Post-Installed Anchors in Concrete
- F. International Standards Organization (ISO):
  - 1. ISO/IEC 17011 Conformity Assessment General Requirements for Accreditation Bodies.
  - 2. ISO/IEC 17025 General Requirements for the Competence of Calibration and Testing Laboratories.
  - 3. ISO/ASQ/ASNI 9000 Quality Management Systems Fundamentals and Vocabulary
  - 4. TMS 402/602 Building Code Requirements and Specifications for Masonry Structures, The Masonry Society (TMS)

## 1.03 SUBMITTALS

- A. Submit in accordance with Section 01 33 00.
- B. Product Data:
  - 1. Submit material grade, thickness, and dimensional data for nuts and washers.
  - 2. Adhesive anchors.
  - 3. Reinforcing steel dowels.
  - 4. Mechanical anchors, expansion anchors.

- C. Samples: Manufacturer's latest standard product: Specify special or unique products.
- D. ICC Evaluation Service Reports or equivalent IAPMO evaluation reports for all anchors submitted demonstrating compliance with OSSC applicable ACI acceptance criteria for Mechanical or Adhesive anchors respectively. Reports for concrete anchors shall demonstrate approval for use in cracked concrete in Seismic Design Categories A-F.
  - 1. A submittal without a relative and current evaluation report will not be accepted.
- E. Anchor Installation Plan:
  - 1. List of all anchors installed including location, diameter, material type, number, and length of anchors.
  - 2. For post-installed anchors include a description of the drilling equipment, hole cleaning and preparation procedure, adhesive injection or mechanical anchor insertion technique, preparation for rebar dowels and threaded rods, and torquing procedure.
  - 3. Testing plan for anchors, including percentage of anchors to be tested and proof loads for anchors (see Verification Testing below).
  - 4. Certified Verification Testing Report:
    - a. Detailing results of field testing required in Tests and Additional Tests below.
    - Certified by an independent testing laboratory or registered Professional Civil or Structural Engineer licensed to practice in the State where the project is being constructed.
- F. Anchorage in Concrete AND/OR Masonry as a Deferred Submittal:
  - Complete calculations, details, and complete reference drawings that are required to be submitted as part of a deferred submittal and as defined in the OSSC and within the Contract Documents, shall be prepared, stamped, signed, and furnished by a Professional Civil or Structural Engineer licensed to practice in the State where the project is being constructed.
  - 2. Comply with Specification Section 01 87 13.
  - Deferred submittal calculations and details shall be prepared and designed in accordance with the applicable codes referenced within the Contract Documents. Anchors shall be assumed to see a maximum short-term service temperature of 130°F and a long-term service temperature of 110°F, unless otherwise specified.
  - 4. Minimum Calculation and Reference Drawing Requirements:
    - a. Calculations shall be comprehensible and complete. When evaluating the structural strengths, indicate stress for comparing with strengths or show the demand versus capacity ratio in the structural elements. Evaluating the results by stating "Okay by Inspection" is not acceptable.
    - b. Derivation of forces used, including at least one complete sample calculation, showing the process used so that Engineer of Record may determine general conformance. Printouts of spreadsheets without explanation of calculations used to determine values are not acceptable.
    - c. Submittal calculations and details shall demonstrate a complete vertical and lateral load path and shall clearly indicate all forces imposed on the supporting structure. Include all load combinations used in the design shall be referenced and include a clear indication whether service level or strength level was used in the design.

- d. Reference drawings shall include plans, sections, details, and equipment information as necessary for calculations. Indicate the location of the equipment on plan which is necessary for the development of load calculations.
- e. The Engineer of Record's review of the deferred submittal items identified in Contract Documents cannot be completed until all related items have been coordinated and submitted for review. Submittals will be returned without review if:
  - 1) The calculations and details are not sealed and signed by a Professional Civil or Structural Engineer licensed to practice in the State where the project is being constructed.
  - 2) Submittals include only calculations without reference drawings.
  - 3) Calculations have no sheet numbers or sheets are missing.
  - 4) Calculations or reference drawings are illegible.
  - 5) Calculations are made based on wrong information, assumptions, or design parameters.
  - 6) Information in reference drawings is insufficient for calculations or review.
  - 7) No details of the anchorage are provided.
- 5. Anchorage Details as a Deferred Submittal:
  - a. Anchorage details shall be prepared, stamped, signed, and furnished by a Professional Civil or Structural Engineer licensed to practice in the State where the project is being constructed.
  - b. Anchorage details shall include the required concrete strength AND/OR masonry strength consistent with the Contract Documents, anchor bolt diameter, embed, spacing, maximum grout pad height, and edge distances consistent with the favorably reviewed submittal calculations.
  - c. Include anchoring methods and leveling criteria for equipment consistent with manufacturer's recommendations.
- 6. Coordination and Other Shop Drawings:
  - a. The Contractor is responsible for coordinating the final foundation sizes with the final size of equipment and final anchorage calculations, including the coordination for any required edge distance as noted in the favorably reviewed anchorage submittal.
  - b. Deferred submittals that require anchor reinforcement or supplementary reinforcement identified in a favorably reviewed submittal or the Contract Documents shall be included in that specific shop drawing submittal.
  - c. Deferred submittals that require edge distance that exceeds the available edge distance noted on the Contract Drawings, shall notify the Engineer of Record prior to ordering or fabricating any materials.
- G. Quality Assurance Submittals
  - 1. The Contractor shall be qualified to install cast-in-place and post-installed anchors.
  - 2. Certification of Installation:
    - a. For Post-Installed Anchors: Submit a certification of completion of each individual installing the anchors consistent with the Contract Documents or favorably reviewed deferred submittal.
  - 3. Evaluation Reports:

- a. Submit the current and relative ICC-ESR or IAPMO-UES reports used in the design of anchorage. A submittal without a relative and current ICC-ESR or IAPMO-UES report will be rejected.
- 4. Verification of Installation:
  - a. Special Inspection reports or documentation verifying the anchor installation was performed in accordance with the Contract Documents or favorably reviewed deferred submittal.
  - b. Anchorage as a Deferred Submittal: Submit a letter from the Contractor's Engineer indicating the installation was performed as required by the favorably reviewed deferred submittal and ICC-ESR or IAPMO-UES report.
- 5. Test Reports:
  - a. Submit test reports for testing of anchors in accordance with the Contract Documents.

## 1.04 QUALITY ASSURANCE

- A. General:
  - 1. Contractor Qualifications: 5-years of experience installing similar anchors in concrete AND/OR masonry structures.
  - 2. Anchors shall be manufactured under a certified quality system meeting the requirements of the ISO 9000 quality management system or equivalent.
  - 3. All anchors shall be tested and evaluated under an approved quality assurance program with following-up by an inspection agency under ISO/IEC 17020 by a recognized accreditation body conforming to the requirements of ISO/IEC 17011.
  - 4. Anchors shall be stamped with identifying marks and colors.
  - 5. Installer Training:
    - a. Complete a thorough training with the manufacturer or the manufacturer's representative for the submitted product. Training shall consist of a review of the complete installation process for drilled-in anchors, including but not limited to:
      - 1) Hole drilling procedure(s),
      - 2) Hole preparation and cleaning technique(s),
      - 3) Adhesive injection technique(s), dispenser training and maintenance,
      - 4) Reinforcing steel dowel preparation and installation procedures,
      - 5) Proof loading and torquing.
    - b. Individuals that have not completed the quality assurance requirements of this Section will not be permitted to install anchors without qualifications specific to the products intended for use.
- B. Special Inspection and Testing:
  - 1. General:
    - a. The Owner or Owner's authorized agent, independent of the Contractor, shall employ one or more approved agencies to provide special inspections and testing in accordance with the Contract Documents, Chapter 17 of the OSSC, and the current and relative ICC-ESR or IAPMO-UES.
    - b. Special Inspections and Testing shall be independent of the Contractor.
    - c. Special Inspections and Testing shall govern the quality, workmanship, and requirements for materials covered with in the Contract Documents.
    - d. Materials of construction and testing shall conform to the applicable standards listed in the referenced building code and Contract Documents.
  - 2. Special Inspections:

- a. Special Inspections shall comply with the Contract Documents and schedules identified on the Drawings. Unless otherwise specified within the Contract Documents, at a minimum the special inspection of anchors in concrete AND/OR masonry shall comply with Chapter 17 of the OSSC and ICC-ESR or IAPMO-UES evaluation reports.
- b. At a minimum, the Special Inspector shall visually inspect the following, but not limited to: required substrate type and thickness, presence of moisture on the substrate, anchor bolt layout, hole cleaning procedures, product identification and expiration date, product installation procedures, anchor bolt location, embedment, anchor size, anchor spacing, minimum edge distance, and installation temperature.
- C. Unless specifically identified elsewhere within the Contract Documents, all special inspections of anchors in concrete AND/OR masonry shall be in accordance with the ICC-ESR or IAPMO-UES Evaluation Report. Additional Tests:
  - 1. Anchors, washers, and nuts that require repair or are required to be replaced due to faulty work performed during installation shall be clearly identified, replaced, and re-tested at no additional cost to the Owner.
  - 2. All materials and all additional documentation to substantiate any faulty or damaged anchors, washers, and nuts in an effort to avoid replacement shall be at no additional cost to the Owner.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Handle, ship, and store material in a manner that will prevent distortion, rust, damage to the shop coat or any other damage.
- B. Store material in a clean, properly drained location out of contact with the ground, and in accordance with the manufacturer's recommendations.
- C. Ensure that dissimilar metals are not in contact with each other.
- D. Replace or repair all damaged material to an equal product. Do not install damaged anchor bolts.

## PART 2 - PRODUCTS

## 2.01 GENERAL REQUIREMENTS

- A. General
  - 1. Provide only named adhesive anchor products, mechanical anchors products, and anchor material types where specified within this Section or the Contract Documents.
  - 2. Product and anchor type deviations will only be considered provided the deferred submittal anchorage design calculations for the proposed products include supporting documentation consistent with this Section and the Contract Documents.
    - a. Provide a clear explanation to substantiate any proposed deviations.
    - b. The Engineer of Record will decide whether to accept or reject any proposed deviations.
    - c. Proposed deviations without a relative and current ICC-ES, or IAPMO UES evaluation report will not be accepted.

#### 2.02 EXPOSURE AND FINISH

A. The following table summarizes the minimum criteria for anchor material and hardware finishes for the specified exposure condition, unless otherwise specified in the Contract Documents:

Exposure Condition	Finish Type
Interior/ Exterior: Dry conditions. Interior and exterior locations not subjected to high moisture environments.	Hot-Dip Galvanized per ASTM F2329 OR ASTM A153 or ASTM A193, Grade B7, or equal
High Moisture: Exposed to extreme weather conditions or high moisture environments not subjected to submerged conditions or placement in earth.	AISI 304, Type 304 Stainless- Steel or ASTM A193, Grade B8 Class 2, or equal
Submerged and//or Buried: All submerged and buried conditions, conditions where fasteners will be continuously or intermittently wet, exposed to corrosive chemicals, exposed to earth, or as required by other Specification Sections.	AISI 316, Type 316 Stainless- Steel or ASTM A193, Grade B8M Class 2, or equal

B. Do not install hot-dip galvanized or zinc coated anchors in high moisture, submerged, and buried conditions.

#### 2.03 NUTS AND WASHERS

- A. Nuts and washer shall be used for the installation of all anchors, anchor bolts and anchor rods, for both cast-in-place and post-installed conditions. Comply with the following:
  - 1. Size nuts and washers to accommodate galvanizing and plate threads where required.
  - 2. Do not oversize nuts or washers.
  - 3. Nuts shall be hex or heavy hex and shall meet the dimensional requirements of ASME B18.2.2, unless otherwise specified. Where a manufacturer specifies a type and finish of nut for a specific anchor, the manufacturer recommended nut shall be used.
  - 4. Washers shall be circular (round) and meet the dimensional requirements of ASME B18.21.1, unless otherwise specified. Where a manufacturer specifies a type and finish of washer for a specific anchor, the manufacturer recommended washer shall be used.
- B. The following hardware schedule summarizes the minimum criteria for nuts and washers to be used with the specified anchor material. Unless otherwise specified in the Contract Documents or a favorably reviewed submittal, the following shall apply to all anchor types:

Anchor Material	Nuts	Washers
ASTM F1554, Hot-Dip Galvanized, or Zinc Coated	ASTM A563, Grade A Hex or Heavy Hex Head	ASTM F844 or ASTM F436

#### Hardware Schedule for Nuts and Washers

ASTM A913, Grade B7 Alloy Steel	ASTM A194, Grade 2H Heavy Hex	ASTM F436, Type 1
ASTM 55 or 105, Hot-Dip Galvanized	ASTM A563, Grade DH Heavy Hex Head (or ASTM A194, Grade 2H)	ASTM F436, Type 3 (Round SAE Pattern)
Type 304	ASTM F594, Alloy Group 1	AISI 304
Stainless-Steel	CW1 (F594C) & CW2 (F594D)	(Type 304 Stainless-Steel)
ASTM A193,	ASTM A194, Grade 8	AISI 304
Grade B8 Class 2	(Stainless AISI 304 Heavy Hex)	(Type 304 Stainless-Steel)
Type 316	ASTM F594, Alloy Group 2	AISI 316
Stainless-Steel	CW1 (F594G) & CW2 (F594H)	(Type 316 Stainless-Steel)
ASTM A193,	ASTM A194, Grade 8M	AISI 316
Grade B8M Class 2	(Stainless AISI 316 Heavy Hex)	(Type 316 Stainless-Steel)

C. Leveling nuts used below base plates shall conform to the dimensions and materials used for nuts.

#### 2.04 ANCHORS AND STEEL REINFORING BAR MATERIALS

- A. Headed Anchor Bolts (Cast-in-Place):
  - 1. All headed anchor bolts shall be cast-in-place, and conform to the following, unless specified elsewhere in the Contract Documents or favorably reviewed submittal:

Anchor Type	Material Grade	Minimum Yield Strength	Minimum Tensile Strength
Standard: (Low-Carbon)	ASTM F1554, Grade 36	36 ksi	58 ksi
High-Strength: Low Alloy Alloy, Heat Treated	ASTM F1554, Grade 55 Grade 105	55 ksi 105 ksi	75 ksi 125 ksi
Stainless-Steel Type 304: Alloy Group 1 CW1 Alloy Group 1 CW2	ASTM F593C ASTM F593D	65 ksi 45 ksi	100 ksi 85 ksi
Stainless-Steel Type 316: Alloy Group 2 CW1 Alloy Group 2 CW2	ASTM F593G ASTM F593H	65 ksi 45 ksi	100 ksi 85 ksi

#### Headed Anchor Bolts (Cast-in-Place)

B. Welded Headed Studs (Cast-in-Place):

1. Welded headed studs shall be cast-in-place, welded directly to plates and secured in place. Welded headed studs shall conform to the following, unless specified elsewhere in the Contract Documents:

Welded Headed Studs (Cast-in-Place)			
Material	Grade or Type	Minimum Yield Strength	Minimum Tensile Strength
Hoodland Chemical Improvements Job No. 2376011*00 © 2024 Kennedy/Jenks Consultants	05 05 23 - 8	Cc	Anchors in Increte and Masonry

ASTM A29	Type B, 1010, 1020	65 ksi	51 ksi
ASTM A1044	Type 1	65 ksi	51 ksi
Stainless Steel Type 304 or Type 316	ASTM A276 or ASTM A493	35 ksi	70 ksi

- 2. Elongation: 20-percent in 2-inches minimum.
- 3. Reduction of area: 50-percent minimum.
- 4. Mechanical requirements for carbon steel welded headed studs shall comply with AWS D1.1.
- 5. Welded headed studs shall be attached with a stud welding gun. Fillet welding of welded headed studs will not be acceptable. Do not fillet weld headed studs.
- 6. Mechanical requirements for stainless-steel welded headed studs shall comply with AWS D1.6.
- 7. Avoid dissimilar metals. Plate material welded to the welded headed studs shall be compatible with the studs.
- 8. Hot-dip galvanize carbon steel welded head studs after welding. Do not galvanize prior to welding.
- 9. Products: Headed Anchors by Nelson Stud Welding, Inc., Tru-Weld Steel Headed Stud Anchors by TFP Corporation, or equal.
- C. Threaded Anchor Rods (Cast-in-Place and Post-Installed):
  - 1. Intended for cast-in-place and post-installed adhesive anchors, threaded anchor rods shall be straight, fully threaded, and comply with ANSI B1.1 UNC coarse thread series.
  - 2. For cast-in-place threaded anchor rods, provide double nuts with a washer between nuts at the embedded end of the threaded rod. Nuts and washer material shall comply with the hardware schedule for nuts and washers.
  - 3. Threaded anchor rods shall conform to the following, unless specified elsewhere within the Contract Documents or favorably reviewed submittal:

		Minimum	Minimum
Anchor Type	Material Grade	Yield Strength	Tensile Strength
Standard	ASTM F1554,	36 ksi	58 ksi
(Low-Carbon)	Grade 36		
ASTM A913, Grade B7	ASTM A193, B7	105 ksi	125 ksi
Alloy Steel	(AISI 4140/ 4142)		
High-Strength	ASTM F1554,		
Low Alloy	Grade 55	55 ksi	75 ksi
Alloy, Heat Treated	Grade 105	105 ksi	125 ksi
Stainless-Steel Type 304:			
Alloy Group 1 CW1	ASTM F593C	65 ksi	100 ksi
Alloy Group 1 CW2	ASTM F593D	45 ksi	85 ksi
A193, Grade B8	ASTM A193,	60 ksi	100 ksi
(Stainless-Steel AISI 304)	Grade B8 Class 2		

#### **Threaded Anchor Rods (Fully Threaded)**

Stainless-Steel Type 316: Alloy Group 2 CW1 Alloy Group 2 CW2	ASTM F593G ASTM F593H	65 ksi 45 ksi	100 ksi 85 ksi
A193, Grade B8M (Stainless-Steel AISI 316)	ASTM A193, Grade B8M Class 2	50 ksi	90 ksi

- D. Reinforcing Steel Bars (Post-Installed):
  - 1. Reinforcing steel bars used for anchoring or post-installed conditions shall be used with an adhesive anchoring system approved for use in cracked concrete and cracked masonry.
  - 2. Reinforcing steel shall be deformed bars conforming to the following:

Anchor Type	Material Grade	Minimum Yield Strength	Minimum Tensile Strength
ASTM A615 (Plain-Carbon Steel)	ASTM A615 Grade 60	60 ksi	90 ksi
ASTM A706 (Low-Alloy Steel)	ASTM A706 Grade 60	60 ksi	80 ksi

#### Steel Reinforcing Bars (for use with Adhesives)

- 3. The embedded portion of reinforcing steel bars shall be straight, and free of mill scale, rust, mud, oil, and other coatings that may impair the bond with the adhesive.
- 4. Provide 45-degree chisel or cut point on embedded end.
- 5. Do not bend reinforcing steel bars before or after installation.
- 6. Heating of reinforcing steel bars is not permitted.
- 7. Do not use ASTM A615, Grade 40 reinforcing steel bars unless approved by the Engineer of Record.

#### 2.05 POST-INSTALLED ADHESIVE ANCHORS

- A. Post-Installed Adhesive Anchoring Systems in Concrete:
  - 1. General:
    - a. Adhesive anchoring systems for concrete shall be qualified per ACI 318 and ACI 355.4.
    - b. Adhesive anchoring systems shall have a relative and current evaluation report by ICC-ES and/or IAPMO-UES. Evaluation reports for adhesive anchoring systems shall be qualified for cracked concrete in Seismic Design Categories A through F. Do not use adhesive anchoring systems specified for masonry only in concrete.
    - c. Adhesive anchors shall be installed in concrete having a minimum age of 21days, has not been exposed to water for the preceding 14-days, and has a minimum compressive strength of 2,500 psi at the time of anchor installation. Do not drill into concrete prior to 21-days.
  - 2. Epoxy Adhesives in Concrete:
    - a. A two-component, epoxy-based, injectable, cartridge-type system meeting the requirements of ASTM C881 Type IV, Grade 3, Class B and C.

- b. The adhesive shall be supplied in manufacturer's standard side-by-side cartridge and dispensed through a static-mixing nozzle supplied by the manufacturer.
- c. Products:

Supplier	Products	Compliance
Adhesives Technology Corporation (ATC)	Ultrabond HS-1CC	
DeWalt	Pure110+,	
	or equal	ACI 318,
Hilti, Inc.	HIT-RE-500 V3,	ACI 355.4,
	or equal	ICC-ESR,
Simpson Strong-Tie	SET-3G, SET-XP,	IAPMO-UES
Company, Inc.	or equal	
Other	Approved Equal	

#### **Epoxy Adhesive Products in Concrete**

- 3. Acrylic Adhesives:
  - a. A two-component, acrylic-based (or hybrid), injectable adhesive system. The adhesive shall be supplied in manufacturer's standard side-by-side cartridge and dispensed through a static-mixing nozzle supplied by the manufacturer.
  - b. Products:

Supplier	Products	Compliance
DeWalt	AC200+ or equal	
Hilti, Inc.	HIT-HY-200, or equal	ACI 318,
ITW Red Head	Red Head A7+	ICC-ESR,
Simpson Strong-Tie Company, Inc.	AT-XP or equal	IAPMO-UES
Other	Approved Equal	

#### Acrylic (or Hybrid) Adhesive Products in Concrete

- B. Post-Installed Adhesive Anchoring Systems for Grouted Masonry (CMU):
  - 1. General:
    - a. Adhesive anchoring systems for masonry shall be qualified per TMS 402/602.
    - b. Adhesive anchoring systems shall have a relative and current evaluation report by ICC-ES and/or IAPMO-UES. Evaluation reports for adhesive anchoring systems shall be qualified for use in masonry resisting seismic and wind forces. Do not use adhesive anchoring systems specified for concrete only in masonry.

- c. Adhesive anchors shall be installed in masonry having a minimum age of 28days and a minimum compressive strength of 1,500 psi at the time of anchor installation. Do not drill into masonry prior to 28-days.
- 2. Adhesives:
  - a. A two-component high-solids resin and hardener material. The adhesive shall be supplied in manufacturer's standard side-by-side cartridge and dispensed through a static-mixing nozzle supplied by the manufacturer.
  - b. Products:

Supplier	Products	Compliance
DeWalt	AC100+Gold, or equal	
Hilti, Inc.	HIT-HY 200-R HIT-HY-270, or equal	TMS 402/602, ICC-ESR,
Simpson Strong-Tie Company, Inc.	SET-XP, ET-HP or equal	
Other	Approved Equal	

#### Adhesive Products in Grouted Masonry (CMU)

- C. Post-Installed Injectable Adhesive Anchoring Systems in **Unreinforced Masonry (URM)**, Hollow (Ungrouted) Concrete Block, and Brick with Holes or Voids:
  - 1. General:
    - a. Adhesive anchoring systems for masonry shall be qualified per TMS 402/602.
    - b. Adhesive anchoring systems shall have a relative and current evaluation report by ICC-ES and/or IAPMO-UES. Evaluation reports for adhesive anchoring systems shall be qualified for use in masonry resisting seismic and wind forces.
    - c. Adhesive anchors shall have a minimum age of 28-days at the time of anchor installation. Do not drill into masonry prior to 28-days.
  - 2. Adhesive:
    - a. Adhesive: A two-component high-solids resin and hardener material. The adhesive shall be supplied in manufacturer's standard side-by-side cartridge and dispensed through a static-mixing nozzle supplied by the manufacturer.
    - b. Products:

# Adhesive Products in Unreinforced Masonry (URM), Hollow (Ungrouted) Concrete Block, and Brick with Holes or Voids

Supplier	Products	Compliance
Hilti, Inc.	HIT-HY-270, or equal	TMS 402/602, ICC-ESR, IAPMO-UES
Other	Approved Equal	

3. Inserts for Hollow Masonry Fastening:

- a. Composite, plastic or metal mesh screen tubes or plastic umbrellas compatible with anchor rod as required by manufacturer.
- b. Post-installed injectable adhesive anchors shall not be used to resist seismic or wind loading, unless specifically approved by a relative and current ICC-ESR or IAPMO-UES report.

#### 2.06 POST-INSTALLED MECHANICAL ANCHORS

- A. Post-Installed Mechanical Anchors in Concrete:
  - 1. General
    - a. Applicable to torque-controlled expansion anchors, displacement-controlled expansion anchors, screw anchors, and undercut anchors placed into predrilled holes and anchored in concrete by mechanical means.
    - b. Post-installed mechanical anchoring systems for concrete shall be qualified per ACI 318 and ACI 355.2.
    - c. Post-installed mechanical anchoring systems shall have a relative and current evaluation report by ICC-ES and/or IAPMO-UES. Evaluation reports for mechanical anchoring systems shall be qualified for cracked concrete in Seismic Design Categories A through F. Do not use mechanical anchoring systems specified for masonry only in concrete.
    - d. Post-installed anchors shall be installed in concrete having a minimum age of 21-days unless specifically identified by the manufacturer's written literature, and meets the minimum compressive strength required per the Contract Documents at the time of anchor installation. Do not drill into concrete prior to 21-days.
- B. Mechanical Expansion Anchors in Concrete:
  - 1. Mechanical expansion anchors shall be pre-assembled expanding sleeve or wedge type, threaded at one end and a tapered mandrel at the other end enclosed by a three-section expansion element, with nuts and washers.
  - 2. Anchors shall meet the description of Federal Specification A-A 1923A or A-A 1922A, Type 4.
  - 3. Every anchor, if available in one or more length per anchor diameter, shall be marked with the actual numerical length or with the length marking that is visible and legible after installation. The length identification code shall comply with ACI 355.2.
  - 4. Provide hex head stud style anchors unless flat or rod coupler styles, unless otherwise noted on Drawings or in a favorably reviewed deferred submittal.
  - 5. Carbon steel expansion anchors shall receive manufacturer's most corrosion resistant zinc coating. Zinc coating in accordance with ASTM B633, SC1, Type III or B695, or F1941.
  - 6. Products:

Anchor Type	Material	Products	Compliance
Carbon Steel	Anchor: ASTM A568, Carbon Steel, or equal	Hilti, Inc. Kwik Bolt-TZ2	
		Simpson Strong-Tie	
	Expansion Part:	Strong-Bolt 2,	
	ASTM A240, Grade 316	_	
	or AISI 304/316,	DeWalt Power-Stud SD6,	

#### **Mechanical Expansion Anchors in Concrete**

	Hex Nuts: ASTM A563, Grade A	or equal	ACI 318, ACI 355.2, ICC-ESR, IAPMO-UES
	Washers: ASTM F844		
Stainless Steel	Anchor and Expansion Part: AISI 304 or 316	Hilti, Inc. Kwik Bolt-TZ2	
		Simpson Strong-Tie,	
	Hex Nuts: ASTM F594, or Type 304, Type 316	Strong-Bolt 2,	
		DeWalt Power-Stud SD6,	
	Washers:		
	Type 304 or Type 316	or equal	

#### C. Mechanical Undercut Anchors in Concrete

- 1. Undercut anchors are post-installed anchors that derives tensile holding strength by the mechanical interlock provided by undercutting the concrete, achieved by either a specialty tool (brazen tungsten carbides) or by the anchor itself during installation. Undercut anchor types may be load-controlled, displacement controlled, or torque-controlled.
- 2. Undercut anchors shall consist of 'through-set' configurations. Do not use 'preset' configured undercut anchors.
- 3. Carbon steel undercut anchors shall receive manufacturer's most corrosion resistant zinc coating. Zinc coating in accordance with ASTM B633 Type I, B695, or F1941.
- 4. Products:

## Mechanical Undercut Anchors in Concrete

Anchor Type	Material	Products	Compliance
Carbon Steel	ASTM A193, B7, or ISO 898, Class 8.8 (Sleeve: AISI 1045 or f _u ≥ 80 ksi)	DeWalt Atomic+ Undercut, Hilti, Inc HDA-T, or equal	ACI 318, ACI 355.2, ICC-ESR, IAPMO-UES
Stainless Steel	AISI 316	DeWalt, Atomic+ Undercut, Hilti, Inc. HAD-TR or equal	

## A. Post-Installed Mechanical Anchors in Grouted Masonry (CMU):

- 1. General:
  - a. Applicable to torque-controlled expansion anchors, displacement-controlled expansion anchors, and screw anchors placed into predrilled holes and anchored in masonry by mechanical means.
  - b. Post-installed mechanical anchors for masonry shall be qualified per TMS 402/602.
  - c. Post-installed mechanical anchors shall have a relative and current evaluation report by ICC-ES and/or IAPMO-UES. Evaluation reports for post-installed mechanical anchors shall be qualified for use in masonry

resisting seismic and wind forces. Do not use post-installed mechanical anchors specified for concrete only in masonry.

- d. Post-installed mechanical anchors shall be installed in masonry having a minimum age of 28-days and a minimum compressive strength of 1,500 psi at the time of anchor installation. Do not drill into masonry prior to 28-days.
- B. Mechanical Expansion Anchors in Grouted Masonry (CMU):
  - 1. Mechanical expansion anchors shall be pre-assembled expanding sleeve or wedge type, threaded at one end and a tapered mandrel at the other end enclosed by a three-section expansion element, with nuts and washers.
  - 2. Anchors shall meet the description of Federal Specification A-A 1923A or A-A 1922A, Type 4.
  - 3. Every anchor, if available in one or more length per anchor diameter, shall be marked with the actual numerical length or with the length marking that is visible and legible after installation.
  - 4. Provide hex head stud style anchors unless flat or rod coupler styles, unless otherwise noted on Drawings or in a favorably reviewed deferred submittal.
  - 5. Carbon steel expansion anchors shall receive manufacturer's most corrosion resistant zinc coating. Zinc coating in accordance with ASTM B633, SC1, Type III or B695, or F1941.
  - 6. Products:

Anchor Type	Material	Products	Compliance
Carbon Steel	Anchor: ASTM A568,	Hilti, Inc. Kwik Bolt-TZ2	
	Carbon Steel, or equal		
		Simpson Strong-Tie	
	Expansion Part:	Strong-Bolt 2,	
	ASTM A240, Grade 316		
	or AISI 304/316,	or equal	
			TMS 402/602,
	Hex Nut:		ICC-ESR,
	ASTM A563, Grade A		IAPMO-UES
	Washers: ASTM F844		
Stainless Steel	Anchor and Expansion	Hilti, Inc. Kwik Bolt-TZ2	
	Part: AISI 304 or 316,		
		Simpson Strong-Tie,	
	Hex Nut: ASTM F594,	Strong-Bolt 2,	
	Type 304, or Type 316		
		or equal	
	Washers:		
	Type 304 or Type 316		

#### Mechanical Expansion Anchors in Grouted Masonry (CMU)

#### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. General:
  - 1. Comply with this Section and the Contract Documents.

- 2. Provide grout pads below base of equipment and bearing plates using nonshrink non-metallic grout having a minimum thickness of 3/4-inch and maximum not to exceed thickness of 1-inch, unless otherwise noted. Do not exceed the limits of grout pad thickness without approval from the Engineer.
- 3. Do not anchor directly to concrete, masonry, or equipment bases.
- 4. Provide leveling nuts on anchor bolts, below base plates, and adjust to the correct elevation prior to grouting.
- 5. Do not increase any baseplate or equipment mounting hole diameter, or slot length without the Engineer's approval.
- 6. Post-Installed Anchors or Post-Installed Reinforcement:
  - a. Where drilling into new or existing concrete or masonry is required, locate, and avoid all reinforcing steel at least 14-days prior to drilling.
  - b. Notify Engineer of any conflicts immediately upon discovery.
  - c. Do not drill through or cut any reinforcing steel without Engineer's approval.
- 7. Deviations:
  - a. For post-installed anchors (mechanical or adhesive) proposed as a substitute to cast-in-place anchors, submit request for deviation in accordance with the Contract Documents. Submit product data, evaluation reports, and anchorage calculations demonstrating equivalence, sealed, and signed by a Civil or Structural Engineer licensed in the State in which the project is located.
- B. Cast-In-Place Anchors:
  - 1. Set all anchor bolts by template, with provisions to hold bolts rigid and in correct position with respect to plan and elevation.
  - 2. Do not wet-set cast-in-place anchors in concrete AND/OR masonry. Wet-setting anchors will not be accepted.
  - 3. Post-installed anchors <u>shall not</u> be substituted for cast-in-place anchors without Engineer's approval.
  - 4. Where anchor straps are shown on the Drawings, do not substitute to anchors without approval from the Engineer.
- C. Post-Installed Adhesive Anchoring Systems:
  - 1. Install adhesive anchors or adhesive reinforcing steel in accordance with the applicable ICC-ES or IAPMO-UES, evaluation report for the specific anchor and manufacturer's instructions.
  - 2. Drill holes only after concrete AND/OR masonry has achieved full design strength. Do not drill over-sized holes.
  - 3. Holes shall be drilled perpendicular to the concrete AND/OR masonry surface unless shown otherwise on the Drawings.
  - 4. Shim installed anchors to center in holes as necessary.
  - 5. Anchors installed in overhead conditions shall be installed using the manufacturer's recommended piston-plug and nozzle extension tubing.
  - 6. Adhesive anchors are <u>not allowed</u> in overhead applications unless specifically authorized by the Engineer.
- D. Post-Installed Mechanical Anchoring Systems:
  - 1. Install mechanical anchors in accordance with the applicable ICC-ES or IAPMO-UES evaluation report for the specific anchor and manufacturer's instructions.
  - 2. Drill holes only after concrete AND/OR masonry has achieved full design strength. Do not drill over-sized holes.

- 3. Holes shall be drilled perpendicular to the concrete AND/OR masonry surface unless shown otherwise on the Drawings.
- E. Repair and Modification of Connections and Anchorages:
  - 1. The Contractor shall pay for all necessary work and material, all redesign work by the Engineer, and all additional Special Inspections and Testing made on welds, bolts, and anchors required to repair or replace faulty work performed during the original fabrication and during erection.
  - 2. Anchors, washers, and nuts that require repair or are required to be replaced due to faulty work performed during installation shall be clearly identified, replaced, and re-tested at no additional cost to the Owner.
  - 3. All materials and all additional documentation to substantiate any faulty or damaged anchors, washers, and nuts in an effort to avoid replacement shall be at no additional cost to the Owner.

#### 3.02 FIELD QUALITY CONTROL

- A. Comply with the requirements of this Section and the Drawings.
- B. Anchoring systems shall be installed in accordance with the applicable ICC-ES or IAPMO-UES, evaluation report for the specific anchor and manufacturer's instructions.
- C. All post-installed anchoring systems shall be Special Inspected in accordance with the Contract Documents. Testing of anchoring systems shall comply with Paragraph 1.04.B. Anchoring systems that fail to meet the testing or installation requirements shall be regarded as malfunctioning and shall be considered defective.
- D. Special Inspections and testing shall be independent of the Contractor.
- E. Anchors should exhibit no discernable movement during load testing.
- F. Drilled holes that do not set properly or fail during testing may not be reused and shall be abandoned. Notify the Engineer and fill the holes with non-shrink non-metallic grout or epoxy grout. Do not drill additional holes near abandoned drilled holes without the Engineer's approval.

END OF SECTION
# THIS PAGE INTENTIONALLY BLANK

# SECTION 10 40 00

# IDENTIFYING DEVICES

## SUMMARY

A. Section Includes: pipe markers.

## 1.02 REFERENCES

- A. American National Standards Institute / American Society of Mechanical Engineers (ANSI/ASME), ASME A13.1 - 2015, "Scheme for the Identification of Piping Systems."
- B. American National Standards Institute (ANSI), ICC A117.1 2009, "Accessible and Usable Buildings and Facilities".
- C. National Fire Protection Association (NFPA) NFPA 704, "Standard System for the Identification of the Hazards of Materials for Emergency Response".

# 1.03 SUBMITTALS

- A. Submit in accordance with Section 01 33 00.
- B. Product Data: Fully describe all items proposed for use.
- 1.04 QUALITY ASSURANCE
  - A. Comply with the manufacturer's published recommendation for installation of materials used.

# PART 2 - PRODUCTS

# 2.01 CHEMICAL HAZARD AND HAZMAT COMMUNICATION

- A. Chemical Hazard and GHS Signs
  - 1. Pictogram Signs
    - a. Provide signs in 'diamond' configuration, black pictogram symbol, red sign border with black trim on white background in conformance with OSHA 1910.1200 of the size and quantity noted in the Table, below. Seton L3500 series, or equal.
  - 2. GHS Chemical Signs, Pre-printed.
    - a. Pre-printed signs shall incorporate the elements of the GHS label format as noted in the sample below.



c. Signs shall be provided in the type, size, and quantity noted in the Table below. Signs shall be HCL Labels 'GHS Modern Label' Series, or equal.

	Quantity		
Chemical Name	10"Hx7"W	14"Hx10"W	
Sodium Bisulfite		1	

3. NFPA Fire Hazards of Materials Signs:

b.

- a. Seton Nameplate Company; W.H. Brady Company; or equal.
- b. Sign characteristics: Four-color background, blue, red, yellow, white; diamond shape; 7-1/2 inches by 7-1/2 inches; 3-inch-high black hazard numerals scheduled below; conform to NFPA No. 704, Standard System for the Identification of the Hazards of Materials for Emergency Response.
- c. Material: Semi-rigid plastic with adhesive back.
- d. Where mounted to concrete or other porous materials provide 3/4-inchthick AB Marine grade Douglas Fir plywood backing, sealed edges, and painted. Eyelet holes at corners for mounting.
- e. Schedule of signs required:

Quantity	Hazardous Material	Blue (Health)	Red (Flamma bility)	Yellow (Instability)	White (Special Hazard)
_3 (one per tank and one at pump skid)	Sodium Bisulfite	2	0	1	

# 2.02 PIPE MARKERS

- A. Seton Nameplate Company; SetMark, W.H. Brady Company; Piper Marker System 1; or equal.
- B. Pipe Markers conforming to ANSI A13.1. See paragraph 3.03 for required locations.
- C. Material: Acrylic plastic snap-around type or pressure sensitive vinyl, temperature tolerance range of -40°F to 250°F, non-fade, colored fields, lengths as shown below.

D. Text: Non-fade ink, lettering size, as shown below:

Outside Diameter of Pipe (Inches)	Length of Color Field (Inches)	Size of Letters (Inches)	
3/4 to 1-1/4	8	1/2	
1-1/2 to 2	8	3/4	

- E. Provide directional arrows to indicate flow direction.
- F. Pipe Marker Schedule:

Text	Field Color	Letter Color	
Sodium Bisulfite	Yellow	Black	

# PART 3 - EXECUTION

# 3.01 PIPE MARKERS

- A. Pipe Markers shall be applied where piping enters or leaves the wall or floor of a structure, adjacent to tanks or other hydraulic containments, at each valve, at each piping change in direction, and shall be applied along piping runs not exceeding 16 feet on center.
- B. Directional Arrows: Point in the direction of flow.
- C. Locate pipe markers for easy reading. Where pipes are located above normal line of vision, the lettering and directional arrows shall be placed below the horizontal centerline of the pipe. Where pipes are below normal line of vision, lettering and directional arrows shall be above the horizontal centerline of the pipe.

# END OF SECTION

# THIS PAGE INTENTIONALLY BLANK

# **SECTION 11 00 00**

## GENERAL EQUIPMENT AND MECHANICAL REQUIREMENTS

#### PART 1 - GENERAL

#### 1.01 SUMMARY

- Section Includes: The general requirements for all of the Equipment and Α. Mechanical work in the scope of the Project, included in Divisions 11 and 40 and elsewhere wherever specifically mentioned in these Specifications.
- Direct the attention of all subcontractors and suppliers of equipment and related Β. appurtenances for the work to the applicable provisions in the Contract Documents wherever they may occur.

#### 1.02 REFERENCES

- American Gear Manufacturers Association (AGMA). Α.
- B. American Institute of Steel Construction (AISC).
- C. Hydraulic Institute.
- D. National Electrical Manufacturers Association (NEMA).
- E. Occupational Safety and Health Act (OSHA).

#### 1.03 STANDARDS FOR THE WORK

- Α. Complete Systems: Provide pipe, fittings, wiring, and supports to produce complete, operable systems with all elements properly interconnected. If a specific dimensioned location is not shown for interconnections or smaller system elements, select appropriate locations and show them on Shop Drawing submittals for review.
- Β. Provide equipment and material new and without imperfections. Erect in a neat and workmanlike manner; aligned, leveled, cleaned and adjusted for satisfactory operation; installed in accordance with the recommendations of the manufacturers and the best standard practices for this type of work so that connecting and disconnecting of piping and accessories can be readily made and so that all parts are easily accessible for inspection, operation, maintenance, and repair. Locate oil and lubrication fittings clear of and away from guards, base, and equipment and within reach from the operating floor. Coordinate location of all motor connections in order to properly orient encased electrical conduits. In order to meet these requirements with equipment as furnished, minor deviation from the Drawings may be made as favorably reviewed by the Engineer.
- C. The recommendations and instructions of the manufacturers of products used in the work are hereby made part of these Specifications, except as they may be superseded by other requirements of these Specifications.

#### 1.04 **SUBMITTALS**

Shop Drawings: Show sizes and arrangement of equipment, foundations, and Α. anchor bolts required; performance characteristics; fan curves and pump curves;

11 00 00 -

control diagrams; wiring diagrams; motor data sheets; methods of assembly; pipe hanging details; ductwork layouts; and connections to other work. Date and sign drawings as certified for use in construction of this project. The arrangement of mechanical equipment and appurtenant piping shown on the Drawings may be varied as necessary to fit the favorably reviewed certified manufacturer's installation drawings. However, manufacturers' drawings shall not deviate in substance from the Contract Drawings and Specifications as to location, size, type, and design of equipment. The following minimum requirements shall accompany all equipment submissions:

- 1. Overall dimensions.
- 2. Mounting arrangement and dimensions.
- 3. Description of materials.
- 4. Connection sizes and orientation.
- 5. Capacity and location of lifting eyes.
- 6. Motor arrangement showing location of electrical connections.
- 7. Rating data Mechanical and Electrical as applicable.
- 8. Detail electrical wiring diagrams, showing component designation and rating.
- 9. Seismic design certifications and anchorage descriptions as required by Section 01 87 13.
- 10. List of special tools and/or spare parts to be furnished, if any.
- B. Each piece of equipment, for which certified witnessed or non-witnessed performance tests are required, shall be accompanied by a completed form containing at least the following information:
  - 1. Owner's name and location of project.
  - 2. Contractor's name and subcontractor if applicable.
  - 3. Name of item being submitted.
  - 4. Specification reference by section, paragraph and page.
  - 5. Data on item (manufacturer, general descriptive data, dimensions, size of connections, speeds, performance curves, serial number). A specific list of the test results plus a list, which shows the values that differ from Specifications.
  - 6. Motor data, type, voltage, frequency, phase, full load amperes, starting method, frame size, enclosure insulation type (NEMA Code letter), dimensions, service factor, serial number.
  - 7. Date and signature of person certifying the performance.
- C. Operations and Maintenance Manuals: Prepare and submit manuals covering installation, operation and maintenance of all equipment and machinery specified in Divisions 11 and 40.

# 1.05 RESPONSIBILITY AND CARE OF EQUIPMENT

- A. The Contractor shall be responsible for the equipment included in this Contract until it has been finally inspected, tested, and accepted in accordance with the requirements of these Specifications.
- B. The Contractor shall make his 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.

# PART 2 - PRODUCTS

- A. DESIGN
- B. General: Design all equipment for the service intended, of rugged construction, of ample strength for all stresses which may occur during fabrication, transportation, erection, and during continuous or intermittent operation. Adequately stay, brace and anchor, and install equipment in a neat and workmanlike manner. Give consideration to appearance and safety, as well as utility, in the design of details. Use cathodically compatible materials of construction.
- C. Seismic: Refer to Section 01 87 13 of the Specifications for the seismic design criteria.
- D. Controls: Unless noted otherwise, the design of the electric control of any equipment system and/or equipment package shall be the responsibility of the manufacturer of the equipment system and/or equipment package. The elementary control diagrams as shown on the Electrical Drawings and the diagrams shown on the Instrumentation Drawings are illustrative of control and monitoring requirements pertaining to various equipment of this project. The manufacturers shall design their own functional electric control devices and circuitry, in consultation with the specific elementary control diagrams and other project specifications, to meet the equipment control requirements. All such systems and package controls shall be furnished by the equipment manufacturer, except that controls shown in motor control centers and process controllers, remote control devices, and their interconnecting wiring. Provide heating, ventilating, and air conditioning controls, both 24-volt and line voltage type, by a HVAC controls specialist.

## 2.02 MATERIALS AND STANDARD SPECIFICATIONS

- A. Materials: Design, fabricate, and assemble equipment and systems with new materials and in accordance with acceptable modern engineering and shop practices. Manufacture individual parts to standard sizes and gauges so repair parts can be installed in the field.
- B. Uniformity: Unless otherwise specified, equipment or material of the same type or classification used for the same purpose shall be the product of the same manufacturer and shall be the same model.

## 2.03 LUBRICATION

A. Provide lubricants of types recommended by equipment manufacturers, in quantities sufficient for consumption prior to completion, testing and final acceptance.

## 2.04 ANCHORS

A. Each equipment manufacturer shall furnish an anchor bolt pattern and the required anchor bolts, nuts, and washers of adequate design for securing bases and bedplates to concrete bases. Provide anchor bolts of length to allow for 1 1/2 inch of grout under baseplates and adequate anchorage into structural concrete unless otherwise shown or specified.

11 00 00 -

- B. Provide anchor and assembly bolts and nuts of ample size and strength for the purpose intended. All bolts shall be standard machine bolts, with cold pressed hexagon nuts. Provide suitable degauling compounds for bronze and stainless steel threaded components. Any space wholly or partially underground, or having a wall or ceiling forming part of a water channel, is classified as a moist location. Unless otherwise specified or noted on the Drawings, provide materials as follows:
  - 1. Bolts and nuts in submerged locations or submerged and embedded in concrete or buried in earth: Type 304 stainless steel.
  - 2. Bolts and nuts for supports or equipment in dry or moist locations: Galvanized steel (hot-dipped), with oversize nuts.
- C. Anchor all motor-driven equipment with cast-in-place anchor bolts or drilled-in anchors set with epoxy adhesive. Do not provide expansion type anchors for motor-driven equipment.
- D. Anchor all non-motor-driven equipment with cast-in-place anchor bolts or drilled-in anchors set with epoxy adhesive except that, where specifically allowed by note on the Drawings, expansion type anchors may be used.

# 2.05 LIFTING EYES

A. Supply all equipment weighing over 100 pounds with lifting eyes. Parts of equipment assemblies which are normally serviced separately, such as motors, to have lifting eyes of their own.

# 2.06 NAMEPLATES

- A. Manufacturer's Nameplate: Furnish each piece of equipment and its driver with a corrosion-resistant metal nameplate fastened to the item in a readily readable position. This nameplate to contain the manufacturer's name, equipment rating, capacity, size, model, serial number, and speed. All information written or printed to be in English.
- B. Direction of Rotation: Furnish each piece of rotating equipment with a direction of rotation arrow.
- C. Functional Identification: Label each piece of equipment using a plastic laminate label with the functional name and number of the equipment.
  - 1. Fasten labels to the equipment, its base, or other acceptable location:
    - a. Letters: At least 1/2-inch high with the border trim on all sides not less than 1/4 inch.
    - b. Color: Green background with white letters.
    - c. Fasteners: Brass or stainless steel screwed into inserts, anchor shields, or tapped holes in equipment or base.

# 2.07 PROTECTION AGAINST ELECTROLYSIS

A. Where dissimilar metals are used in conjunction with each other, provide suitable insulation between adjacent surfaces so as to eliminate direct contact and any resultant electrolysis. Connections of dissimilar piping materials shall utilize dielectric unions, flanges, couplings, or bushings.

# 2.08 SPECIAL TOOLS

A. For each type of equipment to be furnished, provide a complete set of all special tools (including grease guns or other lubricating devices) which may be necessary for the adjustment, operation, and maintenance of such equipment.

## 2.09 NOISE AND VIBRATION

- A. Mechanical and electrical equipment, as installed in this project, shall not create sound levels that are in excess of regulatory requirements, or the noise requirements listed in the technical specifications for 8 hours per day worker exposure unless otherwise noted for the specific piece of equipment involved. If the required sound level cannot be achieved by bare equipment in its designated environment, provide sound attenuating enclosures. Sound attenuating enclosures shall have necessary ventilation to prevent equipment overheating and shall be constructed for easy removal to permit maintenance. Devices necessary for day-to-day operation shall pierce the enclosure or otherwise be accessible without need to remove the enclosure.
- B. Equipment which when operating has obvious excessive vibrations shall be repaired or replaced as directed by the Engineer. Baseline vibration measurements shall be made where specified.

# 2.10 FACTORY TESTS

- A. Perform factory tests for each piece of equipment where specifically called for in the section specifying that equipment. Note that factory tests are inherent in many reference standards. The requirement for a factory test in a referenced standard is hereby made a part of these Specifications. Conduct factory tests at the same speeds and other conditions at which the equipment will operate in the field, except as noted.
- B. Where specifically noted, performance tests may be witnessed by the Engineer or his representative. Inform the Engineer in sufficient time to allow arrangements to be made for witness of such tests. When non-witnessed tests are performed, supply certified results.
- C. Perform factory testing of pumps in accordance with the requirements and standards of the Hydraulic Institute.
- D. Tests of other equipment shall conform to the requirements set forth in these Specifications.

# PART 3 - EXECUTION

## 3.01 EXAMINATION

A. Inspect each item of equipment for damage, defects, completeness, and correct operation before installing.

## 3.02 PREPARATION

A. Prior to installing equipment, ensure that the areas are clean. Maintain the areas in a broom-clean condition during installation operations. Clean, condition, and

11 00 00 -

service equipment in accordance with the approved Instruction Manuals and specific recommendations of the equipment manufacturer.

## 3.03 INSTALLATION

- A. Equipment: Conform to approved Operations and Maintenance Manuals. Employ skilled craftsmen experienced in installation of the types of equipment specified. Use specialized tools and equipment, such as precision machinist levels, dial indicators, gauges, and micrometers, as applicable. Produce acceptable installations free of vibration or other defects. Align and pin to common bedplate equipment and drivers connected by flexible couplings.
- B. Anchor Bolts: Deliver bolts with templates or setting drawings and verify that bolts are correctly located before structural concrete is placed.

## 3.04 EQUIPMENT STARTUP AND ADJUSTMENT

- A. Arrange for an authorized factory-trained representative of the company or companies supplying the various items of equipment to check the installation and adjust and test the equipment. Said representative shall be experienced and knowledgeable of the equipment being tested. Furthermore, the representative shall assist and instruct the operating staff in adjusting and operating the equipment during the initial plant operation period.
  - 1. Provide initial lubrication for all equipment.
  - 2. Test and demonstrate to the Engineer that all equipment operates properly and specified performance has been attained. For pumps, include measurement of suction and discharge pressure at the pump and measurement of pumping rate by volumetric means or through a suitably calibrated meter for two points on the performance curve. For adjustablespeed pumps, conduct tests at a minimum of two speeds. Furnish any test equipment or measuring devices required which are not part of the permanent installation.
  - 3. In addition, demonstrate that the entire facility is in full operating condition prior to the acceptance of the work. Should any equipment or part thereof fail to operate as intended, immediately remove and replace it, all at the Contractor's expense. Pay for all tests involved in this Section.
  - 4. Pressure test equipment and connections thereto as required by these Specifications.

## 3.05 PERFORMANCE TESTS

A. Upon completion of the work, and after all systems are set and balanced, conduct performance tests in accordance with Division 1 and other applicable sections of these Specifications. Submit test conditions, test data and results to the Engineer for review.

## 3.06 TOOLS, LOOSE PARTS, AND LUBRICANTS

A. Tools and Loose Parts Supplied: Provide an inventory of tools and loose parts required to be supplied under the project. Turn over inventory and parts to the Owner. The Owner's written acknowledgment of receipt is required for project completion. Loose parts are defined as items such as special tools, keys, safety equipment, and portable equipment.

- B. Recommended Spare Parts: Furnish a complete list of recommended spare parts and supplies for each equipment furnished with current prices and a source of supply.
- C. Provide a list of all recommended lubricants not listed in the Operations and Maintenance Manuals.

END OF SECTION

# THIS PAGE INTENTIONALLY BLANK

Hoodland Chemical Improvements Job No. 2376011.00 © 2024 Kennedy/Jenks Consultants C:bmskjce-pwld0301478/11 00 00-General_Equipment_and_Mechanical_Requirements (1).docx

# SECTION 26 05 00

## GENERAL ELECTRICAL REQUIREMENTS

## PART 1 - GENERAL

## 1.01 SECTION INCLUDES

- A. Work Included:
  - 1. Provide all required labor, project equipment and materials, tools, construction equipment, safety equipment, transportation, and test equipment, and satisfactorily complete all electrical work shown on the Drawings, included in these Specifications, or required for a complete and fully operating facility. In addition, provide wiring for the equipment that will be provided under other Divisions of these Specifications.
  - 2. Provide conduit, wire and field connections for all motors, motor controllers, control devices, control panels and electrical equipment furnished under other Divisions. Coordinate with the supplier of electrical equipment specified under other Divisions.
  - 3. Provide all conduit, wiring and terminations for all field-mounted instruments furnished and mounted under other Divisions, including process instrumentation primary elements, transmitters, local indicators and control panels. This also includes lightning and surge protection equipment wiring at process instrumentation transmitters if required. Contractor shall install vendor furnished cables specified under other Divisions.
  - 4. Provide a complete raceway system for the specialty cable systems. Install the specialty cable systems in accordance with the system manufacturer's installation instructions. Review of the raceway layout, prior to installation, with the system supplier and cable manufacturer to ensure raceway compatibility with the system and materials being furnished. Where redundant cables are furnished, install them in separate raceways.
  - 5. Provide raceway and power wiring for all heating, ventilation and air conditioning equipment furnished under other related Divisions. Refer to HVAC drawings and related specifications for power requirements.
  - 6. Auxiliary Devices: Provide conduit and wire for power and control for all auxiliary devices such as solenoid valves, pressure switches, and instruments that are included as part of a manufacturer's packaged system (i.e., all systems specified in Divisions 40 through 48. Contractor shall be responsible for conduit and wire to these auxiliary devices even if not specifically shown on the Drawings or specified herein.
  - 7. Provide concrete, excavation, backfill and steel reinforcement required for encasement, installation or construction of the WORK of the various Sections of Division 16 as a part of the WORK under the respective Sections, including duct banks, manholes, handholes, equipment housekeeping pads and light pole bases.
- B. Work to be Done by Utilities:
  - 1. Providing and connecting power company meters and instrument transformers.
  - 2. Providing telephone company instruments, relays, terminals, and cables.
- C. Safety: Conduct operations in accordance with NFPA 70E, Standard for Electrical Safety Requirements for Employee Workspaces.

# 1.02 CODE COMPLIANCE AND REFERENCE STANDARDS

- A. Electric equipment, materials and installation shall comply with the National Electrical Code (NEC) and with the latest edition of the following codes and standards:
  - 1. National Electrical Safety Code (NESC)
  - 2. Occupational Safety and Health Administration (OSHA)
  - 3. National Fire Protection Association (NFPA)
  - 4. National Electrical Manufacturers Association (NEMA)
  - 5. American National Standards Institute (ANSI)
  - 6. Insulated Cable Engineers Association (ICEA)
  - 7. Instrument Society of America (ISA)
  - 8. Underwriters Laboratories (UL)
  - 9. Factory Mutual (FM)
  - 10. Institute of Electrical and Electronics Engineers
  - 11. American Society of Testing Materials (ASTM)
  - 12. Local Telephone Company requirements
  - 13. Local Utility Company requirements
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.
- C. All materials and equipment for which a UL standard exists, shall bear a UL label. No such material or equipment shall be brought onsite without a UL label affixed. Other Nationally Recognized Testing Laboratories (NRTLs) acceptable for this project include:
  - 1. FM Approvals (Factory Mutual)
  - 2. ETL (Intertek Electrical Testing Labs)
- D. If the issue of priority is due to a conflict or discrepancy between the provisions of the Contract Documents and any referenced standard, or code of any technical society, organization or association, the provisions of the Contract Documents will take precedence if they are more stringent or presumptively cause a higher level of performance. If there is any conflict or discrepancy between standard specifications, or codes of any technical society, organization or association, or between Laws and Regulations, the higher performance requirement shall be binding on the Contractor, unless otherwise directed by the Owner/Engineer.
- E. In accordance with the intent of the Contract Documents, the Contractor accepts the fact that compliance with the priority order specified shall not justify an increase in Contract Price or an extension in Contract Time nor limit in any way, the Contractor's responsibility to comply with all Laws and Regulations at all times.

# 1.03 SUBMITTALS

- A. Shop Drawings shall be custom prepared for this project and submitted as listed in each of the Electrical Specification Sections. Shop drawings shall include the following:
  - 1. Complete materials list stating manufacturer, brand name and catalog number of each item or class of material.
  - 2. For equipment, panels, boxes, control devices, wiring devices, and other uniquely-tagged items as indicated on the Drawings, include the respective tag(s) on each applicable shop drawing and cut sheet.
  - 3. Shop drawings for grounding work not specifically indicated on the drawings but required under the NEC.

- Front, side and rear elevations along with top views with required dimensional 4. data.
- 5. Location of conduit entrances and access plates.
- Catalog cuts defining component data. 6.
- Connection diagrams, terminal numbers, internal wiring diagrams, conductor 7. size and cable numbers.
- 8. Method of anchoring, seismic requirements and weight.
- 9. Types of materials and finish.
- 10. Nameplates.
- 11. Temperature limitations, as applicable.
- 12. Voltage requirements, phase and current, as applicable.
- 13. Front and rear access requirements.
- 14. Test reports.
- B. O&M Manuals and other documentation, shall be submitted in accordance with these contract documents. The manuals shall be prepared specifically for this installation and shall include catalog data sheets, drawings, equipment lists, descriptions, parts lists, etc. to instruct operating and maintenance personnel unfamiliar with such equipment. All manuals and other documentation shall be submitted as listed in each of the Electrical Specification Sections and include the followina:
  - 1. A comprehensive index.
  - 2. A complete "As-built" set of approved shop drawings.
  - 3. A complete list of the equipment supplied, including serial numbers, ranges and pertinent data.
  - A table listing of the "as left" settings for all timing relays and alarm and trip 4. set points.
  - System schematic drawings "As-Built", illustrating all components, piping and 5. electrical connections of the system supplied under this Section.
  - 6. Detailed service, maintenance and operation instructions for each item supplied.
  - 7. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.
  - 8. The operating instructions shall also incorporate a functional description of the entire system, with references to the systems schematic drawings and instructions.
  - 9. Complete parts list with stock numbers, including spare parts.
- C. Record Drawings shall be promptly furnished when the equipment installation is complete. Payment may be withheld until Record Drawings have been furnished and approved.
- At the time of delivery of the equipment, the Contractor shall have an approved D. shop drawing in his possession for the Owner's Inspector and/or Owner's Engineer for verification.
- E. As-Built Drawings: As the work progresses, legibly record all field changes on a set of Project Contract Drawings, hereinafter called "As-Built Drawings". The As-Built Drawings and specifications shall be kept up to date throughout the project. As-Built Drawings shall accurately show the installed condition of the following items at a minimum:

3

- One-line Diagram(s). 1.
- 2. Raceways and pullboxes.
- 3. Conductor sizes and conduit fills.

- 4. Panelboard Schedule(s).
- 5. Control Wiring Diagram(s).
- 6. Luminaire Schedule(s)
- 7. Luminaire, receptacle and switch outlet locations.
- 8. Underground raceway and duct bank routing including manhole/handhole locations.
- 9. Plan view, sizes and locations of switchgear, switchboards, distribution transformers, motor control centers and panelboards.

## 1.04 TESTS

- A. The Contractor shall be responsible for factory and field tests indicated in Division 26, as required by the Engineer and as required by other authorities having jurisdiction.
- B. Furnish necessary testing equipment
- C. Pay the costs of the tests, including replacement parts and labor due to damage resulting from damaged equipment or from testing and correction of a faulty installation.
- D. Reporting
  - 1. Where test reporting is indicated, submit proof-of-design test reports for mass-produced equipment with the Shop Drawings.
  - 2. Submit factory performance test reports for custom-manufactured equipment for approval prior to shipment.
  - 3. Submit field test reports for review prior to Substantial Completion.
- E. Remove and replace equipment or material that fails a test, or, if the Engineer approves, repair and retest for compliance.
- F. Connections to equipment or materials with a factory warranty shall be as recommended by the manufacturer and shall be performed in a manner that does not void the warranty.

## 1.05 PERMITS AND INSPECTIONS

- A. Obtain permits and pay all fees required for permits inspections.
- B. Pay inspection, connection and turn-on service charges required by the utility company.
- C. The Engineer may inspect the fabricated equipment at the factory before shipment to job site. Provide the Engineer with sufficient prior notice so that an inspection can be arranged at the factory.
- D. Inspection of the equipment at the factory by the Engineer will be made after the manufacturer has performed satisfactory checks, adjustments, tests and operations.
- E. Favorable review of the equipment at the factory only allows the manufacturer to ship the equipment to the project site. The Contractor shall be responsible for the proper installation and satisfactory startup operation of the equipment to the satisfaction of the manufacturer and the Engineer.

## 1.06 DEMOLITION AND RELATED WORK

- A. General 1. Per
  - Perform electrical demolition work as indicated.

- 2. The Contractor is cautioned that demolition work may also be indicated on non-electrical Drawings.
- 3. Coordinate with all trades regarding electrical de-energization, disconnection and removal, and the overall sequence of construction.
- B. Electrical Requirements for Removed Equipment
  - 1. Remove dedicated wiring and exposed conduits back to the source.
  - 2. Where control wiring to be demolished shares a conduit with other wiring to remain, the control wiring shall be abandoned in place. Where power wiring to be demolished shares a conduit with other wiring to remain, the power wiring shall be removed.
  - 3. Remove power wiring from the power source to the first pullbox or manhole remote from the panel and abandon in place the remaining wiring.
  - 4. Abandon in place wiring routed through encased conduits and cut encased conduits flush to the floor and grout flush with the floor.
  - 5. Remove remote mounted starters, disconnect switches, circuit breakers, sensors and transmitters
- C. Where new lighting and receptacles are installed in existing structures, remove old lighting, receptacles, switches, wiring and conduits.
- D. Junction Boxes
  - 1. Wiring and conduits indicated to be extended shall be terminated in a new junction box with terminal strips.
  - 2. Provide a junction box with a NEMA rating in accordance with the area in which it is located and sized as required by the NEC.
  - 3. Properly identify wires and terminals before disconnection.
- E. Identification
  - Where switchgear, motor control centers, switchboards or panelboards are indicated to have components, assemblies or circuits removed and/or reconnected, provide the affected equipment compartments with new engraved nameplates matching the existing. Modify panelboard schedule(s) to indicate revised circuits.
  - 2. Pencil or magic marker markings directly on equipment will not be acceptable.

# 1.07 COORDINATION

- A. Coordinate the electrical work with the other trades, code authorities, utilities, and the Owner.
- B. Where connections must be made to existing installations, properly schedule all the required work with the Owner, including the power shutdown periods. Schedule and carry out shutdowns so as to cause the least disruption to operation of the plant and privately owned facilities.
- C. Submit a written sequencing request indicating the sequence and duration of activities to be performed during the plant shutdown.
- D. Switching, safety tagging and other project related tasks required for shutdown or to isolate existing equipment, shall be performed by the Contractor.
- E. In no case shall the Contractor begin any work in, on or adjacent to existing equipment without written authorization from the Engineer.
- F. Modifications

- 1. Perform modifications or alterations to existing electrical facilities as required to successfully install and integrate the proposed electrical equipment as indicated.
- 2. Perform modifications to existing equipment, panels and cabinets in a professional manner. Repair coatings of existing equipment to match existing
- 3. The costs for modifications to existing electrical facilities that are required for a complete and operable system shall be included as part of the Work.
- G. Existing Utilities
  - 1. Exercise extreme caution when digging trenches to not damage existing underground utilities.
  - 2. The cost of repairs of damages caused during construction shall be included as a part of the Work.
- H. Field Verifications
  - 1. Visit the site before submitting a Bid to become better acquainted with the Work of this Contract.
  - 2. The lack of knowledge will not be accepted as justification for extra compensation to perform the Work.
  - 3. The Contractor shall be responsible for identifying available existing circuit breakers in lighting panel for the intended use as required.
  - 4. The Contractor shall be responsible for field verifying the available space in switchgear, switchboards and/or motor control centers to integrate new overcurrent protective devices meeting the requirements of these Specifications.
  - 5. The cost for the above field verifications shall be included as part of the Work.
- I. Installation of Temporary Power
  - 1. To facilitate the continuous operation of existing equipment, provide temporary equipment as indicated.
  - 2. Submit installation and connection details for favorable review and acceptance by the Engineer.
  - 3. Costs associated with these temporary installations shall be included as part of the Work.
  - 4. Temporary wiring and equipment shall remain the property of the Contractor unless indicated otherwise.

## 1.08 ELECTRICAL AND TELEPHONE SERVICES

- A. Contact the serving utility and verify compliance with requirements before construction.
- B. Coordinate schedules and payments for Work by utilities.
- C. Where conduits and conductors in the Work are indicated to be larger, heavier schedule, or have greater protective coating than utility requirements, provide the larger size, heavier schedule or greater protection.
- D. Provide electrical service as indicated and as required by the serving utility.
- E. Verify and provide service conduits, fittings, transformer pad, grounding devices and service wires not provided by the serving utility.
- F. Verify with the utility the exact location of each service point and type of service, and pay charges levied by the serving utilities as part of the Work.

# 1.09 LOCATIONS

- A. General: Use equipment, materials and wiring methods suitable for the types of locations in which they are located, as defined in Paragraph B. herein.
- B. Definitions of Types of Locations:
  - 1. Dry Locations: All those indoor areas which do not fall within the definitions below for Wet, Damp, Hazardous, or Corrosive Locations and which are not otherwise designated on the Drawings.
  - 2. Wet Locations: All locations exposed to the weather, whether under a roof or not, unless otherwise designated on the Drawings.
  - 3. Damp Locations: All spaces wholly or partially underground, or having a wall or ceiling forming part of a channel or tank, unless otherwise designated on the Drawings.
  - 4. Hazardous Locations: All areas in which fire or explosion hazards may exist, normally or accidentally, due to flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings. These areas are shown on the Drawings, together with the Class and Division designations as defined in the NEC, determining the enclosure types and wiring methods required.
  - 5. Corrosive Locations: Areas where chlorine or sulfur dioxide gas under pressure, sulfuric acid, or liquid polymer are stored or processed. These areas are shown on the Drawings.
- C. Unless otherwise specified herein or shown on the Drawings, electrical enclosures and associated installations shall have the following ratings:
  - 1. NEMA 1 gasketed or 12 for dry, non-process indoor above grade locations
  - 2. NEMA 3R for outdoor installations identified not to be hazardous or corrosive.
  - NEMA 4X enclosures of Type 304 or 316 stainless steel in corrosive areas except in chlorine and HFS areas where non-metallic enclosures shall be provided.
  - 4. NEMA 6 or 6P enclosures for submersible, indoor or outdoor use. Enclosures for temporary submersion shall be rated NEMA 6 and prolonged submersion shall be rated 6P at limited depth.
  - 5. NEMA 7 enclosures (and listed for use in the area classifications shown) for "Class 1 Div. 1 Group D" and "Class 1 Div. 2 Group D" hazardous locations shown on the Drawings or as defined in NFPA 820 or other codes.
  - NEMA 9 enclosures (and listed for use in the area classifications shown) for "Class 1 Div. 1 Group E, F and G" and "Class 1 Div. 2 Group E, F and G" hazardous locations shown on the Drawings or as defined in NFPA 820 or other codes.
- D. Equipment, materials and installation in areas designated as hazardous on the Drawings shall comply with NEC Articles 500, 501, 502 and 503.
- E. Equipment and materials installed in areas designated as hazardous on the Drawings shall be UL Listed for the appropriate hazardous area classification.

## 1.10 PHASE BALANCING

- A. The Drawings do not attempt to balance the electrical loads across the phases. Circuits on motor control centers and panelboards shall be field connected to result in evenly distributed loads across all three phases.
- B. Field balancing of circuits shall not alter the conductor color coding requirements defined in Section 26 05 16.

# 1.11 SIZE OF EQUIPMENT

- A. Investigate each space in the structure through which equipment must pass to reach its final location. Coordinate shipping splits with the manufacturer to permit safe handling and passage through restricted areas in the structure.
- B. The equipment shall be kept upright at all times during storage and handling. When equipment must be tilted for passage through restricted areas, brace the equipment to ensure the tilting does not impair the functional integrity of the equipment.

## PART 2 - PRODUCTS

# 2.01 GENERAL

- A. Products that are specified by manufacturer, trade name or catalog number establish a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are favorably reviewed by the Engineer prior to installation.
- B. It is the intent of these Specifications and Drawings to secure high quality in all materials and equipment in order to facilitate operation and maintenance of the facility. All equipment and materials shall be new and the products of reputable suppliers having adequate experience in the manufacture of these particular items. For uniformity, only one manufacturer will be accepted for each type of product. All equipment shall be designed for the service intended and shall be of rugged construction, of ample strength for all stresses, which may occur during fabrication, transportation, erection, and continuous or intermittent operation. All equipment shall be adequately stayed, braced and anchored and shall be installed in a neat and workmanlike manner. Appearance and safety, as well as utility, shall be given consideration in the design of details.
- C. All components and devices installed shall be standard items of industrial grade, unless otherwise noted, and shall be of sturdy and durable construction suitable for long, trouble-free service. Light-duty, fragile and competitive grade devices of doubtful durability shall not be used.
- D. Where a NEMA enclosure type is indicated in a non-hazardous location, use that type of enclosure despite the fact that certain modifications such as cutouts for control devices may negate the NEMA rating.
- E. Temperature Ratings of Equipment Terminations and lugs shall be rated for use with 75-degree C conductors. Wire sizes in the Contract Documents are based on NEC ampacity tables using the 75-degree C ratings.

## 2.02 MOUNTING HARDWARE

- A. Miscellaneous Hardware
  - 1. Provide nuts, bolts and washers constructed of stainless steel.
  - 2. Provide threaded rods for trapeze supports constructed from continuous threaded galvanized steel, 3/8-inch diameter minimum.
  - 3. Slotted channel
    - a. Construct struts for mounting of conduits and equipment of galvanized steel.

- b. Where contact with concrete or dissimilar metals may cause galvanic corrosion, use suitable non-metallic insulators in order to prevent such corrosion.
- c. Slotted channel manufacturer shall be Unistrut, B-Line or approved equal.
- 4. Provide plastic protective end caps for all exposed slotted channel ends. End caps shall be manufactured by Unistrut P2860-33 or approved equal
- 5. Provide stainless steel expansion anchors for attaching equipment to concrete walls, floors and ceilings. Expansion anchors shall be manufactured by Power Fasteners, Inc and be the "Power-Bolt" or "Power-Stud" series or approved equal.

# 2.03 LENS COLOR SCHEME

A. Indicating light lens colors shall be red for "Run", "Open" or "On"; green for "Stop", "Close" or "Off"; and amber for alarm.

# 2.04 NAMEPLATES

- A. For each piece of electrical equipment, provide a manufacturer's nameplate showing his name, location, the pertinent ratings and the model designation.
- B. Identify each piece of equipment and related controls with a rigid laminated engraved phenolic nameplate. Engrave nameplates with the inscriptions indicated on the Drawings and, if not so indicated, with the equipment name. Securely fasten nameplates in place using fasteners constructed of brass, cadmium plated steel or stainless steel and screwed into inserts or tapped holes as required. Where no inscription is indicated on the Drawings, furnish nameplates with an appropriate inscription furnished by the Engineer upon prior request by the Contractor.
- C. Provide engraved characters of the block style, with no characters smaller than 1/8 inch top to bottom.
- D. Each control device, including pushbuttons, control switches, and indicating lights, shall have an integral legend plate or nameplate indicating the device function. These shall be inscribed as indicated on the Drawings or as favorably reviewed by the Engineer.
- E. At the service entrance equipment, provide signs inscribed with 1/4 inch letters: "EMERGENCY STANDBY POWER IS SUPPLIED FROM THE STANDBYE GENERATOR".

## 2.05 PROTECTIVE MATTING

- A. Provide full-length, high-voltage switchboard matting in front of indoor switchgear, service equipment and motor control centers.
- B. For equipment rated at 600-volt, provide matting that is 1/4-inch thick and 42" wide.
- C. Protective matting shall be as manufactured by Rhino or approved equal

# 2.06 PAINTING

A. Equipment: Refer to each electrical equipment section of these Specifications for painting requirements of equipment enclosures. Repair any final paint finish, which has been damaged or is otherwise unsatisfactory, to the satisfaction of the Engineer.

B. Wiring System: Paint all exposed conduits, boxes and fittings to match the color of the surface to which they are affixed. Paint finishes shall include proper surface preparation, prime coat and a final finish coat, and shall conform to Section 09 96 00.

# PART 3 - EXECUTION

## 3.01 REQUIREMENTS

A. All electrical installations shall conform to the codes and standards outlined in this Section.

## 3.02 WORKMANSHIP

- A. Assign a qualified representative who shall supervise the electrical construction work from beginning to completion and final acceptance.
- B. Perform all labor using qualified craftsmen, who have had experience on similar projects. Provide first-class workmanship for all installations.
- C. Ensure that all equipment and materials fit properly in their installations.
- D. Perform any required work to correct improperly fit installations at no additional expense to the Owner.
- E. Provide materials and incidental required for a complete and operable system, even if not required explicitly by the Contract Documents.
- F. Typical incidentals are terminal lugs not furnished with vendor-supplied equipment, compression connectors for cables, splices, junction and terminal boxes, and control wiring required by vendor-furnished equipment to connect with other equipment indicated in the Contract Documents.

## 3.03 EXCAVATION AND BACKFILL

- A. Provide the excavations for electrical equipment foundations and trenches for conduits as shown on the Drawings.
- B. Exercise caution during all excavation work and avoid damage to existing underground pipes. Exercise extreme caution when working near existing electrical conduits and facilities. Field verify the location of all electrical facilities before proceeding with any nearby work.
- C. Refer to Division 31, Earthwork, of these Specifications for all excavation and backfilling work.

## 3.04 CONCRETE

- A. Where shown on the Drawings or specified, provide the required concrete installations for conduit encasement and equipment foundations.
- B. Refer to Division 3, Concrete, of these Specifications for all concrete work.

## 3.05 CONDUCTOR IDENTIFICATION

A. Identify all wires and cables in conformance with the requirements of Sections 26 05 19, 26 05 13, and 26 05 20. This requirement applies to all equipment provided

under this contract, regardless of Division, as well as to all conductors provided or worked on during this contract.

## 3.06 CONCRETE HOUSEKEEPING PADS

- A. Provide concrete housekeeping pads for indoor floor-standing electrical equipment.
- B. Install all floor-mounted equipment on 3.5-inch-high reinforced concrete pads. The Contractor, suppliers, and fabricators shall take this requirement into consideration when designing, fabricating, and installing panels, motor control centers, and other enclosures so that height above the floor of the operating handles of electrical devices meets the requirements of these Specifications and applicable codes.
- C. Provide concrete housekeeping curbs 3-inches above the finished floor or grade for conduit stub-ups in indoor locations that are not concealed by equipment enclosures.

# 3.07 CUTTING, DRILLING, AND WELDING

- A. Provide any cutting, drilling, and welding that is required for the electrical construction work.
- B. Structural members shall not be cut or drilled, except when favorably reviewed by the Engineer. Use a core drill wherever it is necessary to drill through concrete or masonry.
- C. Provide the required welding for equipment supports. Conduits and fittings shall not be welded to structural steel.
- D. Perform patch work with the same materials as the surrounding area and finish to match, as specified in Division 3 of these Specifications.

## 3.08 METAL PANELS

A. Mount all metal panels which are mounted on or abutting concrete walls in damp locations or any outside walls 1/4 inch from the wall, and paint the back sides of the panels with a high build epoxy primer. Film thickness shall be 10 mils minimum.

# 3.09 PROTECTIVE DEVICE COORDINATION

A. Perform power system studies and provide protective device coordination in accordance with Section 26 05 73.

# 3.10 TESTING

- A. Perform acceptance testing in accordance with Section 26 01 26.
- B. Perform additional testing as indicated within specific equipment sections.

# 3.11 EQUIPMENT STORAGE AND PROTECTION

- A. During construction, provide adequate storage for all equipment and materials that will become part of the completed facility so that it is protected from weather, dust, water, and other environmental impacts, or damage from construction operations.
- B. Store and protect products in accordance with manufacturer's instructions. Seals and labels shall be intact and legible.

- C. Store moisture sensitive products including electrical equipment, instruments and controls in weathertight, humidity and temperature-controlled enclosures to avoid condensation and dust buildup.
- D. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.
- E. Exercise care at all times after installation of equipment, motor control centers, etc., to keep out foreign matter, dust, dirt, debris, or moisture. Use protective sheet-metal covers, canvas, heat lamps, etc., as needed to ensure equipment protection.

# 3.12 CLEANING EQUIPMENT

- A. Before final acceptance, thoroughly clean the electrical Work of cement, plaster and other materials.
- B. Clean out and vacuum all construction debris from the bottom of all equipment.
- C. Provide and touch-up to original condition any factory painting that has been marred or scratched during shipment or installation, using paint furnished by the equipment manufacturer.
- D. Remove temporary tags, markers, stickers and the like.
- E. Remove all oil and grease spots with a non-flammable cleaning solvent by carefully wiping and scraping cracks and corners.
- F. Clean luminaires inside and out.
- G. Dispose of cleaning debris and refuse off-site.

END OF SECTION

# SECTION 26 05 20

# SIGNAL CABLE

## PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Provisions: Applicable provisions of Section 26 05 00 become a part of this Section as if repeated herein.
- B. Related Work Described Elsewhere:1. Division 40: Instrumentation and Controls

#### 1.02 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)/Telecommunications Industry Association (TIA):
  - 1. 568-C.2 Balanced Twisted-Pair Telecommunications Cabling and Components Standards
- B. American Society for Testing and Materials (ASTM):
  - 1. B8-11 Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- C. Institute of Electrical and Electronic Engineers (IEEE):
  - 1. 1143 Shielding Practice for Low Voltage Cables, Guide on
- D. Insulated Cable Engineers Association (ICEA)
  1. S-73-532 Standard for Control, Thermocouple, Extension, and Instrumentation Cable
- E. National Fire Protection Association (NFPA):
  - 1. 262 Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces
- F. Underwriters Laboratories Incorporated (UL):
  - 1. 13 Standard for Power-Limited Circuit Cables
  - 2. 83 Thermoplastic-Insulated Wires and Cables
  - 3. 444 Communications Cables
  - 4. 1666 Standard for Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts

## 1.03 SUBMITTALS

A. Submit material or equipment data in accordance with the Product Information category of the General Conditions and the submittal requirements of Section 26 05 00.

## PART 2 - PRODUCTS

#### 2.01 INSTRUMENTATION CABLE

- A. Provide UL listed, twisted pair instrumentation Tray Cable (TC) conforming to ICEA S-73-532, and suitable for transmission of 4-20mA analog, low voltage signals.
- B. The cable shall be two-conductor (2/C), three-conductor (3/C), four-conductor (4/C), or more as indicated on the Drawings.
- C. Each conductor in the cable shall be #16 AWG 7x24 stranded bare copper, or as indicated on the Drawings.
- D. Conductor insulation: Polyvinyl Chloride/Nylon
- E. Shield: Aluminum Foil, 100 percent coverage
- F. Drain wire: #18 AWG, stranded, tinned copper
- G. Jacket material: Polyvinyl Chloride, minimum thickness 0.047 inches.
- H. Insulation shall be rated at 600 volts.
- I. Temperature rating: UL dry, 90 degrees C; UL web, 75 degrees C
- J. Instrumentation cable installed in underground conduits shall be rated as suitable for the application.
- K. Instrumentation cable shall be Belden 3090A, 3091A, or approved equal.

#### 2.02 ETHERNET (TCP/IP) CABLE

- A. Industrial use, unshielded:
  - 1. Provide UL listed, Category 6 unshielded twisted pair (UTP) Ethernet cable conforming to ANSI/TIA-568-C.2 and suitable for use in harsh environments.
  - 2. Conductors: 4 pairs of #23 AWG solid bare copper
  - 3. Conductor insulation: Fluorinated Ethylene Propylene, minimum thickness 0.01 inches
  - 4. Jacket material: Fluorinated Ethylene Propylene, factory marked at regular intervals indicating verifying organization and performance level. Minimum thickness 0.03 inches.
  - 5. Insulation shall be 300 volt class.
  - 6. Insulation temperature range: -55 to +150 degrees C
  - 7. Electrical Characteristics: Cable shall have a maximum attenuation of 20 dB per 100 meters at 100 MHz and 33 dB per 100 meters at 250 MHz
  - 8. Terminations/Connectors: Cables shall terminate in Category 6 RJ-45 crimp connectors with strain-relief boots, or at Category 6 punch down blocks at both ends.
  - 9. Cable shall be plenum-rated for flammability in accordance with NFPA 262, and suitable for use as riser cable.
  - 10. Ethernet cable installed in underground conduits shall be rated as suitable for the application.
  - 11. Industrial, unshielded Ethernet cable shall be Belden 7931A or approved equal.

# 2.03 ANTENNA FEEDER CABLE

- A. Antenna feeder cable shall be coaxial type suitable for use with a 900 MHz radio system.
- B. Use only coaxial cable recommended for specific applications such as radio antenna systems as required by the radio manufacturer or system supplier. Due to wide differences in electrical ratings and physical characteristics between cable types, any deviations from manufacturers recommended types, cable is not acceptable.

# PART 3 - EXECUTION

## 3.01 CABLE INSTALLATION

- A. Signal cable shall be installed by personnel who have a minimum of 3 years' experience in terminating and splicing shielded twisted pair cables and coaxial cables.
- B. Adequate care shall be exercised by the installers to prevent cable damage or sheath distortion. Bending radius shall not be less than 10 times the cable outside diameter.
- C. Raceways shall be swabbed before installation of cable to remove moisture and debris.
- D. Cables shall be continuous from initiation to termination without splices except where specifically indicated.
- E. Cable shielding shall be grounded at one end only of the cable. Bonding shall be to a single ground point only. Bonding from cable to cable in multiple run installations shall not be permitted.
- F. Heat shrinkable sleeving shall be installed on all cables to insulate shielding at the ungrounded cable terminations.
- G. Signal cable shall not be run in the same raceway with power and control wiring except where specifically indicated.
- H. Where installed in control consoles containing power circuits, cables shall be routed a minimum of 2 inches distant. Color coding shall be strictly observed throughout the installation.
- I. Cable in panels, cabinets, and wireways shall be neatly grouped using nylon tie straps, and shall be fanned out to terminals.
- J. For telephone cables, provide station cable to outlets. Use backbone cable for connection between telephone patch panels. Allow at least 25% spare capacity between patch panels.
- K. Manufacturer's cable pulling tension shall not be exceeded.
- L. Pulling lubricant shall be UL approved.

# 3.02 CONDUCTOR SPLICES AND TERMINATIONS

- A. Splices: Install all conductors without splices unless necessary for installation, as determined by the Engineer. Splices, where approved, and terminations shall be in accordance with the splice or termination kit manufacturer's instructions.
- B. Terminations:
  - 1. Crimp-type terminals shall be UL listed, self-insulating, sleeve type with ring or rectangular tongue, suitable for size and material of the wire to be terminated and for use with either stranded or solid wire. Spade type lugs are acceptable with telephone cable systems only.
  - 2. Crimp with manufacturer's recommended ratchet-type tool with calibrated dyes. Hand crimping tools are not acceptable.
  - 3. Coaxial cable and connectors shall be terminated in accordance with the manufacturer's instructions.

# 3.03 CONDUCTOR IDENTIFICATION

- A. Identify each wire or cable at each termination, in each pullbox, and in each handhole using numbered and lettered wire markers. All electrically common conductors shall have the same number. Each electrically different conductor shall be uniquely numbered. Identify panelboard circuits using the panelboard identification and circuit number. Identify motor control circuits using the equipment identification number assigned to the control unit by the motor control center manufacturer and the motor control unit terminal number. Identify other circuits as shown in the circuit schedule or as favorably reviewed by the Engineer. Conductor numbering shall be coordinated with the Interconnection Diagrams specified in Division 40.
- B. Conductors between terminals of different numbers shall have both terminal numbers shown at each conductor end. The terminal number closest to the end of the wire shall be the same as the terminal number.
- 3.04 FIELD TESTS
  - A. Perform testing in accordance with Section 26 01 26 Electrical Tests.

END OF SECTION

# **SECTION 26 05 33**

# ELECTRICAL RACEWAY SYSTEMS

#### PART 1 - GENERAL

#### 1.01 SCOPE OF WORK

- Furnish and install complete raceway systems as shown on the drawings and as Α. specified herein.
- B. Raceways and conductors that are listed on the conduit and cable schedules are generally not shown on the Drawings, except where they are required to pass through a restricted or designated space and the Contractor would benefit from additional information. Conduit block diagrams indicate exposed conduits as solid lines and shall be run near the ceilings or along walls of the areas through which they pass and shall be routed to avoid interferences with HVAC ducts, cranes and hoists, lighting fixtures, doors and hatches, etc. Conduit block diagrams indicate concealed or buried conduits as dashed lines and shall be run in underground duct banks, center of concrete floor slabs, in partitions, or above hung ceilings as required.
- C. In the event that individual equipment loads provided are larger than indicated in the Contract Documents, revise raceways, conductors, starters, overload elements, and branch circuit protectors as necessary in order to control and protect the increased connected load in conformance to NEC requirements as part of the WORK.

#### 1.02 REFERENCE STANDARDS

4

- Α. American National Standards Institute (ANSI) Publications:
  - 1. C80.1 Specification for Zinc Coated Rigid Steel Conduit
  - 2. C80.5 Specifications for Rigid Aluminum Conduit
- Federal Specifications (FS): Β.
  - FS W C 1094 W C 1094A 1.
  - 2. FS WW C 540 WW C 540A
  - 3. WW C 540C
- Conduit and Conduit Fittings. Plastic. Rigid
- Conduit, Metal, Rigid, (Electrical, Aluminum)
- Conduit, Metal, Rigid & Coupling, Elbow & Nipple, Electrical Conduit, Aluminum
- Flexible Metal Conduit FS WW C 566 WW C 566C
- National Electrical Manufacturers Association (NEMA) Publications: C.
  - RN 1 Polyvinyl Chloride Externally Coated Galvanized Rigid Steel Conduit 1. and Electrical Metallic Tubing
  - Electrical Polyvinyl Chloride (PVC) Conduit 2. TC2
  - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and 3. TC3 Tubina
  - 4. TC 6 PVC and ABS Plastic Utilities Duct for Underground Installation
  - 5. TC14 Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
  - D. Underwriters Laboratories (UL) Standards:
  - **Rigid Metal Electrical Conduit** 1. 6
  - 2. 6A Electrical Rigid Metal Conduit – Aluminum, Red Brass and Stainless Steel
  - 3. 360 Liquid-Tight Flexible Metal Conduit

- 4. 651 Electrical Rigid Nonmetallic Conduit and Fittings
- 5. 651A Type EB and A Rigid PVC Conduit and HDPE Conduit
- 6. 2515 Aboveground Reinforced Thermosetting Resin Conduit

## 1.03 SUBMITTALS

- A. Submit complete catalog cuts of raceways, fittings, boxes, supports, and mounting hardware, marked where applicable to show proposed materials and finishes.
- B. Prepare as-built drawings of encased concealed and exposed raceways, ducts, raceways, junction boxes, pull boxes, and electrical and instrumentation equipment.

# 1.04 LOCATIONS

A. Refer to Section 26 05 00 for definitions of types of locations.

# PART 2 - PRODUCTS

# 2.01 GENERAL

- A. Pull and junction boxes, fittings and other indicated enclosures that are dedicated to the raceway system shall comply with the requirements of this Section.
- B. Provide exposed conduit of 3/4-inch minimum trade size and encased conduit of 1inch minimum trade size. Provide 2-inch minimum trade size for conduits containing fiber optic cables.
- C. The use of short sections of 1/2-inch flexible conduit for final termination of field control devices and instrumentation is permitted. They may not be longer than 36 inches in length, and may only transition to the smaller size junction boxes or condulets at the field device.

## 2.02 CONDUIT RACEWAYS

- A. Galvanized Rigid Steel Conduit (GRS) shall be manufactured from mild steel, hotdip galvanized inside and out, conforming to ANSI C80.1 and UL 6. Couplings shall be threaded type. Manufacturers shall be Allied Tube and Conduit, Wheatland Tube or approved equal.
- B. PVC coated rigid steel conduit (PGRS) shall meet the requirements of GRS above. A PVC coating shall be bonded to the outer surface with a thickness not less than 40 mils. The inside surfaces and threads of the conduit shall be provided with a 2mil urethane coating. PGRS shall be manufactured in accordance with UL-6, ANSO C80.1 and NEMA RN1. Manufacturers shall be Robroy Industries Perma-Cote or Plasti-Bond series, Thomas & Betts Ocal Blue or approved equal.
- C. Liquidtight Flexible Conduit shall be constructed of a flexible galvanized metal core with a sunlight-resistant thermoplastic outer jacket. Conduit shall be manufactured• in accordance with UL 360. Flexible conduit in hazardous areas shall be rated for the Class, Division and Group in which its installed. Manufacturers shall be Anaconda Sealtite, Electriflex Liquatite or approved equal.
- D. Rigid Nonmetallic Conduit: Rigid nonmetallic conduit shall be PVC Schedule 40 (PVC 40) or PVC Schedule 80 (PVC 80) and sunlight resistant. Conduit shall be approved for underground use and for use with 90°C wires, and shall conform to

NEMA TC-2 and UL 651. Manufacturers shall be Carlon, Cantex or approved equal.

E. Fiberglass conduit shall be manufactured using the single circuit filament winding process. The resin shall be epoxy-based, with no fillers. All additives for increasing flame spread and lowering smoke density shall be halogen free. Conduit shall be manufactured in accordance with NEMA TC 14. Manufacturers shall be Champion Fiberglass, United Fiberglass or approved equal.

# 2.03 CONDUIT SUPPORTS

- A. For indoor, dry locations, supports for individual conduits shall be galvanized malleable iron one-hole type with conduit back spacer. All other locations shall be Type 316 stainless steel.
- B. For indoor, dry locations, supports for multiple conduits shall be hot-dip galvanized Unistrut or Superstrut channels, or equal. All associated hardware shall be hot-dip galvanized. All other locations shall be Type 316 stainless steel.
- C. All channels, strut, threaded rods, nuts and clamps in corrosive areas shall be of epoxy resin reinforced fiberglass material. Provide Robroy, Superstrut, or equal.

# 2.04 FITTINGS

- A. General
  - 1. For use with metallic conduit, provide cast and malleable iron fittings of the threaded type with 5 full threads.
  - 2. Fittings
    - a. Provide fittings with neoprene gaskets and non-magnetic stainless steel screws.
    - b. Attach covers by means of holes tapped into the body of the fittings.
    - c. Covers for fittings attached by means of clips or clamps will not be accepted.
  - 3. Terminations
    - a. In outdoor areas, terminate conduit in rain-tight hubs as manufactured by Myers, O.Z. Gedney, Appleton or approved equal.
    - b. In other than outdoor areas, provide sealed locknuts and bushings.
- B. Fittings for use with rigid steel shall be hot dipped galvanized steel or galvanized cast ferrous metal; access fittings shall have gasketed cast covers and be Crouse-Hinds Condulets, Appleton Unilets, or equal. Provide threaded-type couplings and connectors; set-screw type and compression-type are not acceptable.
- C. Fittings for use with aluminum shall be cast aluminum with less than 0.40 percent copper content, and suitable for use with aluminum conduit. Manufactures shall be O.Z. Gedney, Appleton, Crouse-Hinds or approved equal.
- D. Fittings for use with PVC-coated GRS conduit shall be PVC-coated that are the products of the same manufacturer as the conduit. Both male and female threads and internal surfaces shall contain a 2-mil urethane coating.
- E. Fittings for use with rigid nonmetallic conduit shall be PVC and have solvent-weldtype conduit connections. Boxes shall be manufactured of PVC or fiberglass reinforced polyester (FRP). Manufactures shall be Carlon, Crouse-Hinds, Hoffman or approved equal. If such are not available, then the Specification for PVC coated galvanized rigid steel fittings shall apply.

- F. Fittings for flexible conduit shall be Appleton Type ST, O.Z. Gedney Series 4Q, or approved equal.
- G. Fittings for use with fiberglass conduit shall be fiberglass and as recommended by the conduit manufacturer.
- H. Combination expansion-deflection fittings with internal grounding shall be installed where conduit movement is expected in more than one dimension, and where conduits transition out of structures in locations where differential settlement may occur. Combination expansion/deflection fittings shall be manufactured by Crouse-Hinds Type XJGD or approved equal.
- I. Expansion fittings with internal grounding shall be installed wherever exposed raceway cross building expansion joints. Expansion fittings shall be Crouse Hinds Type XLGSA or approved equal.
- J. Union couplings for conduits shall be the Erickson type and shall be Appleton Type EC, O.Z. Gedney 3-piece Series 4, or approved equal. Threadless couplings shall not be used.
- K. Bushings:
  - 1. Bushings shall be the insulated type.
  - 2. Bushings for rigid steel conduit shall be hot dip galvanized insulated grounding type, O.Z. Gedney Type HBLG, Appleton Type GIB, or approved equal.
- L. Conduit seals in hazardous areas shall have zinc electroplate and shall be Crouse-Hinds Type EYS or EZS; Appleton Type EYS, ESU, or EY series; or approved equal.
- M. Conduit seals in areas where chlorine, ammonia, sulfur dioxide and/or hydrofluosilicic areas shall be Link Seal or approved equal.

# 2.05 BOXES

- A. Boxes specified herein are for use with raceway systems only. Boxes used for housing electrical and instrumentation equipment shall be as described elsewhere in these Specifications.
- B. NEMA 1 Areas: NEMA 1 terminal boxes, junction boxes, pull boxes, etc. shall be either sheet or cast malleable iron or aluminum depending on raceway material. Boxes shall be suitable for wall mounting or have feet where self-standing. Boxes shall have continuously welded seams and welds shall be ground smooth. Box bodies shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14 gauge metal and covers shall not be less than 12 gauge metal. All boxes shall have hinged gasketed doors with quarter turn latches or 3-point latch (single operator) system on enclosures larger than 36 inches wide or 32 inches tall. Terminal boxes shall be furnished with terminal mounting straps and brackets. Terminal blocks shall be NEMA type, not less than 20A, 600V. Boxes shall be Concept Series as manufactured by Hoffman Engineering Co. or approved equal.
- C. Boxes for use in chemically corrosive areas shall be of rigid PVC. Construction shall be the same as specified for NEMA 4X areas as specified above.

# 2.06 WIREWAYS AND AUXILIARY GUTTERS

- A. General: Wireways shall consist of a prefabricated channel-shaped trough with hinged or removable covers, associated fittings, and supports. Straight sections shall not be longer than 5 feet. Separate power, control, signal and communications cables by grounded metallic dividers in wireways or run in separate wireways. Cross-sectional dimensions shall be as indicated on the Drawings. Fittings shall consist of elbows, tees, crosses, and closing plates as required.
- B. Interior Locations: All components shall be constructed from sheet steel not less than 14 gauge and coated with a corrosion-resistant gray paint. Covers shall be held closed with hinges and clamps.
- C. Exterior Locations: Wireway and associated fittings shall be NEMA rated for the area in which it is to be installed. Wireways shall be supplied with gasketed closing end plates and gasketed hinged covers.
- D. Corrosive Locations: In corrosive locations provide enclosure type boxes for use as wireways. Enclosures and associated fittings shall meet NEMA 4X classifications and shall be manufactured from reinforced injection molded fiberglass or formed and welded stainless steel and shall have gasketed closing plates and hinged and gasketed covers with spring loaded latches.
- E. Ground the steel and aluminum wireway bodies. Provide steel dividers with steel wireways or aluminum dividers with aluminum wireways, and ground by means of an individual grounding conductor.
- F. Terminate conduits in all wet and damp locations with rain-tight hubs as manufactured by O.Z. Gedney, Myers or approved equal. In finished areas, provide sealed locknuts and bushings.

## 2.07 CONDUIT SEALANTS

- A. Moisture Barrier Types: Sealant shall be a non-toxic, non-shrink, non-hardening, putty type hand applied material providing an effective barrier under submerged conditions.
- B. Fire Retardant Types: Fire stop material shall be a reusable, non-toxic, asbestosfree, expanding, putty type material with a 3 hour rating in accordance with UL 1479. Provide products indicated by the manufacturer to be suitable for the type and size of penetration.

# PART 3 - EXECUTION

## 3.01 CONDUIT, RACEWAY AND FITTING INSTALLATION

- A. No wire shall be pulled until the raceway system is complete in all details; in the case of concealed work, until all rough plastering or masonry has been completed; in the case of exposed work, until the raceway system has been completed in every detail.
- B. From pull point to pull point, the sum of the angles of all of the bends and offsets shall not exceed 270 degrees.
- C. Coat threads with a conductive lubricant before assembly.

- D. Provide joints that are tight, thoroughly grounded, secure and free of obstructions by use of a mandrel. Adequately ream the conduit in order to prevent damage to the wires and cables inside. Use strap wrenches and vises to install the conduit in order to prevent wrench marks on the conduit. Any conduit with wrench marks shall be replaced.
- E. The ends of all conduits shall be tightly plugged to exclude dust and moisture during construction. Duxseal, or 3M seal spray shall be used in all applications. Plugging with tape is prohibited, even for short periods of time.
- F. For power, control and signal circuits, provide conduit per Conduit Use Tables below, unless specifically indicated otherwise on the Drawings:
  - 1. Exception: For raceways leaving a building above grade and then going below grade, provide PVC-coated GRS from a point 3 feet above grade to a point 5 feet from the building wall.
- G. Unless boxes have cast, threaded hubs, provide insulated type metallic grounding bushings for metallic conduits at all boxes. Bond together all conduits to provide continuity of the equipment grounding system. Size bonding conductor per NEC.
- H. Provide flexible conduit in lengths of not more than 36 inches at connections to motors, valves and any equipment subject to vibration or relative movement. All flexible conduits, regardless of length or manufacturer rating, shall have a dedicated ground bonding conductor pulled through, whether it is included in the conduit fill schedules or not.
- I. Damage to PVC coating of coated conduits or fittings shall be repaired with factory-approved PVC patching material to the original factory condition.
- J. Install fiberglass conduit in accordance with the manufacturer's instructions. Connections between sections of conduit may be either glued or threaded, at the Contractor's option.
- K. Underground Raceways: Slope all underground raceways to provide drainage; for example, slope conduit from equipment located inside a building to the handhole located outside the building. For additional requirements see Section 16402.
- L. Conduit Supports: Properly support all conduits as required by the NEC. Run all conduits exposed except where the Drawings indicate that they are to be embedded in the floor slab, walls, or ceiling, or to be installed underground.
  - 1. Exposed Conduits:
    - a. Support exposed conduits within 1 foot of any outlet and at intervals not exceeding NEC requirements; wherever possible, group conduits together and support on common supports. Support exposed conduits fastened to the surface of the concrete structure by one-hole clamps, or with channels. Use conduit spacers with one-hole clamps. Coordinate conduit locations with piping, equipment, fixtures, and with structural and architectural elements. Conduits attached to walls or columns shall be as unobtrusive as possible and shall avoid windows. Run all exposed conduits parallel to building lines. No diagonal runs will be accepted. Bends in parallel runs shall be concentric and shall be run straight and true.
    - b. Group together exposed conduits in horizontal runs located away from walls and support on trapeze hangers. Arrange such conduits uniformly and neatly. Trapeze hangers shall consist of channels of adequate size, suspended by means of minimum 3/8" diameter rods or other suitable

means from the ceiling or from pipe hangers. Install such runs so as not to interfere with the operation of valves or any other equipment, and keep at least 6 inches clear of any pipe which may operate at more than 100°F. Treat cut surfaces or damaged ends with corrosion-resistant coatings such as "Devcon Z", prepared by Subox Coatings; "Galvanox Type I", prepared by Pedley-Knowles; or approved equal. Application shall follow manufacturer's recommendation.

- M. All penetrations through walls into or out of corrosive locations, as defined in Section 26 05 00 shall be made gas-tight. In concrete walls, pour concrete after the conduit is in place, if possible. If not, core drill concrete or CMU walls, install conduit and caulk around it with non-shrink grout. Install conduit seal in each conduit near the penetration.
- N. All conduit penetrations through interior walls and floors shall be sealed with fire retardant type conduit sealant.
- O. Conduit Identification: In each handhole, pullbox, cabinet, motor control center or other equipment enclosure, identify each conduit using the conduit number shown on the Drawings by means of a stamped brass tag affixed with stainless steel wire; where affixing a tag is not feasible, identify conduits by affixing a brass tag with epoxy or other approved method of stenciling to the wall or structure adjacent to the conduit terminus.
- P. Conduit Sizes:
  - 1. Provide exposed conduit of 3/4-inch minimum trade size.
  - 2. Provide underground conduit of one-inch minimum trade size.
- Q. Conduit Seals:
  - 1. Moisture Seals: Provide in accordance with NEC Paragraph 300.5(g).
  - 2. Gas Seals: Provide in accordance with NEC Paragraph 501.5.
- R. Aluminum conduit shall not be installed underground or encased in concrete. If necessary to run through concrete, install in a non-metallic conduit sleeve or use PVC coated conduit.
- S. Rigid PVC conduit shall be stored on a flat surface and shielded from the sun.

	Inside Buildings						
	Exposed			Concealed			
Circuit Type	Standard	Corrosive	Hazardous	Above Suspended Ceilings	In Stud Walls	Embedded In Concrete	Slab On Grade
Power & 120	GRS or	PVC Coated	PVC Coated	PVC-80 or	GRS	PVC-40 or	PVC-40 or
Vac Control	Aluminum**	GRS or	GRS or	GRS		PVC-80	PVC-80
		Aluminum**	Aluminum**				
Signal	GRS or	PVC Coated	PVC Coated	GRS	GRS	GRS	GRS
	Aluminum**	GRS or	GRS or				
		Aluminum**	Aluminum**				
Fiber Optic	GRS or	PVC Coated	PVC Coated	PVC-80 or	GRS	PVC-80	PVC-80
Cable	Aluminum**	GRS or	GRS or	GRS			
		Aluminum**	Aluminum**				

## CONDUIT USE TABLE 1

* Provide ground wire sized per NEC requirements for all circuits.
** Aluminum and/or Fiberglass may be used in corrosive locations where environmental conditions warrant its use.

#### Notes:

- 1. Generally, the Conduit Use Tables apply.
- 2. Signal circuits are those subject to RF interference or induced current. MSPs, TSPs, telephone cable, coaxial cable, and manufacturer's cables specially designed for low level signals are all presumed to be part of signal circuits.
- 3. Provide fiberglass conduit where indicated on the Drawings.

#### 3.02 WIREWAY INSTALLATION

- A. Straight sections and fittings shall be solidly bolted together to be mechanically rigid and electrically continuous. Dead ends shall be closed. Unused conduit openings shall be plugged.
- B. Wireways shall be supported every 5 feet.
- C. Wireways and auxiliary gutters shall not contain wiring or control devices and shall not extend over 30 feet in length.

## END OF SECTION

## SECTION 40 27 00

## PIPING, VALVES, AND ACCESSORIES

## PART 1 - GENERAL

#### 1.01 SUMMARY

A. Section Includes: Provide all piping, including fittings, valves, supports, and accessories as shown on the Drawings, described in the Specifications and as required to completely interconnect all equipment with piping for complete and operable systems, including equipment drains.

#### 1.02 REFERENCES

- A. Air-Conditioning and Refrigeration Institute (ARI)
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- C. ASTM International (ASTM)
- D. American Society of Mechanical Engineers (ASME)
- E. American National Standards Institute (ANSI)
- F. American Water Works Association (AWWA)
- G. American Welding Society (AWS)
- H. Cast Iron Soil Pipe Institute (CISPI)
- I. U.S. Department of Transportation (DOT)
- J. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS)
- K. National Fire Protection Association (NFPA)

## 1.03 SUBMITTALS

- A. Shop Drawings:
  - 1. Verify by excavation, inspection and measurement all installation conditions, including existing utilities and structures, for all pipe before preparation of Shop Drawings. Submit field measurements and photos with Shop Drawings where exposed conditions are significantly different than indicated on the Drawings.
  - 2. Layouts and Schematics: Submit detailed installation drawings of all piping. Schematics may be submitted for piping 4 inches and smaller. The Drawings and schematics shall include: pipe support locations and types, fittings, valves, other appurtenances. (Product Review)
  - 3. Submit data to show that the following items conform to the Specification requirements:
    - a. Pipe, fittings and accessories (Product Review).
    - b. Pipe couplings and flexible pipe pieces (Product Review).
    - c. Valves and Accessories (Product Review).
  - 4. Pipe, fittings and joint fabrication details for shop fabricated and field-welded pipe (Product Review).

- 5. Submit certified test reports as required herein and by the referenced standard specifications (Product Information).
- 6. Samples: Solder and flux for copper pipe.
- 7. Gaskets for gasketed pipe.
- 8. Testing data for welded joints.
- 9. Submit leak and pressure testing plan in accordance with the requirements herein.
- 10. Submit shop drawings for leak and pressure testing apparatus.
- B. Manuals: Furnish manufacturer's installation and operation manuals, bulletins, and spare parts lists for the following items:
  - 1. Valves.
  - 2. Strainers.
  - 3. Pressure regulators.
  - 4. Rotameters.
- C. Field test reports as required in Part 3.
- 1.04 DELIVERY, HANDLING AND STORAGE
  - A. Exercise great care to prevent injury to or scoring of the pipe lining and coating, as applicable, during handling, transportation or storage. Do not store pipe on rough ground and do not roll, drag, or otherwise handle the pipe in a manner damaging to the coating.
  - B. All materials delivered to the job site shall be new, free from defects, and marked to identify the material, class, and other appropriate data such as thickness for piping.
  - C. Store pipe so that it's off the ground, adequately supported on suitable supports such as wooden sleepers, rubber tires or sandbags and securely blocked. Avoid compression damage or deformation to the ends.
  - D. Where possible, store pipe in unit packages provided by the Pipe Manufacturer.
  - E. Stack pipe in accordance with the Pipe Manufacturer's recommendations.
  - F. Do not roll, drag, or drop pipe.
  - G. Store gaskets in a cool, dark place, out of direct sunlight, preferably in original cartons.
  - H. Damaged pipe, lining, and coatings shall be repaired or replaced at the expense of the Contractor to the Owner's satisfaction.

#### 1.05 QUALITY ASSURANCE

- A. Materials and equipment under this Section shall be furnished by manufacturers regularly engaged in the design and manufacture of the materials and equipment for a period of at least 5 years.
- B. Pipe installed under this contract may be inspected for compliance by the Engineer, Owner and/or an independent testing laboratory selected by the Owner.
  - 1. Pipe rejected by the Engineer or Owner shall be immediately removed from the job site.

- C. Acceptance of materials shall be subject to strength and quality testing in addition to inspection of the completed product. Acceptance of installed piping systems shall be based on inspection and leakage tests as specified hereinafter.
- D. Factory Quality Control: The Contractor shall test all products as required herein and by the reference specifications.
- E. Field Quality Control:
  - 1. The Owner will:
    - a. Inspect pipe fabrication and witness any test
  - 2. The Contractor shall:
    - a. Perform leakage tests
    - b. Be responsible for the costs of additional inspection and retesting by the Owner resulting from noncompliance.

## 1.06 PIPING SYSTEMS

A. The various piping systems are identified by a multi-letter code on the Drawings. Unless otherwise shown on the Drawings, each system shall be constructed using the materials indicated for that system in the Pipe Schedule. Piping materials are identified by type designation in the schedule unless otherwise noted, and most valves and accessories are identified by a valve and accessory system unless otherwise noted.

## PART 2 - PRODUCTS

## 2.01 GENERAL

- A. Pipe and valve sizes are nominal inside diameter unless otherwise noted.
- B. Construct vents of materials specified for the pipe system for which they serve.
- C. All materials delivered to the job site shall be new, free from defects, and marked to identify the material, class, and other appropriate data such as thickness for piping.
- D. Acceptance of materials shall be subject to strength and quality testing in addition to inspection of the completed product. Acceptance of installed piping systems shall be based on inspection and leakage tests as specified hereinafter.

#### 2.02 GENERAL MATERIAL REQUIREMENTS

- A. Gaskets: Gasket materials shall be as noted in the Valve and Accessory System.
- B. Bolts: Unless specified otherwise herein, flange bolts and nuts, coupling bolts and nuts, and other hardware shall be Type 316 stainless steel per ASTM A193, Grade B8M, Class 2. Apply an anti-galling compound to the threads of stainless steel bolts.
- C. Flexible Sealant: Flexible sealant for pipe joints, where shown on the Drawings, shall be a two-component polysulfide, non-sag; Sikaflex 2C, Dualthane, or equal.
- D. All materials in contact with potable water shall comply with the Safe Drinking Water Act and NSF 61 requirements for use in water systems.

#### 2.03 PIPING MATERIALS

- A. Pipe and Fitting Designation: Piping materials are identified by a "Type" designation in these Specifications. The "Type" designation identifies not only the pipe itself but the associated fittings and appurtenances and the installation and test procedures described for that "Type." The designation of a particular type shall indicate a complete installation including fittings, joints, cleaning and testing. The pipe and fitting materials for each type designation shall be as specified herein and summarized in the Pipe Type Schedule.
- B. Pipe Schedule: Piping systems and their corresponding piping and valve systems are listed on the Drawings.
- C. Pipe Type Schedule: Pipe material, joints, and fittings shall be as summarized below. A detailed specification of each pipe type follows. The detailed specification supersedes the schedule in case of any conflicts.

Ріре Туре	Pipe Description	Field Joints	Fittings
GSP	Galvanized Steel Pipe, Schedule 40	Thread	Galvanized Malleable Iron or Cast Iron
PVC-1	PVC, Schedule 80	Threaded or Solvent Weld	PVC, Schedule 80

# D. <u>GSP Pipe:</u>

- 1. Pipe: Galvanized steel, ASTM A53, Schedule 40.
- 2. Fittings:
  - a. Pressure Pipe Service: Galvanized malleable iron, screwed, ASTM A197 for materials, ANSI B16.3 Class 150 for dimensions (rated 300 psig WOG (Water, Oil, Gas) at 150°F).
  - b. Drain Pipe Service: Galvanized cast iron drainage pattern, ANSI B16.12.
- 3. Threads: ANSI B2.1.
- 4. Unions: Galvanized malleable iron, ASTM A197 for materials and ANSI B16.39 for dimensions, with brass seats.
- 5. Thread Compound: Permatex No. 2; Crane equivalent; or equal, or Teflon tape.

## E. <u>PVC-1 Pipe:</u>

- 1. Pipe: Schedule 80 polyvinyl chloride (PVC), gray, normal impact, Type 12454 B, ASTM D1784 and ASTM D1785. Pipe shall bear the National Sanitation Foundation (NSF) label.
- 2. Joints: Solvent weld, except flanged permitted where required at equipment connections and where required on the Drawings. Use Military Specification T 27730A tape for threaded joints.
- 3. Fittings: Solvent weld, socket type, of same material as the pipe, Schedule 80, ASTM D2467.
- 4. Cement: Solvent weld, ASTM D2564, as recommended by the pipe manufacturer for the schedule and size to be joined, PVC 724 by Weld-On; no equal.
- 5. Pipe Cleaner: As recommended by the pipe manufacturer for the schedule and size to be joined.

#### 2.04 VALVES AND ACCESSORIES

- A. Valve and Accessory System Designation: Most valves and accessories to be furnished and installed are identified by a valve and accessory system designated by a letter symbol in the Pipe Schedule.
- B. General Requirements for Valves:
  - 1. All valves of each type shall be the product of one manufacturer.
  - 2. All exposed valves shall be furnished with operators, handwheels, levers, or other suitable type wrench including handles as specified herein or as shown on the Drawings. General Requirements for Accessories:
  - 3. Pressure Gauges: Provide pressure gauges with features and accessories in accordance with Section 46 30 00. Provide shutoff valves for all pressure gauges.
- C. Valve and Accessory Systems: See Pipe Schedule on Sheet G-004.

## 1. Valve and Accessory System A:

- a. Applicable Service Condition: Clean Water and air not covered elsewhere.
- b. Gaskets shall be SBR unless noted otherwise.
- c. Ball Valves through size 4-inch in metal piping:
  - 1) Rating: 400 psi WOG (Water, Oil, Gas).
  - 2) Type: Lever.
  - 3) Connections: Threaded.
  - 4) Materials: Bronze body, chrome-plated ball, Teflon seats.
  - 5) Manufacturers: Apollo 70-100; Watts B-6000; or equal.
- d. Water Meter: Badger Recordall Disc series, lead-free alloy, Model M170 for 2" connections.

## 2. Valve and Accessory System C:

- a. Applicable Service Condition: Sodium bisulfite.
- b. Gaskets shall be PTFE unless noted otherwise.
- c. Ball Valves Through 4-inch Size:
  - 1) Rating: 150 psi at 75°F.
    - 2) Type: Double union.
    - 3) Connections: Socket.
    - 4) Materials: PVC body, teflon seats and EPDM O-ring seals.
    - 5) Manufacturers: R&G Sloane, Asahi/America Pro Block, or equal.
- d. Check Valves Double Union Type:
  - 1) Rating: 150 psi at 75°F.
  - 2) Type: Ball for horizontal or vertical service.
  - 3) Connections: Union ends for socket weld.
  - 4) Materials: PVC body, Viton O-ring seals and seats.
  - 5) Manufacturers: Chemtrol True Union BC, Plastiline No. 8611, or equal.
- e. Strainers:
  - 1) Rating: 150 psi.
  - 2) Type: Wye-type basket strainers. Strainer screen size as recommended by feed pump supplier.
  - 3) Connections: Threaded.
  - 4) Materials: PVC.
  - 5) Manufacturers: Chemtrol, GF, or equal.

- 6) Installation: Each to be installed with ball valve blowoff and piping to drain.
- f. Pressure Gauges: Provide protector body and diaphragm and isolation valve materials appropriate for the chemical solutions to which they will be exposed. See Section 46 30 00.
- g. Refer to Section 46 30 00 for pulsation dampeners, pressure relief valves, and backpressure control valves.
- D. Miscellaneous Valves and Accessories:
  - Link-Type Seals: Link-type seals shall be interlocking synthetic rubber links connected by stainless steel bolts and nuts to form a continuous belt. Tightening of the bolts shall expand the rubber to form a watertight seal of the annular space between a pipe and the hole or sleeve in the wall.
  - 2. Valve Tags: Plastic, fiberglass, or plastic material, 2-inch square with grommeted hole. The tags shall be attached to valves with a brass jack chain. For buried installations use a nylon strap. Lettering shall be stamped or cut into the tag at least 3/16-inch high.
  - 3. Chemical Fill Station Quick-Disconnect Assembly: Consists of a diaphragm or ball check valve, diaphragm or ball isolation valve and a male/female coupling with cam seated washer type seal. Valve types shall be consistent with valve and Accessory System C with the exception that horizontal mounting requires use of a diaphragm check valve. The couplings shall be Monel. Couplings shall be "Kamlock" by OPW or equivalent. Coordinate coupling size with Owner for compatibility with local supplier's chemical delivery equipment.
  - 4. Chemical Sample/Flushing Connections: Consist of a ³/₄-inch NPT male fitting in Type 316 stainless steel on the outlet side of a ball valve. Provide a 5-foot length of ³/₄-inch ID wire reinforced, rubber covered Teflon hose with crimped ³/₄-inch couplings, male on one end and female on the other.
  - 5. Pipe Escutcheons:
    - a. Manufactured wall, ceiling, and floor plates; cast brass, polished chrome plated, with set-screw, deep pattern type where required to conceal protruding fittings and sleeves.
    - b. Inside Diameter: Closely fit around pipe, tube, and insulation of insulated piping.
    - c. Outside Diameter: Completely cover opening.
    - d. One-piece design for piping to plumbing fixtures and to equipment in finished spaces.
    - e. Split concealed hinge type for piping not serving plumbing fixtures or equipment in finished spaces.

## PART 3 - EXECUTION

- 3.01 PIPING INSTALLATION
  - A. General Handling and Placing:
    - 1. Carefully inspect each pipe, fitting, valve and accessory before installation to insure there is no defective workmanship or obstructions. Inspect the interior and exterior protective coatings and patch all damaged areas in the field or replace to the satisfaction of the Engineer.

- 2. Place or erect all piping to accurate line and grade and backfill, support, hang, or brace against movement as specified or shown on the Drawings, or as required for proper installation. Remove all dirt and foreign matter from the pipe interior prior to installation and thoroughly clean all joints before joining.
- 3. Use reducing fittings where any change in pipe size occurs. Do not use bushings unless specifically noted on the Drawings. Use eccentric reducing fittings wherever necessary to provide free drainage of lines.
- 4. Cast all metallic pipes and sleeves 6-inch and larger into new concrete walls without blockout. Pipes 5 inches and smaller may be cast in place or installed in a smooth core drilled hole using a link type seal at the Contractor's option. Maintain at least ½-inch clearance between reinforcing steel and metal pipe in penetrations.
- 5. Cover polyvinyl chloride (PVC) pipe stored outside for more than two months with canvas or other opaque material. Provide for air circulation under the covering.
- 6. Prevent damage to the pipe, lining and coating during handling and placement.
- 7. Remove all dirt and foreign matter from the pipe interior prior to installation and thoroughly clean all joints before joining.
- 8. Connections between ferrous and non-ferrous piping and accessories shall be made using a dielectric coupling, union, or insulated flanged joint.
- B. General Exposed Piping Installation:
  - 1. Unless shown otherwise, install piping parallel to building lines, plumb and level.
  - 2. Install piping without springing or forcing the pipe in a manner that would set up stresses in the pipe, valves, or connected equipment.
  - 3. Set all pipe flanges level, plumb, and aligned. All flanged fittings shall be true and perpendicular to the axis of the pipe. All bolt holes in flanges shall straddle vertical centerline of pipes.
  - 4. Flexibility and Expansion: Provide flexible couplings, flexible hose, or flexible spools for all piping connections to motor driven equipment and where otherwise shown. The Contractor may install additional flexible couplings at favorably reviewed locations to facilitate piping installation, provided that he submits complete details describing location, pipe supports, and hydraulic thrust protection. Anchor piping subject to expansion or contraction in a manner permitting strains to be evenly distributed. Sleeves for branches through walls from adjacent mains shall be of sufficient size to allow for free side motion of covered pipe in sleeves.
  - 5. Install unions or flexible connections where shown on the Drawings, and at all non-motor-driven equipment to facilitate removal of the equipment.
  - 6. Provide valves wherever equipment drain connections are furnished and carry the discharge pipe to the nearest floor drain, drain trench or sump. Where no receptacle for drain exists, install drain piping to 1-inch above the floor. Drain piping and valve materials shall conform to the requirements of the system served.
  - 7. Where piping conveying liquids passes over motor control centers, electrical panels and other electrical devices, install a protective drainage tray below the piping.
  - 8. Provide a vent valve at all piping high spots if air release valves or other venting means are not shown.

- C. Installation Specifics:
  - 1. GSP Pipe: Threaded joints shall have connections made metal to metal tight. Remove all burrs from ends of pipe, and clean threads of all oil and chips. Coat male threads with joint lubricant. Properly tape wrap joints of plasticcoated pipe.
  - 2. PVC-1 Pipe:
    - a. Install pipe in accordance with the manufacturer's instructions.
    - b. Place PVC pipe within the installation areas at least 24 hours prior to installation to permit temperature equalization.
    - c. Cut pipe ends squarely, ream and deburr inside and out.
    - d. Clean pipe ends and bells of dirt, grease and other foreign materials prior to making the joint.
    - e. Solvent Weld Joints: Clean pipe ends and sockets and join in strict conformance with the pipe manufacturer's instructions. Make joints in accordance with ASTM D2855. Handle solvent cements and primers in accordance with ASTM F402.
    - f. Containment fittings for chemical and chemical solution lines shall be installed and tested in accordance with manufacturers' instructions. Install containment pipe with position clips at 3-foot centers and at fittings during installation of carrier pipe. Do not make joints until after successful leak tests of carrier pipes.
    - g. PVC-1 Pipe: Threaded connections shall use a short nipple, threaded at one end, socket at the other. Provide thread sealant in accordance with the pipe manufacturer's recommendations. Take care not to overtighten the connection.
    - h. PVC-1 Pipe: No work shall be performed until the pipe manufacturer provides onsite installation training and certifies the installers are trained per ASTM D-2855. The Owner's inspector shall be present for the training session.

## 3.02 INSTALLATION OF VALVES AND ACCESSORIES

- A. Install valves and accessories such that all parts are easily accessible for maintenance and operation.
- B. Install pressure gauges and thermometers in a position to permit reading them from a point approximately 5 feet above floor level, except that pump pressure gauges shall be installed close to the pump elevation.
- C. Rigidly support pressure switches and connect them to piping and equipment using a suitable flexible linkage that will not permit transmission of vibrations from the piping or equipment to the pressure switches.
- D. Provide a union adjacent to each screwed end valve and accessory with additional unions as necessary to facilitate removal.
- E. Provide a shutoff valve below each pressure gauge, protective device or air valve unless otherwise specified.
- F. Connections between ferrous and non-ferrous piping, valves, accessories or pipe supports shall be made using a dielectric coupling, union, or flange.
- G. Where valves or other pipeline items require metal full-face connecting flanges, provide transition flanges if the connecting flange is not adequate.

H. Install link-type seals in cast-in-place metal sleeves or in smooth core drilled holes. Grout both sides flush with non-shrink grout unless otherwise shown on the Drawings.

## 3.03 PIPE AND VALVE IDENTIFICATION

- A. General: Identify all exposed piping in this project by painting, banding, system name labels, and direction arrows. The color and banding shall be as selected by the Engineer. Identify all exposed valves with tags as specified below.
- B. Exposed Pipe Identification: Before painting, banding and labeling, pipes shall be identified by the Contractor with temporary wired-on cardboard tags showing the proposed marking for review by the Engineer.
- C. Piping: Provide pipe markers per the schedule specified in Section 10 40 00.
- D. Valves: Provide each valve with a valve tag identifying the pipeline contents, and either its valve number, or the area or item served by the valve for valves without a valve number. Contents shall be as designated in the Piping Schedule.

## 3.04 FIELD QUALITY CONTROL

- A. Factory Quality Control: The Contractor shall test all products as required herein and by the reference specifications.
- B. The Contractor shall:
  - 1. Perform leakage tests.
  - 2. Be responsible for the costs of additional inspection and retesting by the Owner resulting from non-compliance.

## 3.05 CLEANING

A. Prior to testing, thoroughly clean the inside of each completed piping system of all dirt, loose scale, sand and other foreign material. Cleaning shall be by sweeping, flushing with water or blowing with compressed air or oil-free nitrogen gas, as appropriate for the size and type of pipe. Flushing shall achieve a velocity of at least 3 feet per second. The Contractor shall install temporary strainers, temporarily disconnect equipment, or take other appropriate measures to protect equipment while cleaning piping. Cleaning shall be completed after any pipeline repairs.

#### 3.06 FIELD TESTING

- A. General: Perform leakage tests on all pipe installed in this project. Furnish all equipment, material, personnel and supplies to perform the tests and make all taps and other necessary temporary connections. The test pressure, allowable leakage and test medium shall be as specified and as shown in the Pipe Schedule. Test pressure shall be measured at the highest point on the line, except that pressure at lowest point shall not exceed pipe manufacturer's rated test pressure, unless specifically noted otherwise. Leakage tests shall be performed on all piping at a time agreed upon and in the presence of the Engineer. All visible leaks shall be repaired, regardless of the test results.
- B. Exposed Piping: All supports, anchors and blocks shall be installed prior to the leakage test. No temporary supports or blocking shall be installed for final test.

- C. Accessories: It shall be the responsibility of the Contractor to block off or remove equipment, valves, gauges, etc., which are not designed to withstand the full test pressure.
- D. Testing Apparatus: Provide pipe taps, nozzles and connections as necessary in piping to permit testing including valves to isolate the new system, addition of test media, and draining lines and disposal of water, as is necessary. These openings shall be plugged in a manner favorably reviewed by the Engineer after use. Provide all required temporary bulkheads.
- E. Pneumatic Testing: Piping tested by air or another gas shall show no reduction of pressure during the test period after corrections have been made for changes in temperature in conformance with the following relationship:

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

Where  $T_1$  and  $T_2$  are the absolute temperatures of the gas in the pipe and P1 and P2 are the absolute pressures. The subscript "1" denotes the starting conditions and the subscript "2" denotes the final conditions.

- F. Precautions for Pneumatic Testing: Where air or another gas is called for as the test medium, the Contractor shall take special precautions to protect personnel. During the initial pressurization of a pipeline to the specified test pressure, personnel shall be protected by suitable barricades or shall remove themselves to locations where portions of the concrete structure itself are between them and the pipeline under test.
- G. Correction of Defects: If leakage exceeds the allowable, the installation shall be repaired or replaced and leakage tests shall be repeated as necessary until conformance to the leakage test requirements specified herein have been fulfilled. All visible leaks shall be repaired even if the pipeline passes the allowable leakage test.
- H. Drying: Gas lines tested with water shall be drained and blown dry with air or oilfree nitrogen gas.
- I. Reports: The Contractor shall keep records of each piping test, including:
  - 1. Description and identification of piping tested, test pressure, date of test.
  - 2. Witnessing by Contractor and Engineer.
  - 3. Test evaluation.
  - 4. Remarks, to include such items as leaks (type, location), and repairs made on leaks.
  - 5. Test reports shall be submitted to the Engineer.
- J. Venting: Where not shown on the Drawings, the Contractor may install valved "tees" at high points on piping to permit venting of air. Valves shall be capped after testing is completed.
- K. Testing Specifics: Piping shall be tested as indicated in the Pipe Schedule shown on the Drawings. Unless specified otherwise, test each system for 4 hours.

END OF SECTION

## SECTION 40 60 00

#### INSTRUMENTATION AND CONTROLS, GENERAL REQUIREMENTS

#### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Work Included:
  - 1. Provide all tools, equipment, materials, and supplies and be responsible for all labor required to complete the installation, startup and operational testing of a complete and operable Instrumentation and Control (I&C) System as indicated on the Drawings and as specified herein.
  - 2. Provide all the necessary equipment components and interconnections along with the services of manufacturers' engineering representatives necessary to ensure that the Owner receives a completely integrated and operational I&C system as herein specified.
  - 3. Provide all terminations for wiring at field mounted instruments, equipment enclosures, alarm and status contacts.
  - 4. Provide all Instrumentation and Control wire required for a fully functioning Instrumentation and Controls System as shown on the Drawings except for wire specifically specified in Division 40.
- B. Work Specified in Other Divisions:
  - 1. Process piping, installation of inline instrumentation, gas monitors, metering pumps and other mechanical work and equipment as specified in Divisions 43, 12, 46, 41, or 40.
  - 2. Instruments and controls which are not directly used for process control, i.e., those provided as part of a package system.
  - 3. Division 40 work, including all instrumentation and controls conduit, and only that wire specified in Division 40. Refer to Division 40 Specifications for specific requirements for wire, conduit, grounding, and other electrical equipment.
  - 4. Final control elements as specified in Section 40 27 00.
  - 5. General mechanical requirements as specified in Section 11 00 00.

#### 1.02 REFERENCE STANDARDS

- A. American National Standard Institute (ANSI) Publications:
  - 1. Y14.15a Drafting Practice
  - 2. C62.1 Surge Arrestors
- B. Instrumentation Society of America (ISA) Publications:
  - 1. S5.4 Instrument Loop Diagrams
  - 2. S20 Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves

#### 1.03 I&C SUBCONTRACTOR QUALIFICATIONS

A. An I&C Subcontractor shall be an electrical contractor who has demonstrated experience in purchasing, calibrating, fabricating, installing and testing the Instrumentation and Control (I&C) products listed in this Specification Section. Normally, the I&C Subcontractor is a systems house regularly engaged in the

business of panel fabrication, control component procurement, programmable logic controller and personal computer (PC) application in the process control industry.

- B. The I&C Subcontractor has been regularly engaged for a period greater than five years in performing all aspects of the type of work specified in this Section and shown on the Drawings and must prequalify as specified below.
- C. The I&C Subcontractor shall submit 1) proof in the form of names and references of jobs over the past five years where this work was accomplished, 2) present samples and an explanation of representative work performed at a meeting with the Engineer prior to bid award, 3) submit the name and qualifications (resumes) of the proposed employees of the firm who would be responsible for the day-to-day work, and 4) an explanation of how the I&C Subcontractor will carry out and implement the responsibilities described in the following section.

## 1.04 I&C SUBCONTRACTOR SYSTEM RESPONSIBILITIES

- A. General: The I&C equipment as specified in this Division shall be considered an integrated system. Entire system installation including calibration, verification, startup, operation testing, and training shall be performed by qualified personnel, possessing all the necessary skills and equipment, and who have had experience performing similar installations. Instrumentation and control systems drawings are diagrammatic only; it is the responsibility of the Contractor to obtain technical data, determine performance requirements, develop instrumentation detail installation designs, and coordinate the selection of specified equipment with Contractor supplied equipment to meet the design conditions stated.
- B. System Responsibilities:
  - 1. Instrumentation and control system drawings are diagrammatic only. Ensure that all components of the instrumentation system, including primary measuring, indicating, transmitting, receiving, recording, totalizing, controlling, and alarming devices and all appurtenances are completely compatible and shall function as outlined and shall furnish and install such additional equipment, accessories, etc., as are necessary to meet these objectives at no cost to the Owner.
  - 2. Compatibility: See that all components of the instrumentation system, including equipment specified under other Divisions, are completely compatible and function properly as a system. Provide such additional equipment, accessories, etc., as are necessary to meet these objectives at no cost to the Owner.
  - 3. Coordination: For control components, devices, and systems specified in Divisions 43, 12, 46, 41, 40, 26 and 40, or shown on the Drawings.
    - a. Provide technical advice to mechanical and electrical subcontractors as necessary regarding their installation of instruments.
    - b. Verify the correctness of installation of all instruments.
    - c. Verify that the proper type, size, and number of control wires with their conduits are provided.
    - d. Verify that the proper type, size, and number of pneumatic tubes with their conduits are provided.
    - e. Verify that proper electric power circuits provided for all components and systems.
    - f. Resolve all manufacturers' installation discrepancies between requirements and the detail requirements of the Drawings and Specifications.

- Supervise final signal connections, both electric and pneumatic, to all g. process instrumentation and control equipment.
- h. Adjust, startup, and test all process instrumentation and control equipment.
- Provide specified documentation and training. i.
- Performance: While the Drawings provide sufficient information to establish 4. the form and function of the systems and their relationships, the responsibility for system integration and performance rests solely with the Contractor. The Engineer provides technical instruction and guidance where needed.
- Site and Instrument Inspection: Inspect site for conformance to Drawings, 5. paying special attention to space allocation and dimensions shown or required on Drawings. Inspect completed work and verify that it is ready for installation of instruments and equipment. Inspect each instrument and piece of equipment for damage, defects, completeness, and correct operation before installing.

#### 1.05 SUBMITTALS

- Refer to Division 1 for required method of preparation and transmittal, and conform Α. to requirements herein.
- Β. Shop Drawings: Submit shop drawings (diagrams) for review in complete bound sets indexed by Specification number, with exterior tabs marked by subject. Submit manufacturer's catalog cuts for each item for which shop drawings are not required. Manufacturer's catalog cuts, specifications or data sheets shall be clearly marked to delineate the options or styles to be furnished. Show dimensions, physical configurations, methods of connecting instruments together, mounting details, and wiring schematics. Drawings shall be complete with device tag numbers, wire numbers and terminal board numbers. Submit fabrication details, nameplate legends, and control panel internal wiring and piping schematic drawings. Submit panel graphic drawings where applicable. Include material lists and/or bills of material.
  - Loop/Interconnect Diagrams: Submit a set of analog and discrete wiring 1. diagrams combining the elements of Sketches 40 60 00-1 and 40 60 00-2 that shows the complete details of installation of instruments and control system components. Include on each drawing the conduit number, wire numbers, the conduit run (via pullboxes, handholes, terminal cabinets, etc.) wiring interconnection and termination points.
  - 2. Elementary Diagrams: Submit an elementary diagram (also known as a schematic diagram - see Sketch 40 60 00-3) for control, protection, and monitoring circuits. Elementary diagrams are not required for lighting, communications and those systems clearly defined on the single line diagram. Show all interconnections between power sources, apparatus, and device elements of a particular system or equipment, and all interlocks with other systems in a manner which fully indicates circuit function and operation. Refer to the Drawings for functional and operational requirements.
- C. **Specification Forms:** 
  - Submit completed Specification Forms per ISA S20, including those 1. instrumentation and control components directly related to process control, but specified in other Divisions of these Specifications.
  - Include on each form the assigned tag numbers, manufacturer's part 2. numbers, and device data. More than one tag numbered item may be included on a sheet.

3

- D. As-Built Drawings: Submit a revised set of shop drawings that incorporates all change orders and modifications made during performance of the work. In addition to updated loop diagrams, interconnect diagrams and elementary diagrams, submit equipment and device wiring diagrams (see Sketch 40 60 00-4) and other drawings as necessary to depict the "as-built" condition of equipment. Include all installed field and panel conduit and piping/tubing runs and routing, tray systems, supports, mounting details, interconnection diagrams with cable, wire, tube and termination numbers. Coordinate all drawings with the conductor identification requirements in Section 26 05 19 and Section 26 05 20. Submit a copy of CAD produced drawings on magnetic media in AutoCAD DWG format.
- Operation and Maintenance Manuals: Furnish Operation and Maintenance E. Manuals, including Instruction Manuals and Part Lists, for equipment provided under Division 17 as required by Division 1. Obtain data from manufacturers, and format and bind as specified. Obtain distribution method instructions from the Owner or his representative.
  - Schedule: Deliver at least two (2) copies of manuals in 3-ring binders (8-1/2 1. by 11-inch format) not later than the equipment shipment date.
  - 2. Contents: Include in manuals not less than the following information, as applicable, for each instrument, equipment, subsystem and/or control loop:
    - а General, introduction and overall description, purpose, functions, simplified theory of operations, etc.
    - Specifications (including equipment specification data sheet as b. described above under Shop Drawings), sufficiently detailed for reordering exact duplicates of the original items.
    - Installation instructions, procedures, sequences, tolerances, and C. precautions.
    - Operational procedures. d.
    - Shutdown procedures. e.
    - Maintenance, calibration, and repair instructions. f.
    - Parts list and spare parts recommendations. g.
    - h. Calibration curves, rating tables, and any other data showing the relationship of the variable inputs and the calibrated output of all measuring devices and controlled equipment.
    - i. Software programs (PLC Ladder Logic, BASIC, or Source Code).
    - Computer screens (DWG.PIC). j.
  - 3. Format:
    - Use drawings and pictorials to illustrate the text to the extent necessary a. to insure a clear, concise presentation. If manuals have been written to cover a family of similar instruments or equipment, strike out inapplicable information in a neat fashion or emphasize applicable portion by heavily weighted arrows, circles or boxes; whichever provides the clearest and neatest presentation.
    - Group manuals by system control panels, including field instrumentation b. connected or associated with the panel. Where identical instruments are used in more than one control loop or subsystem, include only one instruction manual, per panel grouping; however, an index by tag number for all instruments shall identify its location in that manual.
    - Provide control loop and/or subsystem operational descriptions to C. identify the function of each instrument and its relation to the other instruments in the loop.
  - 4. Binding: Bind each manual in a cover which indicates the panel or process area to which it applies, manufacturer's name, local address and telephone

Hoodland Chemical Improvements	40 60 00 -	Instrumentation and controls,
Job No. 2376011*00	4	General Requirements
© 2024 Kennedy/Jenks Consultants		•

number, and year of purchase. Punch and bind manuals in standard three ring binders and include system name and subcontractor's name on binding.

- F. Accessory and Maintenance Materials: Submit data for the following items:
  - 1. Special Tools and Accessories: Special tools, instruments, and accessories for maintaining instruments and equipment requiring periodic repair and adjustment as specified elsewhere herein. Also, furnish special lifting and handling devices for equipment requiring such devices.
  - 2. Maintenance Materials and Spare Parts: Submit a list of manufacturer recommended spare parts for each item specified. Refer to other sections of these Specifications.
- G. Test Reports: Submit the following test reports as described herein:
  - 1. Instrument Calibration Data Sheets (para. 2.13)
  - 2. Factory Testing of Control Panels (para. 2.14)
  - 3. Instrument Verification Report (para. 3.08.B)
  - 4. Final Operational Testing (para. 3.08.C)
- H. Demonstration and Final Operation Test Plan and Results: Submit a document that outlines all procedures to be used in final operational testing of instrument and control systems. Include a description of each system, the scope of testing, test methods and materials, testing instruments and recorders, a list of functional parameters to be recorded on each item, and Shop Drawings showing temporary bypasses, jumpers, and devices.

#### 1.06 QUALITY ASSURANCE

A. Standard of Quality: The Contractor shall provide equipment of the types and sizes specified which has been demonstrated to operate successfully. Provide equipment which is new and of recent proven design.

#### 1.07 INSPECTIONS

- A. The Engineer may inspect the fabricated equipment at the factory before shipment to job site. Provide the Engineer with sufficient prior notice so that an inspection can be arranged at the factory.
- B. Inspection of the equipment at the factory by the Engineer will be made after the manufacturer has performed satisfactory checks, adjustments, tests and operations.
- C. Favorable review of the equipment at the factory only allows the manufacturer to ship the equipment to the project site. The Contractor shall be responsible for the proper installation and satisfactory startup operation of the equipment to the satisfaction of the manufacturer and the Engineer.

#### 1.08 DRAWINGS

- A. Drawings: The Instrumentation Drawings are diagrammatic; exact locations of instrumentation products shall be determined in the field by the Engineer. Except where special details are used to illustrate the method of installation of a particular piece or type of equipment or material, the requirements or descriptions in this Specification shall take precedence in the event of conflict.
  - 1. Locations of equipment, inserts, anchors, motors, panels, pull boxes, manholes, conduits, stub-ups, fittings, power and convenience outlets, and

40 60 00 - 5

ground wells are approximate unless dimensioned; verify locations with the Engineer prior to installation. Field verify scaled dimensions on Drawings.

- 2. Review the Drawings and Specification Divisions of other trades and perform the instrumentation work that will be required for the installations.
- 3. Should there be a need to deviate from the Instrumentation Drawings and Specifications, submit written details and reasons for all changes to the Engineer for favorable review.
- 4. Resolution of varying interpretations of the Contract Documents shall conform to Division 0, General and Supplementary Conditions.
- 5. The Drawings provide details of installation and supersede the manufacturer's recommendation where a conflict exists.

## 1.09 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Box, crate, or otherwise enclose and protect instruments and equipment during shipment, handling, and storage. Keep all equipment dry and covered from exposure to weather, moisture, corrosive liquids and gases or any element that could degrade the equipment. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Notify the Engineer in writing in the event that any equipment or material is damaged. Obtain prior favorable review by the Engineer before making repairs to damaged products.

Type	Loop	Description	1/0	Signal	Range Calib. Range	P&ID Elem Dia Detail	Spec.	PNI
Type	INO.	Description	1/0	Signal	Setpoint	Detail	Fala.	FINL
FE/FI T	101	Sodium Bisulfite with carrier water Flow	AI	4-20mA	0-10 gpm	I-101	46 30 00	Vendor Supplied Panel
FE/FI T	102	Carrier Water Flow	AI	4-20mA	0-10 gpm	I-101	46 30 00	Vendor Supplied Panel
PSH	101	Pressure Switch	DI	DISCRET E	0-100 PSI	I-101	46 30 00	Vendor Supplied Panel
PSH	102	Pressure Switch	DI	DISCRET E	0-100 PSI	l-101	46 30 00	Vendor Supplied Panel
LE/LI T	101	Sodium Bisulfite Tank No. 1 Level	AI	4-20MA		I-101	40 72 00	Remote I/O Rack
LE/LI T	102	Sodium Bisulfite Tank No. 2 Level	AI	4-20MA		I-101	40 72 00	Remote I/O Rack
AE/AI T	101	Sodium Dioxide Analyzer	AI	Discrete		I-102	40 91 10	Remote I/O Rack

#### 1.10 INSTRUMENT SCHEDULE

## PART 2 - PRODUCTS

## 2.01 MATERIALS AND STANDARD SPECIFICATIONS

A. Provide instruments, equipment and materials suitable for service conditions and meeting standard specifications such as ANSI, ASTM, ISA, and SAMA. The intent of this Specification is to secure instruments and equipment of a uniform quality and manufacture throughout the plant. All instruments in the plant of the same type shall be made by the same manufacturer.

#### 2.02 NAMEPLATES

- A. For each piece of equipment, provide a manufacturer's nameplate showing his name, location, the pertinent ratings and the model designation.
- B. Identify each piece of equipment and related controls with a rigid laminated engraved phenolic nameplate. Engrave nameplates with the inscriptions indicated on the Drawings and, if not so indicated, with the equipment name. Securely fasten nameplates in place using two stainless steel screws or, where favorably reviewed by the Engineer, with epoxy cement. Where no inscription is indicated on the Drawings, furnish nameplates with an appropriate inscription furnished by the Engineer upon prior request by the Contractor.
- C. Each control device, including pushbuttons, control switches, and indicating lights, shall have an integral legend plate or nameplate indicating the device function. These shall be inscribed as indicated on the Drawings or as favorably reviewed by the Engineer.
- D. Provide CAUTION or SAFETY nameplates to alert operators of special conditions that may result in faulty equipment operations. Devices containing batteries that must be replaced periodically must be clearly identified. Nameplates are not required if the device senses and displays a low battery warning.

#### 2.03 NAME TAGS

- A. All instrumentation and equipment items or systems shall be identified by name tags. Field equipment shall be tagged with the assigned instrumentation tag number listed in the Instrument Schedule.
- B. Name tags shall be stainless steel with engraved or stamped black characters of 3/16 inch minimum height. Tags shall be attached to equipment with a tag holder and stainless steel band with a worm screw clamping device. Use 20-gauge stainless steel wire where banding is impractical. For field panels or large equipment cases use stainless steel screws; however, such permanent attachment shall not be on an ordinarily replaceable part.

#### 2.04 FIELD-MOUNTED EQUIPMENT

A. All instrument and control equipment mounted outside of protective structures shall be equipped with suitable surge arresting devices to protect the equipment from damage due to electrical transients induced in the interconnecting lines from lightning discharges or nearby electrical devices. Protective devices used on 120 Vac inputs to field mounted equipment shall be secondary valve surge protectors conforming to the requirements of ANSI C62.1.

# 2.05 EQUIPMENT OPERATING CONDITIONS

- A. All equipment shall be rated for normal operating performance with varying operating conditions over the following minimum ranges:
  - Electrical Power: 120 Vac ±10%, 60 Hz, unregulated, except where specifically stated otherwise on the Drawings or in the Specifications, or when two-wire, loop-powered devices are specified.
  - 2. Field Instruments:
    - a. Outdoor Areas: Ambient Temperature: +15°F to +120°F Ambient Relative Humidity: 5% to 100% Weather: Rain, sleet, snow and ice
    - Indoor Unheated Areas: Ambient Temperature: +40°F to +120°F Ambient Relative Humidity: 5% to 95%, non-condensing
    - c. Indoor Environmentally Controlled Areas: Ambient Temperature: +60°F to +104°F Ambient Relative Humidity: 10% to 90%, non-condensing

# 2.06 EQUIPMENT LOCATIONS

A. Provide equipment and materials suitable for the types of locations in which they are located as defined under Division 16. All equipment specified for field mounting shall be weatherproof and splash proof as a minimum. If electrical or electronic components are contained within the equipment, they shall be housed in NEMA 3R gasketed cases, and NEMA 7 in hazardous locations unless noted otherwise on the Drawings.

# 2.07 ANALOG SIGNAL INDICATED UNITS

A. For all instruments with local or remote indicators, provide indicators scaled in actual engineering units, i.e., gallons per minute, feet, psi, etc., rather than 0 to 100%, unless noted otherwise on the Drawings or Instrument Schedule.

## 2.08 SIGNAL TRANSMISSION

- A. Analog:
  - 1. Signal transmission between electric or electronic instruments shall be 4 20 mA and shall operate at 24 Vdc. Signal output from all transmitters and controllers shall be current regulated and shall not be affected by changes in load resistance within the unit's rating. Where practical, milliampere signals from the field shall be converted to a voltage signal at the external terminals of each panel, and all instruments within a panel shall be parallel wired.
  - 2. Nonstandard transmission systems such as impulse duration, pulse rate, and voltage regulated will not be permitted except where specifically noted in the Instrument Schedule or shown on the Drawings. When transmitters with nonstandard outputs do occur, their output shall be converted to 4 20 mA prior to transmission.
- B. Discrete: All alarm and status signals shall be 24 Vdc unless specified otherwise on the Instrument Schedule. Proprietary data highway or serial bit transmissions such as RS232C shall be allowed to the extent shown on the Drawings.

## 2.09 PANEL/RACK/ENCLOSURE BAY POWER SUPPLIES

- A. Provide each main rack and/or enclosure bay with a separate isolation transformer to prevent ground loops between the instrument and electrical power grounds. These transformers may be nonshielded control power type.
- B. For each two-wire transmitter, provide a 24 Vdc regulated 50 mA power supply with 120 Vac input. Output voltage may be 24 Vdc ±5% manufacturing tolerance at no load, but shall hold within 1% from no load to full load at 120 Vac ± 10% input. Line to-load regulation shall be within 0.1% from no-load to full load. Ripple shall be less than 15 mV peak-to-peak.
- C. Manufacturer: Provide Model AP9046 instrument loop power supply as manufactured by Action Instruments with plug-in mounting base, equivalent capacity Lambda power supply with terminal blocks for external connections, or equal.

## 2.10 PAINTING

A. Factory paint all instruments and equipment except where installed in pipelines. Where instrument panels are installed adjacent to electrical control panels provided under Division 16, provide instrument panels of identical color to that of electrical control panels. Paint as required in Division 9 for structural supports, brackets, etc. Repair damaged factory paint to satisfaction of the Engineer. Feathering, priming and painting shall produce a reasonable match to the surrounding paint work.

#### 2.11 FASTENERS

A. Fasteners for securing equipment to walls, floors and the like shall be either hot-dip galvanized after fabrication or stainless steel. Provide stainless steel fasteners in corrosive locations. When fastening to existing walls, floors, and the like, provide capsule anchors, not expansion shields. Size capsule anchors to meet load requirements. Minimum size capsule anchor bolt is 3/8 inch.

#### 2.12 INSTRUMENT CALIBRATION

- A. Each field instrument shall be calibrated at 0%, 25%, 50%, 75% and 100% of span using test instruments to simulate inputs and read outputs that are rated to an accuracy of at least 5 times greater than the specified accuracy of the instrument being calibrated. Such test instruments have accuracies traceable to the National Institute of Standards and Technology (NIST).
- B. Submit a written report to the Engineer on each instrument. This report shall include a laboratory calibration sheet or the manufacturer's standards calibration sheet on each instrument and calibration reading as finally adjusted within tolerances.
- C. The Contractor may, at his option, choose to perform calibration on an instrument by acquiring the services of an independent test lab, or by obtaining the required test instruments and performing the calibration.

## 2.13 FACTORY TESTING OF CONTROL PANELS

A. All fabricated equipment shall be tested before it leaves the factory. At the factory verify wiring continuity and equipment operation by simulating input and output.

- B. Factory testing of control panels/devices/equipment shall be accomplished. Refer to individual Specification sections for tests requiring favorable review.
- C. Upon completion of factory testing, submit a report certifying the control panels/devices/equipment are operable and meet the Specifications.

## PART 3 - EXECUTION

## 3.01 MOUNTINGS

- A. Mount and install equipment as indicated. Mount field instruments on pipe mounts or other similar means in accordance with suppliers' recommendation. Where mounted in control panels, mount according to requirements of that section.
- B. Equipment specified for field mounting shall be suitable for direct pipe mounting or surface mounting, surface-mounted indicators and equipment with calibration adjustments or requiring periodic inspection shall be mounted not lower than 3 feet 6 inches nor higher than 6 feet above walkways, platforms, catwalks, and the like.
- C. Note that applicable specifications require detail drawings showing seismic sway bracing design and anchorage requirements for their equipment. Seismic zone requirements are specified in Division 1.
- D. All devices shall be accessible to operators for servicing, operating, reading, etc. Provide permanent platforms to assure devices are continuously accessible.

#### 3.02 PROCESS CONNECTIONS

- A. Provide instrument impulse tubing (see Part 2) to meet the intended process service and ambient environmental condition for corrosion resistance, etc. Install impulse tubing with a continuous slope according to service to promote self-draining or venting back to the process. Terminate connection to process lines or vessels in a service rated roof valve, provided under other Divisions, that will permit closing off the impulse line or removal of the element without requiring shut down of the process. Include blowdown of drip legs and valves for terminations of impulse lines at the instruments.
- B. Process vessels, line penetrations, and root valves shall be furnished and installed under other Divisions of these Specifications. Instrument tubing and valve manifolds are installed as part of this Specification.

## 3.03 FIELD WIRING

A. Ring out signal wiring prior to termination and perform surge withstand tests where required (see Section 26 05 00, Part 3 for methods). Verify wire number and terminations are satisfactory as designated on the Loop and Interconnect Diagrams. Verify all terminations are tight and shields are uniformly grounded at one location.

#### 3.04 ELECTROMAGNETIC INTERFERENCE (EMI)

- A. Construction shall proceed in a manner which minimizes the introduction of noise (RFI/EMI) into the I&C System.
- B. Cross signal wires and wires carrying ac power or control signals at right angles.

C. Separate signal wires from wires carrying ac power or switched ac/dc control signals within control panels, terminal cabinets, telemetry equipment, multiplexer cabinets, and data loggers as much as possible. Provide the following minimum separations within such equipment unless indicated otherwise on the Drawings:

Power Wiring Capacity	Separation (Inches)			
120 volts ac or 10 amps	12			
240 volts ac or 50 amps	18			
480 volts ac or 200 amps	24			
4.160 volts ac or 800 amps	48			

## 3.05 SIGNAL GROUNDING

- A. A single-point grounding system for instrument signals is required for all instrument panels. This instrument single point grounding system does not use building steel or conduit systems for its ground path.
  - 1. Ground all signal shields, signal grounds, and power supplies at an isolated signal bus within each instrument panel, rack, or enclosure. See Section 40 67 00 for isolated bus requirements. The shields at the far ends of these signal cables must be disconnected (floated) from any ground to prevent ground loops.
  - 2. Do not connect the rack or enclosure frames to the signal grounding buses.
  - 3. Connect each isolated signal ground bus within each panel using a stranded, insulated copper wire of size 6 AWG or larger directly to a system ground rod installed per the Drawings.

## 3.06 PREPARATION

- A. Ensure that installation areas are clean and that concrete or masonry operations are completed prior to installing instruments and equipment. Maintain the areas in a broom-clean condition during installation operations.
- B. Panels shall be protected during construction to prevent damage to front panel devices and prevent dust accumulation in the intervals. Other protective measures (lamp, strip heaters, etc.) shall be included as weather conditions dictate.

#### 3.07 FIELD TESTING

- A. General: The purpose of the field testing is to verify instruments are calibrated and operationally performing their intended function. Provide the services of factory trained and experienced engineers to perform verification and operational testing as prescribed below. Since the initial calibration of instruments may not satisfy the final operation of system, perform recalibration or adjust setpoints as required to satisfy the performance requirements of the system. Notify the Engineer and Owner in writing a minimum of 48 hours prior to the proposed date for commencing final operational testing and acceptance.
- B. System Verification Testing: Verify that each instrument shown on the Instrument Schedule is operating and calibrated as specified in the Instrument Schedule by simulating inputs at the primary element in each system loop and verify performance at loop output devices (i.e. recorder, indicator, alarm, etc., except controllers). Simulate inputs at 0%, 25%, 50%, 75%, and 100% of span or with onoff inputs, as applicable. During system verification:

- 1. Make initial or provisional settings on levels, alarms, etc. listed in the Instrument Schedule.
- 2. Verify controllers by observing that the final control element moves in the proper direction to correct the process variable as compared to the set point.
- 3. Cause malfunctions to sound alarms or switch to standby to check system operation.
- 4. Check all loop instruments thoroughly for correct operation.
- 5. Immediately correct all defects and malfunctions disclosed by tests.
- 6. Submit a report certifying completion of verification of each instrument system. This report shall include a data sheet on each instrument tested that indicates instrument tolerances, instrument calibration verification, data and initial settings made to devices.
- C. Final Operational Testing: Upon completion of instrument verification, test all systems under process conditions in the presence of the Owner or designated representative. The test for each portion thereof shall be witnessed, documented and signed off upon completion by the Engineer. The intent of this test is to demonstrate and certify the operational interrelationship of plant instrumentation and control systems. This testing shall include, but not be limited to:
  - 1. Making final adjustments to levels, alarms, etc.
  - 2. Optimum tuning of controllers.
  - 3. Checking all alarms, failure interlocks, and operational interlocks.
  - 4. Verifying all computer input and outputs and CRT displays are fully functional.
  - 5. Verifying automatic computer-generated reports are performing satisfactorily.
  - 6. Immediately correcting all defects and malfunctions and retesting.
  - 7. Submit the witnessed test results and a transmittal letter indicating that all required systems have been tested satisfactorily and the systems meet all the functional requirements of their applicable specifications.

# 3.08 INSTRUCTION OF OWNER'S PERSONNEL

A. Provide the services of a factory trained and field experienced instrumentation engineer to conduct group training of up to five of the Owner's designated personnel in the operation of each instrument system. This training shall be for the time period of five working days and shall be performed during the operational testing period. Include instruction covering basic system theory, operating principles and adjustments, routine maintenance and repair, and "hands on" operation. The text for this training shall be the Operation and Maintenance Manuals furnished under these Specifications.

# END OF SECTION

#### SECTION 40 61 96

#### CONTROL STRATEGIES

#### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. <u>Section Includes:</u> Work under this section includes control strategies for new equipment and modifications to existing plant control strategies. The control strategies shall direct the contractor and the control system integrator (CSI) with regard to all plant operations involving hardwired systems, PLC-based control strategies, Human Machine Interface (HMI) control strategies and SCADA system or alternative architectures such as Distributed Control Systems (DCS) control strategies. These systems shall be referred to collectively as the Process Control System (PCS).
- B. The District will provide SCADA control programming on their existing control platform. Contractor is responsible for all controls and programming for vendor supplied packaged metering system. The system shall tie into the new remote I/O panel and provide the functionality of the system described by the Contract Documents. Where there is reference to the Control System Integrator in this specification it is in reference to the Contractor's equipment scope of supply. The CSI is not responsible for development of SCADA screens or plant programming on the Owner's operating platform.
- C. <u>Related Sections:</u> All provisions of this Section shall apply to the Contract Documents including the following Sections:
  - 1. Section 40 60 00 GENERAL REQUIREMENTS, INSTRUMENTATION.
  - 2. Section 40 63 00 PROGRAMMABLE LOGIC CONTROLLERS

## 1.02 QUALITY ASSURANCE

- A. <u>Performance and Design Requirements</u>: The Control System Integrator (CSI) shall provide a complete and comprehensive integrated control system hardware and software package for Vendor supplied packaged pump system. This may include database system programming, Wide and Local Area (WAN/LAN) interface configuration, System Security, PLC programming, and VFD control and monitoring software, shall be provided complete, ready for use and operational by the System Integrator. The System Integrator shall have demonstrated performing and commissioning five similar projects in the past 5 years providing integrated software for the specific hardware platform described in specification 40 63 00 PLCs, or alternative platform as specified.
- B. <u>Codes and Standards:</u> Unless specifically noted, the following organizations may be quoted in this specification and are listed here for reference:
  - 1. IEEE Institute of Electrical and Electronic Engineers.
  - 2. ISA Instrument Society of America.
  - 3. JIC Joint Industrial Council.
  - 4. NEMA National Electrical Manufacturers Association.
  - 5. OSHA Occupational Safety and Health Administration.
  - 6. SAMA Scientific Apparatus Makers Association.

**Control Strategies** 

- 7. UL Underwriters' Laboratories, Inc.
- 8. NEMA ICS 1-1993 General Standards for Industrial Control and Systems.
- 9. NEMA ICS 1.1-1984 Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control.
- 10. NEMA/EIA 232-D-1986 Interface Between Data Terminal Equipment and Data Communications Equipment Employing Serial Binary Data Interchange
- 11. WEF Automation of Wastewater Treatment Facilities MOP 21, current edition.
- 1.03 CONTROL SYSTEM ARCHITECTURE
- A. The PCS may consist of:
  - 1. A PLC system, which may consist of:
  - a. PLC CPU units
  - b. Remote Input/Output (RIO) racks
  - c. A network, usually Ethernet, with all switches, fiber converters, and other appurtenances.
  - 2. A proprietary controller (e.g. a configurable pump system controller such as Xylem Multismart), which may be interfaced to some of the units listed for use with PLC systems using an open communication protocol stack such as Modbus. This may be used in conjunction with a network of SCADA and/or operator interface panels as described under PLC Systems above.
  - 3. The primary process control network shall be of one protocol stack, Ethernet/IP. Auxiliary networks may also be integrated into the system if necessary. CSI shall provide all hardware and protocol conversions to make all data appear and interoperate on the primary network. No devices shall be connected to this network other than process control equipment, and this network shall not be connected to any other networks with connections to the internet without a firewall device approved by the owner's IT department. If a vendor requires remote support capability, it shall be achieved through a separate ad-hoc connection point, which shall be approved for use in the facility by the owner's IT department.
  - 4. The process control system architecture is shown in P&I diagrams in the I sheets. The upper portion of the P&ID will have a number of bands representing different controllers, HMI elements, and data collection systems. In addition, vendor control panels are shown below, in the field equipment area, as standalone boxes, but will generally contain a PLC or other intelligent networkable control engine. This defines the list of, and organization of the control elements in the system.
  - The control functionality is executed by one or more control devices, usually PLCs. They may connect directly to I/O or may be connected via one or more remote I/O (RIO) units.
  - 6. Packaged systems that will have their own PLC based controls will be provided by the various Packaged System Suppliers and require control and feedback/monitoring from the Plant SCADA System. The CSI will be responsible for coordination with the

Package System Suppliers to make sure that the proper data transfers take place between the various Package Systems and the Plant SCADA System, and any required lateral communication with other controllers. The package vendors and the CSI are jointly responsible for cooperation and coordination with each other and shall exchange data address tables and other required information to be coordinated.

Proprietary source code in vendor control devices is discouraged and does not relieve the vendor from responsibility to furnish to the CSI necessary documentation for monitoring and providing necessary input to the vendor control system so that the CSI can fulfill the integration requirements. Package systems which cannot meet this requirement shall not be accepted.

- 7. Plant personnel shall operate and monitor these various processes with a SCADA and/or HMI system. The system may consist of:
  - a. A single SCADA station with one or more video monitors
  - b. A client/server system comprising a SCADA server and multiple clients. These clients may be full desktop computers, local panel-mounted PC, or portable tablet device.
  - c. A stand-alone (generally field mounted) HMI device.
- 8. In general, the display screens and screen structure shall be the same for all devices in a client-server system. All devices will have access to all screens configured in the server.
- B. The CSI shall apply the information presented on the Process and Instrumentation Diagrams (P&ID) to the various components in the PCS. Control functions beyond what are shown on the P&IDs are described below and in PART 2 – CONTROL STRATEGIES.
- C. Interpret the P&IDs according to the instrumentation legend and ISA standard S5.1, 2009. Extensions to S5.1 which are generally recognized in the water and wastewater industries include presentation at the top to distinguish between SCADA, PLC, and local control panels, or the analogous subsystems in alternate architectures, such as DCS, and are broadly described in WEF MOP 21. These shall be binding on the scope of work for the CSI. The owner may have additional stipulations for P&ID standards, and how to interpret them, which will be shown in the I sheet legends and optionally in additional standards documents. Interpret ISA symbology as follows:
  - 1. PLC:
    - a. In general, the P&IDs present data flow paths, and not detailed logic or sequence descriptions, which are described below in PART 2 CONTROL STRATEGIES.
    - b. Hardware will be shown using I/O triangles as defined in the instrumentation legend sheet. These are analog in and out, and digital in and out. Develop I/O list with the correct module type and points count from these and include with shop drawing submittal. Default signal levels are 24VDC in and out for digital and 4-20 mA DC for analog. If a special signal level is required, (e.g. RTD input), account for those points on special modules, but these are still shown as one of the four basic types (DI, DO,

AI, or AO).

- c. PLC connections to other PLCs and SCADA via network are shown as ISA data linetypes. These can indicate one or several signals. This will not show the complete network architecture, which is shown on a separate network diagram.
- 2. HMI Functions:
  - a. SCADA Screen Display: The SCADA system shall utilize a screen display arrangement that consists of two parts. The first part shall consist of an overview screen containing an overall summary of all of the equipment in the process area and related utility equipment. The overview not only displays summary data for that particular area, but each individual piece of equipment shall have an active area which will link to the detailed page in the screen hierarchy. On large systems, a three-level hierarchy may be required. The system shall provide personnel with the following control functions:
    - 1) Top level summary information on the overall plant operation,
    - 2) Links to subsidiary pages
    - 3) Links to auxiliary functions, such as alarm summary, alarm history, and historical trend pages
  - b. Detailed subsidiary pages are of similar format to the overview but will contain more detail and control functions. They may also contain faceplates for common collections of indications and controls for common equipment.
  - c. Additional non-process screens may be developed for utility functions not associated with a particular process, such as standby generators, power monitors, etc.
  - d. In a three-tiered system, intermediate level screens will contain links to lower level screens, in addition to other relevant links.
  - e. All screens shall have links to auxiliary SCADA functions:
    - 1) Alarm summary (alarms currently in alarm, and acknowledgment status)
    - 2) Alarm History (list of alarm events, including time of clearing, from present into indefinite past)
    - 3) Event history (list of non-alarm events, from present into indefinite past)
    - 4) Historical trending and logging application
    - 5) Others as dictated by the application
- 3. Smart Devices:
  - a. Devices can connect directly to PLCs or SCADA via network connections. In these cases, I/O triangles will not be shown, but direct device-to-PLC data lines will be shown. For PLC to PLC connections, the data to be shared will be described in PART 2 CONTROL STRATEGIES.
- 4. Field instruments
  - a. Interpret per ISA S5.1 2009 and the instrumentation legend. Signals will generally connect to the PCS via an I/O triangle. If connected by data linetype, they are Smart Devices as addressed in item 4. If there is no I/O triangle, they are hardwired to an unintelligent device such as a motor starter.

- 1.04 Provide at least two user login levels for all SCADA and HMI screens; operator and supervisor. All control actions listed below are presumed to be globally adjustable by any login, unless specifically restricted to supervisor (or another higher level). System parameters shall be presumed to be restricted to supervisor login. Supervisor login parameters include, but are not limited to:
  - a. Time delay setpoints
  - b. PID tuning parameters
  - c. Alarm and action point setpoints
  - d. Totalizer reset
- 1.05 Standard control blocks for various types are described below. These shall define the PLC logic and HMI faceplates for device level control and used interface. Additional points and functions may be shown on the P&I diagram, but these are minimum requirements unless specifically stated otherwise on the P&I diagrams, or in Part 2. Higher level control functions are described in Part 2, and cause control action through these blocks. Part 2 may also supplement or replace these standard blocks.
  - 1. Metering Pumps
    - a. The apparatus for different types of metering pumps can be very different, and broadly consists of 2 types; the rotating type used with piston and peristaltic pumps and the solenoid type used with diaphragm pumps. While the word "speed" isn't strictly applicable to solenoid driven pumps, it will be used here to refer to stroke frequency. Also, even with rotating pumps, the VFD is often built in, and not a separate piece of equipment. This will treat all such pumps as if the speed control and local operator interface are built into the unit.
    - b. Display the following in a faceplate for the pump:
      - 1) Speed
      - 2) Run status
      - 3) Run time
      - 4) Local switch in Remote or Auto
    - c. Alarm the following
      - 1) Fail alarm
    - d. Local settings
      - 1) The pump has a switching capability which effectively provides the ability to switch between local and remote. This is inherent in the pump, and the CSI only needs to furnish a digital signal for start/stop in Remote, and an analog signal for speed in Remote.
    - e. HMI Local settings
      - 1) At the HMI, there is a soft Local/Remote switch which instructs the PCS to select between the automatic control specified in Part 2 in Remote, and soft HMI buttons that instruct the pump to start or stop, and an adjustment to adjust the speed when set to Local.

- B. Vendor packages
  - 1. Cooperate with the package system vendors to create SCADA/HMI displays for the equipment in the scope of their package. To the greatest extent practical, unless specifically instructed otherwise in Part 2, duplicate any screens furnished on their local HMI devices on the SCADA system.
- C. Instruments:
  - 1. General:
    - a. Display measurement with assigned units
    - b. Alarm as shown on P&I diagrams
    - c. Historically log all data according to owner logging/trending policy
  - 2. Flow measurement
    - a. Totalize flow when shown on the P&ID.
- D. Switches
  - 1. Log change of state of all switch driven input points except ones that go on and off frequently and regularly.
- 1.06 COMMUNICATION MONITORING
- A. Any communication failures between either of the SCADA Server computers and the various PLCs shall be logged as SCADA Alarms. Provide watchdog timers or other pinging logic in control devices to assure that communication failures are detected and alarmed in a timely fashion, regardless of whether the control device itself is functioning.

PART 2 - CONTROL STRATEGIES

2.01 INDIVIDUAL CONTROL STRATEGIES

## SODIUM BISULFITE

#### PROCESS DESCRIPTION

The Sodium Bisulfite (NaHSO₃) system is used to feed bisulfite to the downstream end of the chlorine contact basin for dechlorination of treated effluent prior to discharge to the outfall. The system consists of two storage tanks, two metering pumps and associated valves/piping/instruments, and carrier water. Processes associated with the bisulfite system are controlled from a control panel in the operations room. Information is routed from the new remote I/O panel to the operations room control panel.

The Bisulfite tank is manually filled by operations staff via the compressed air chemical barrel pump. The dosing pumps are automatically controlled via the plant control system based on operator inputs.

Hoodland Chemical Improvements Job No. 2376011*00 © 2024 Kennedy/Jenks Consultants Chomskice-pwid030147840 61 96-Control_Strategies.docx

## EQUIPMENT

- T-101 (Sodium Bisulfite Tank No 1)
- T-102 (Sodium Bisulfite Tank No 2)
- LE/LIT-101 (Sodium Bisulfite Tank No 1 Level)
- LE/LIT-102 (Sodium Bisulfite Tank No 2 Level)
- PI-101 (Sodium Bisulfite Pump No 1 Discharge Pressure Gauge)
- PSH-101 (Sodium Bisulfite Pump No 1 Discharge Pressure Switch High)
- PI-102 (Sodium Bisulfite Pump No 2 Discharge Pressure Gauge)
- PSH-102 (Sodium Bisulfite Pump No 2 Discharge Pressure Switch High)
- FE/FIT-101 (Sodium Bisulfite Discharge Flow)
- FE/FIT-102 (Carrier Water Discharge Flow)
- PIT-201 (existing carrier water pressure)
- GE/GIT-101 (Sulfur Dioxide Gas Sensor)

# SODIUM BISULFITE DOSING PUMPS

The sodium bisulfite dosing pumps are existing and the control of these pumps will be migrated from the existing control panel to the new control panel. The control programing will also be migrated to the new PLC.

# SODIUM BISULFITE DELIVERY AND STORAGE

Liquid level in the bisulfite tank is measured by an ultrasonic type level sensor with transmitter. Since the tank is manually filled, there is no automated filling procedure. The tanks are opaque and provides a visual check of the level in each tank.

High and low level alarms for each storage tank is generated by the SCADA system in response to input from the analog level transmitter. High and low level alarms will be displayed on the plant HMI system to alert operators that it is time to refill the tank.

## ALARMS

- 1. Sodium Bisulfite Tank No 1 Level Transmitter LOW, HIGH
- 2. Sodium Bisulfite Pump No 1 FAIL
- 3. Sodium Bisulfite Pump No 2 FAIL
- 4. Sulfur Dioxide Gas Sensor HIGH

## ** END OF SECTION **

# THIS PAGE INTENTIONALLY BLANK

# SECTION 40 63 00

## PROGRAMMABLE LOGIC CONTROLLER

## PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Programmable Logic Controller (PLC) and Operator Interface (OI) Hardware and Development Software.
- B. Provisions: Requirements of Division 1 and Section 40 60 00 form a part of this Section.

#### 1.02 REFERENCE STANDARDS

- A. National Electrical Manufacturer's Association (NEMA):
  - 1. ICS 61131 Programmable Controllers

#### 1.03 SUBMITTALS

- A. The following items shall be submitted in this Section as one package under the Product Review category of Shop Drawings.
  - 1. Catalog cuts for the central processing unit, input modules, output modules, communication and interface modules
  - 2. A layout drawing of the PLC enclosure showing module type and slot location.
  - 3. Calculations showing power supply requirements and memory requirements are met.
  - 4. Calculations showing sufficient I/O modules as determined by the P&ID drawings, including total points, and 25% spare points of each I/O type.
  - 5. Software documentation to include fully-annotated, line-by-line listings. Note: Diagram descriptions must contain Instrument tag number description.
  - 6. Setpoint listing with descriptions.
  - 7. Documentation to confirm that the spare memory requirement is complied with.
  - 8. Parts list with current net prices and a list of recommended and provided spares.
- B. Startup, operation, and maintenance procedures.
- C. Factory Acceptance Test procedure.
- D. Factory Acceptance Test results.
- E. Site Acceptance Test procedure.
- F. Site Acceptance Test results.

#### 1.04 QUALITY ASSURANCE

- A. Provide programmable logic controllers (PLCs) which comply with NEMA Standard ICS 61131-1. This standard applies to the construction, programming, performance, test, installation, protection, and safety of PLCs.
- B. PLC components shall be new and free from defects, manufactured by a single supplier.

- 1. Where PLC manufacturer modules are not suitable or available, obtain preapproval from the Engineer before using third-party modules.
- C. All racks, cables, connectors, taps, hardware, etc. used for the installation shall be PLC manufacturer approved components.

## PART 2 - PRODUCTS

## 2.01 GENERAL

- A. Furnish, install, program, configure, test, and place the PLCs into satisfactory operation as required by the Drawings and Specifications.
- B. Provide all necessary cables. All cables and connectors shall be as specified by the manufacturer. Manufacturer-specific cables shall be assembled and installed per the manufacturer recommendations.
- C. Provide PLC equipment with the required memory and functional capacity to perform the specified sequence of operation with the input and output points as listed in the PLC Input/Output List and as shown on the Drawings.
  - 1. PLC systems shall include processor, power supply, input / output modules and communication modules, as required to meet system requirements.
  - 2. Furnish products listed or registered by UL, CSA, or FM approval as suitable for purpose specified and indicated.
  - 3. The PLCs shall communicate between operator workstations and fieldmounted transducers, switches, controllers, and process actuators. Communications protocol shall be completely transparent to process operations at the HMI.
  - 4. The PLC shall be capable of stand-alone operation in the event of failure of the communication link to the HMI subsystem.
- D. Interfacing Relays, Instruments, and Switches:
  - 1. Provide equipment as required for compliance with the functional requirements.
  - 2. Provide analog loop isolators where required to eliminate ground loops.
- E. PLC Enclosure:
  - 1. Each PLC shall be furnished completely assembled and wired on a removable back panel within an enclosure in accordance with Section 17510.
  - 2. Size the PLC to accommodate the future addition of 20% more I/O modules/cards. For PLCs which mount in a chassis or rack with a communications backplane, provide sufficient spare slots. For PLCs which expand by plugging in each successive module into the side of the previous module, or by other non-chassis based means, provide sufficient DIN rail space in the panel layout to accommodate future modules. When calculating spare slots/space round up to the nearest whole I/O module. For example, in a PLC with 7 total I/O cards, design for a future with 9 I/O cards.

## 2.02 PROGRAMMABLE LOGIC CONTROLLERS

- A. Manufacturer: Programmable Logic Controller equipment shall be manufactured by SIEMENS, no equal.
- B. Hardware: Provide each PLC with the following hardware.
  - 1. Provide a modular system to house the processor, power supply, and I/O modules. The selection of size of chassis and/or number of I/O modules to

accommodate all the I/O shown in the Drawings and these Specifications plus an additional 25% is the responsibility of the Contractor.

- 2. Processor: Provide a PLC central processor module with the following features:
  - a. Power: 120 VAC
  - b. Programming language support per IEC 61131 Part 3.
  - c. Floating point arithmetic
  - d. PID loop control
  - e. SD memory back –up
  - f. A watchdog timer which monitors CPU activity, and a relay output for watchdog timer alarm
  - g. Memory Enhancement: Sufficient program memory storage shall be provided such that a minimum of 50% spare program space remains after acceptance testing has been completed.
  - h. Ethernet Ports: Provide dual 10/100/1000-BaseT RJ45 Ethernet ports configurable for independent IP addresses.
- 3. Power Supply: Provide an 8 Amp (min) power supply module to power the processor and local I/O modules. Power supplies rating shall be sufficient to provide an additional 50% of the calculated load, including spare slots. Use average slot load values for spare loading estimates.
- 4. Communications Interface Modules: Provide communication modules as required to achieve the system architecture as shown on the Drawings. Modules shall be capable of the following communication protocols:
  - a. 10BASE-T/100BASE-TX Ethernet communication.
  - b. Ethernet I/P protocol.
- 5. Input and Output (I/O) Modules: Provide removable I/O modules or FlexIO series 5094 with detachable terminal strips so that I/O modules can be removed without disturbing field wiring terminations.
  - a. Coordinate the breaker <del>or fuse</del> size with the internal protection of the module such that the external circuit protection trips first.
  - b. Provide sufficient I/O capacity to accommodate points shown as future on the drawings and specs.
  - c. Provide spare inputs and outputs so that the spare requirements of this section are met. Calculate spares required after including shown future points in the total base I/O count.
  - d. Wire all I/O channels, including spares, to terminal blocks (except for digital outputs which shall be factory wired to the coils of their associated interposing relays).
  - e. Provide output isolation (interposing) SPDT Form C relays on all discrete output channels, including spares. To ease field wiring during panel installation and maintenance, the terminals of the relay's outgoing (field side) contact shall be factory wired to auxiliary terminal blocks of single high construction mounted adjacent to the interposing relays. Field wiring shall be terminated on the auxiliary terminal blocks. Only one pair of auxiliary terminal blocks must be provided for DO channels utilizing only either the NO or NC output contact. For DO channels which will use both the NO and NC output contacts, provide three auxiliary terminal blocks.
- 6. Analog input (AI) modules shall meet the following requirements:
  - a. 4 to 20 mAdc inputs, 250-ohm impedance maximum, 4-POINT configuration.
  - b. Individual Isolated inputs.

- c. Accuracy: +/ 0.1% of span.
- d. Resolution: +/ 0.05% of span.
- e. Common Mode Rejection of 90 dB at 60 Hz, minimum.
- f. Normal Mode Rejection of 45 dB at 60 Hz, minimum.
- g. Drift shall not exceed 0.25% within a 30 day period.
- h. 16-bit precision (min) analog-to-digital conversion
- 7. Discrete input (DI) modules shall meet the following requirements:
  - a. Wetting Voltage: 120 VAC. Power supply shall be current limited to conform with NEC Class 2 remote control and signal wiring circuits.
  - b. Provide filtering on a per unit point basis to provide contact bounce protection.
  - c. 8- or 16-input configuration with common ground terminals. High density 32-input modules will be evaluated at the time of submittal for application.
- 8. Discrete output (DO) modules shall meet the following requirements:
  - a. Output voltage shall be 120 VAC.
  - b. Triac outputs shall be allowed only with approval from the Engineer. Triac outputs shall be supplied with a suppression circuit for an inductive load.
  - c. Outputs shall be individually isolated.
  - d. Provide interposing relays for all discrete outputs as described above.
  - e. 8-output configuration. Outputs shall be optically-coupled. High density 32-output modules will be evaluated at the time of submittal for application.
- 9. Cables: Provide a full complement of manufacturer approved cables for connecting to terminals, interfaces, remote modules, programming ports, and other applicable external devices.
- C. Spare Parts: Provide the following spare parts.
  - 1. One input/output module for each type installed.
  - 2. One spare PLC processor card including memory for each unique processor installed.
  - 3. PLC input/output communication processor, if applicable.
  - 4. One PLC power supply.
  - 5. One loop power supply.
  - 6. One spare communication module for each type installed.
  - 7. One function keypad, if applicable.
  - 8. One backplane module of each type installed.
  - 9. Provide spares for each unique component installed.

#### 2.03 PROGRAMMABLE LOGIC CONTROLLERS SIEMENS SIMATIC

- PART 3 EXECUTION
- 3.01 SYSTEM CONFIGURATION
- 3.02 FACTORY ACCEPTANCE TEST
  - A. Prior to shipment of the PLC to the jobsite, perform a Witnessed Test. This test shall demonstrate full compliance of the PLC with contract requirements. The test shall be witnessed by the Engineer and the Owner or his designated representative.

- B. Prepare a detailed written witnessed test procedure to be submitted at least two weeks prior to start of the test. The test procedure shall describe testing methods and provide detailed specification of the input data and data sequences to be used in the test. If, in the opinion of the Engineer, a resubmission of the proposed test procedure is required, the date for the performance of this test shall be set at least six weeks following delivery of the resubmitted test procedure.
- C. Perform the witnessed test in accordance with the test procedure. Any deviation in performance from that specified in these Specifications shall be corrected prior to shipment. If the deviation in performance is deemed by the Engineer to be substantial and if it is not corrected within the period allowed for the test, then a second test shall be performed.
- D. Submit the results of the test in a formal document within two weeks following satisfactory performance of the test. The test results shall document all problems encountered in running the test, corrective action taken, and the detailed results of each phase of the test.

## 3.03 SITE ACCEPTANCE TEST

- A. After the PLC has been installed at the jobsite, a demonstration of compliance with all functional objectives shall be made under actual or simulated operating conditions, subject to favorable review by the Engineer.
- B. Prepare a detailed written witnessed test procedure to be submitted at least two weeks prior to start of the test. The test procedure shall describe testing methods and provide detailed specification of the input data and data sequences to be used in the test. If, in the opinion of the Engineer, a resubmission of the proposed test procedure is required, the date for the performance of this test shall be set at least six weeks following delivery of the resubmitted test procedure.
- C. Perform the witnessed test in accordance with the test procedure. Any deviation in performance from that specified in these Specifications shall be corrected prior to shipment. If the deviation in performance is deemed by the Engineer to be substantial and if it is not corrected within the period allowed for the test, and then a second test shall be performed.
- D. Submit the results of the test in a formal document within two weeks following satisfactory performance of the test. The test results shall document all problems encountered in running the test, corrective action taken, and the detailed results of each phase of the test.

## 3.04 TRAINING

- A. General: To familiarize the Owner's personnel with PLC operation, training shall be provided as detailed hereunder. The training course shall be conducted under the direction of a training director who shall design a detailed training plan that complements the experience and skill levels of the Owner's personnel. The training course shall be conducted at the treatment plant. The text for both training courses below shall be the O&M Manual and selected handouts. The Owner may videotape the training at the Owner's expense.
- B. PLC Operations Training: A minimum one-day course shall be provided for up to six persons. The level of training shall be sufficient to familiarize the personnel with the operation of the PLC and programming and program storage device. All essential system operating procedures shall be described as required to enable
Owner's personnel to observe the controller operation via the programming device displays.

- C. PLC Corrective Maintenance Training: A one day course shall be conducted for up to six persons on maintenance of modifications to the PLC. Instruction shall be given in the use of hardware diagnostic routines, test equipment and test procedures as required to enable the Owner's personnel to detect and isolate system faults to the circuit board or module level and to implement repairs by replacing failed circuit boards or modules. Step-by-step written procedures shall be provided for identifying hardware faults to the circuit board or module level for all items of digital equipment. All equipment corrective maintenance training activities shall be limited to the use of diagnostic routines with the aid of the programming device. If it is necessary to use special purpose test equipment which is only available from the equipment manufacturer, then such test equipment shall be provided as a part of the system and shall become the property of the Owner.
- D. Additional PLC Training: If requested by Owner, a portion of the field instrument training required in Section 17010 may be allocated toward a continuation of either training course above or covering a specific topic. The Owner and Contractor must agree to the training content prior to commencing any training.

# SECTION 40 72 00

# LEVEL MEASUREMENT

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Provisions: Requirements of Division 1 and Section 40 60 00 form a part of this Section.
- B. Work Included: Level measurement devices for process instrumentation, auxiliary equipment and supplies directly related to the installation of and operation of these level measurement devices, to perform the required functions in conjunction with information and equipment specified in other sections of Division 40. Refer to the Instrument List for a listing of required devices.

#### 1.02 SUBMITTALS

- A. Shop drawings to be submitted in this Section shall be made in one package under the Product Review Category of Shop Drawings.
- B. Shop Drawings: In addition to the requirements of Section 17010, shop drawings shall include for each type of instrument: supply voltage and frequency, electrical load, accuracy, description of operation, operating instructions, and calibration procedure.
- C. Installation Method: The proposed method of mounting sensors and instruments shall accompany all shop drawings.
- D. Parts List: Submit a Parts List with current net prices and a list of recommended spares.

### 1.03 QUALITY ASSURANCE

- A. Manufacturer: In addition to the requirements of General Requirements, level measurement devices furnished shall be manufactured by firms regularly and currently engaged in the design and manufacture of similar equipment. All equipment furnished shall be new and of current design.
- B. Maintainability: All equipment shall be designed for ease of maintenance and repair, and access to critical parts shall not require a major disassembly. Internal field adjustments where permitted or required herein shall be easily accessible upon removal of a panel or cover.
- C. Materials and Installation: Materials and installation shall comply with the requirements of the current editions of referenced electrical codes and standards, and the codes and standards referred to shall be used for establishing the minimum quality of the materials and equipment supplied and installed. All equipment of the same type shall be products of the same manufacturer. Capacities of all equipment shall not be less than that indicated on the Drawings or specified.

# PART 2 - PRODUCTS

# 2.01 LEVEL TRANSMITTER/ULTRASONIC TYPE SENSOR

- A. General: This type of level sensor shall use the following principle. An intense burst of sonic energy is directed toward a target surface of interface. The interface may be air-liquid, air-solid, liquid-solid, and also liquid-liquid if the densities of the two liquids are sufficiently different and provide a clearly definable interface. The return time of the reflected echo is measured and converted into an electrical signal proportional to the distance from the sensor to the interface, or alternatively the distance from another reference level, such as the tank bottom, when the sensor is top mounted.
- B. Specific Requirements:
  - 1. Specific applications indicators, switches, and other requirements shall be as shown on the Drawings. Level ranges, output signals and setpoints are specified in the Drawings.
  - 2. Integral keypad with menu navigation keys.
  - 3. Three output relays, 250V/5A rated dry-contacts.
  - 4. 160x240 pixel monochrome graphical dot-matrix display.
  - 5. NEMA 6P, 125kHz transducer with 5m cable
  - 6. 10° beam angle.
- C. Construction: The level sensing system shall consist of a sensing transducer and a separately mounted solid state electronic controller-converter housed in a NEMA 4X case.
- D. Mounting:
  - 1. The probe shall be flange mounted, and the transmitter shall be wall mounted. Probe installation shall be per manufacturers instructions.
  - 2. A sunscreen of sheet metal construction shall be provided for all transceivers mounted outdoors. The screen shall provide adequate ventilation, out of direct sunlight, and improve readability of digital indicators.
- E. Power: The system shall operate from 120 Vac, 60 Hertz fused power supply, and variations of ±10% in voltage or frequency shall not affect the accuracy in excess of 0.5%.
- F. Manufacturer: ENDRESS+HAUSER FMU42R; no equal.

### PART 3 - EXECUTION

### 3.01 INSTALLATION

A. Installation, testing, calibration, validation, startup and instruction shall be in accordance with Section 40 60 00.

# **SECTION 40 78 00**

## PANEL MOUNTED AND MISCELLANEOUS FIELD INSTRUMENTS

# PART 1 - GENERAL

#### SECTION INCLUDES 1.01

- Provisions: Requirements of Division 1 and Sections 40 60 00 and 26 09 00 form A. a part of this Section.
- Β. Work Included: This Section specifies the panel mounted and miscellaneous field instruments and equipment to perform the required functions in conjunction with information and equipment specified in other sections of Division 40. Refer to the Instrument Schedule in Section 40 60 00 for a list of required devices. This Schedule shall not be construed as complete bills of material.
- Unit Responsibility: It shall be the responsibility of the qualified single firm as C. described in Section 40 60 00 of this Division to ensure that the instruments and equipment furnished under this Section are compatible with the equipment furnished under sections of this Division and other Divisions of these Specifications, and that the signal transmission methods are compatible.
- D. Control and Performance Terminology used hereinafter in this Section shall be as defined in SAMA Standard PMC20-2-1970. "Process Measurement and Control Terminology."
- Ε. Cases: Cases of front of panel mounted instruments shall be of uniform design and color scheme wherever possible. Front of case colors shall be compatible with panel colors, subject to final approval by the Owner. Normally, compatible standard colors of the manufacturer shall be acceptable.
- F. Panel Mounted Equipment:
  - All flush mounted miniature electronic controllers, recorders, and stations 1. shall be a matching style family of instruments utilizing multiple unit mounting cases and back of panel plug-in cable connections. The overall height shall be 6 inches. A nine station multi-unit case shall fit standard 19-inch rack spacing. Each multi-unit case and instrument shall be equipped for standby manual operation.
  - All front panel mounted instruments shall be capable of withdrawing chassis 2. to all service and test positions without affecting operation, and complete removal by a single plug connection from the front.
  - All back of panel mounted signal conditioners and auxiliaries shall be 3. mounted in plug-in card files with labeled adjustment and test point at front of card edge.
  - 4. All instruments shall accept 4-20 mAdc or 1 to 5 Vdc input signals and shall produce 4-20 mAdc or 1 to 5 Vdc output signals as specified in the Schedules. Internal panel signals may be of either type. All signals coming to or leaving the panel shall be 4-20 mAdc.

#### 1.02 RELATED WORK SPECIFIED ELSEWHERE

Panels: Section 40 67 00. Α.

# 1.03 SUBMITTALS

- A. Shop drawings to be submitted in this section shall be made in one package under the Product Review Category of Shop Drawings.
- B. Refer to Section 40 60 00 for additional submittals required for each item herein.

# 1.04 QUALITY ASSURANCE

- A. Manufacturer: In addition to the requirements of Section 17010, instrumentation and control equipment furnished shall be manufactured by firms regularly and currently engaged in the design and manufacture of similar equipment. All equipment furnished shall be new and of the most recent design. Except where specified otherwise, the instruments furnished under this Section shall be as manufactured by Fischer & Porter; Foxboro; or equal. Behind-the-panel equipment shall be as manufactured by the above or by AGM Electronics; Moore Products; or equal.
- B. Maintainability: All equipment shall be designed for ease of maintenance and repair, and access to critical parts shall not require a major disassembly. Internal field adjustments where permitted or required herein shall be easily accessible upon removal of a panel or cover.
- C. Materials and Installation: Materials and installation shall comply with the requirements of the current editions of referenced electrical codes and standards, and the codes and standards referred to shall be used for establishing the minimum quality of the materials and equipment supplied and installed. All equipment of the same type shall be products of the same manufacturer. Capacities of all equipment shall not be less than that indicated on the Drawings or specified.

# PART 2 - PRODUCTS

# 2.01 CONTROLLERS AND MANUAL CONTROL STATIONS

- A. General: Controllers shall compare a process variable input signal with a remote or locally adjusted set point and shall produce a control output signal to correct any deviation of the process variable from the set point by means of a final control element. Manual control stations shall convert a remote or locally adjusted set point value to an output control signal to control a process variable by means of a final control element.
- B. Controllers shall have the following features:
  - 1. Auto-Manual Switching shall be provided on the front panel of each controller except for controllers with manual control action only or two-position control action. Switching from automatic to manual control shall be without an intermediate "Balance" position and shall cause no change in the controller output (bumpless transfer).
  - 2. Remote Set Point shall be provided where indicated on the "Controller and Manual Control Station Schedule." A switch for transfer from remote to local and vice-versa shall be mounted on the front of the controller panel. When in the remote set point mode, the scale of the controller shall be servo motor positioned so that the value of the set point is always indicated.

- 3. Reference Accuracy for the automatic controllers shall be at least ±0.5% of span. All automatic controllers shall have provision for manually overriding and adjusting the controller output signal. Adjustable output limiting shall be furnished on all automatic controllers with integral control.
- 4. Replacement: Each automatic controller shall have provision for replacement by a manual control plug-in module. If this feature is not available in the manufacturer's line of equipment, manual control stations shall be mounted on the front of each local control panel with patch cords or other connecting devices necessary to reach the terminals of all automatic controllers mounted on that panel. In no case shall the manual control be mounted more than 2 feet from its associated automatic control station.
- 5. Indicating Scales: Scales of control stations shall be the center deviation indication type. A set point scale on the front of the instrument shall display the process variable and its deviation from set point. The set point scale shall be at least 4-1/2 inches long and shall be vertically oriented. A separate scale shall display the control output signal to the final control element as 0 to 100%. Set point scale graduation shall be readable to the nearest 1%.
- Cases: Cases of control stations shall have front dimensions with a 6. maximum of 4 inches wide by 6 inches high.
- 7. Signals: Process variable and analog remote set point input and control output signals shall be 4-20 mAdc except that two-position and proportional speed floating control output signals shall be contacts rated for a minimum of 5 amperes at 120 Vac. Signals between units mounted in a single panel may be 1 to 5 Vdc.
- 8. Control Algorithms shall be available in controllers with the following control actions:
  - a. Proportional speed floating (integral).
  - Proportional with manual bias. b.
  - Proportional plus integral with adjustable output limiting. C.
  - d. Proportional plus integral plus derivative with adjustable output limiting.
  - Manual. e.
  - Two-position with adjustable "dead zone." f.
  - Feed forward in addition to "c" or "d" above. g.
- 9. Control Action provided for each controller shall be as indicated on the "Controller and Manual Control Station Schedule." Tuning adjustment of the control actions shall be integral to the control station and shall be accessible from the front of the control panel without disconnecting the controller from the process. When provided, control actions shall be continuously adjustable over the minimum ranges listed below:
  - Proportional Speed Floating: 0.1 to 25 seconds repetition period, 0 to a. 10% dead zone, 0 to 100 speed factor.
  - b. Gain: 0.2 to 33.
  - Integral: 0.04 to 30 repeats per minute. C.
  - Derivative: 0.01 to 8 minutes per repeat. d.
  - Two Position: 0 to 10% dead zone. e.
  - f Feed Forward: 0.5 to 5 gain.
- C. Schedule Abbreviations are listed below:
  - MA Analog, Manual-Automatic. 1.
  - 2. **Control Algorithms:** 
    - a. I - Proportional Speed Floating

- b. P Proportional
- c. PI Proportional plus integral
- d. PID Proportional gain plus integral plus derivative
- e. M Manual
- f. TP Two-position
- g. FF Feed forward

## 2.02 DIGITAL PUMP CONTROLLERS

- A. General: Furnish, install, test and place into satisfactory operation, level controls complete with digital pump controllers to operate in conjunction with the bubbler type level sensing system specified in Section 40 72 00.
- Β. Digital pump controllers shall be all solid state, integrated circuit to control two or more pumps in lead/standby, lead/lag/standby, lead/lag/follow/standby or lead/lag/follow/2nd follow/standby configuration, as shown on the P&ID and elementary control diagrams, plus high and low level alarms with individual start and stop points for each pump. Controllers shall utilize noise immune CMOS digital logic for maximum security. Individual set points for each pump start and stop plus high and low level alarms shall be accomplished using three-digit rotary thumbwheel switches for each level point for trip-point selection to the nearest tenth of a foot. A three-digit digital display shall be provided for level indication in tenths of a foot. Digits shall be not less than 1/2-inch high and shall be clearly visible in a high ambient light. Controllers shall have a 4-20 mA output for use by the adjustable frequency drives (AFDs) for the pumps. Controllers shall convert bubbler gauge pressures to process variables using either integral or separate gauge pressure transducers. Contact outputs for high alarm, low alarm, lead, lag, follow, 2nd follow and standby pump start shall all be rated 10 amps at 120 volts. LEDs shall be provided to indicate high level, low level, lead pump required, lag pump required, follow pump required, 2nd follow pump required, and standby required. On restoration of power, pumps shall start in a timed sequence starting with the lead pump. Include manual simulator to bypass automatic controls for testing, and control disconnect. Low level alarm shall be capable of inhibiting all pump run relays in the event of low level and be capable of low level indication without pump shutdown if desired by operating personnel. Complete control shall be easily removable so that a replacement can be installed. Printed circuit cards of one pump controller shall be interchangeable with cards of any other pump controller.
- C. Supplier of digital controllers shall maintain a service organization within the San Francisco Bay Area consisting of factory trained service engineers. They shall have oscilloscopes, digital meters and all other necessary testing equipment. Parts for this equipment shall be stocked at the service organization and the service engineer shall have enough parts with him on a service call to remedy the problem in the one trip. Supplier shall submit, on request by the District, a list of spare parts for this equipment carried in his local stock.
- D. Digital pump controllers shall be provided with tees and purge valves to facilitate manual blowdown of the bubbler sensing lines.

# 2.03 PROCESS VARIABLE INDICATORS

- A. Vertical single or dual channel process variable indicators shall have a vertical display at least 3 inches long, shall have a reference accuracy of ±2.0% or better, and the indicating pointer shall be driven by the output of a solid state electronic amplifier. Zero and span adjustment shall be provided. Indicating scale graduations shall be readable to 1% of full scale. Input signal shall be 1 to 5 Vdc or 4-20 mA as indicated on the Instrument Schedule. An optional single or dual integral alarm unit may be provided.
- B. Large Case Process Indicators shall be provided as shown on the plans and/or specified herein. Scale units shall be as specified in the Instrument Schedule. The pointer shall be servo driven with feedback and null balancing. Accuracy shall be 0.5% of full scale. Input signal shall be 1 to 5 Vdc or 4-20 mAdc. An optional integrator and 7 digit totalizer shall be provided where shown on the Drawings. When specified, SPDT alarm switches shall be provided, rated at 2 amperes, 120 Vac, 60 Hz. Indicators shall have 4-3/8-inch minimum scale length, and hinged locking door with glass window. Dimensions shall be 15 inches x 14 inches x 8 inches deep maximum. Operating power shall be 120 Vac, 60 Hz.
- C. Digital Indicators shall be provided where indicated and shall display the decimal value of a numerically coded input. Accessories shall be provided to accept analog voltage or current inputs or other digitally coded inputs as specified in the Instrument Schedule. The number and size of the digits shall be as specified. The displayed digits shall be luminous and easily visible in a well-lighted control room. The display style shall be the choice of the I&C Subcontractor, except that all displays shall be of the same style. The accuracy of the display shall be within ± one digit but not less than ±0.1% for analog inputs. There shall be no error with digital inputs. Automatic ranging and polarity selection and sign indication shall be provided.

# 2.04 SIGNAL CONDITIONERS AND CONVERTERS

- A. General: Signal conditioners and converters shall be provided as shown on the Drawings and/or as specified herein. They shall have all solid state circuits on plug-in printed circuit boards and housed in card cases or single cases for in-panel mounting and weatherproof or explosion-proof cases for field mounting depending on the area rating. Accuracy shall be ±0.25% unless shown otherwise. They shall be as manufactured by AGM Electronics; Rochester Instruments; or equal.
- B. Signal Selectors: Signal selectors, if required, shall receive up to four dc control signals and shall retransmit the lower, the intermediate, or the higher of the signals. Signal selectors shall be back-of-panel mounted.
- C. Signal Isolators and Impedance Converters: Signal isolators and impedance converters shall be provided for all field-located transmitters to prevent ground loops and ensure system compatibility and shall be either field-mounted or back-of-panel mounted in the control panels.
- D. Scale and Bias Transmitter:
  - 1. Provide a solid state scale and bias transmitter signal interface instrument, designed to accept voltage or current inputs and provide a current or voltage output. The basic ranges of the standard instrument shall be 1 to 5 Vdc input and 4-20 mA output. Current inputs and voltage outputs shall be obtained

through the application of proper resistor shunts. Zero suppression shall be provided for true zero input and/or true zero output operation.

- 2. A full 100% of the input signal shall be available as an input bias adjustment in this instrument. Provide ratio ability, "K", of 0.1 to 10.0.
- 3. Provide scale and bias calculating equation as follows:
  - Voltage Input K(Vi 1) + Vb = Vo 1 Voltage Output a.
    - Current Input K(Ii 4) + Ib = Io 4 Current Output b.
- Where: 4.
  - K = ratio Ib =current bias Vi = voltage input Vo = voltage output li = current input lo = current output
  - Vb = voltage bias
- Provide all circuitry packaged on high-quality, military-grade, epoxy fiberglass 5. printed circuit boards. All semiconductor elements used shall be silicon.
  - Input Signal (as required): a.
    - 1 to 5 Vdc (Zin greater than 5 megohms) 1)
    - 2) 4-20 mA (Zin 250 ohms)
  - Input Bias Range: ±100% of full scale b.
  - C. Output Bias Range: 0 to 50% of full scale
  - Ratio (gain) Range: 0.1 to 10.0 (100:1) d.
  - Output Signals (as required): e.
    - 1) 4-20 mA
    - 2) 1 to 5 Vdc
- 6. Output Drive Capability:
  - 4-20 mA into 0 to 800 ohms with any available supply ±20% a.
  - 4-20 mA into 0 to 950 ohms with any available supply  $\pm 2\%$ b.
- 7. Output Limiting: 130% of full-scale maximum output
- Computing Linearity: ±0.1% 8.
- Repeatability: ±0.1% of span 9.
- 10. Response Time: less than 50 milliseconds
- Stability and Drift (with 1 to 5 Vdc input, 4-20 mA output): ±0.5% change for 11. a 50°F (28°C) change in ambient temperature maximum; ±0.2% typical
- 12. Ambient Temperature Range: 0° to 140°F (-18° to 60°C)
- 13. Power Input:
  - 115 Vac, ±20%, 50/60 Hz., 5 watts a.
  - 230 Vac, ±20%, 50/60 Hz., 5 watts b.
  - 24 Vdc, ±20%, 4 watts c.
  - d. 48 Vdc, ±20%, 8 watts
- Power Supply Effect (with 800 ohm output load, 4-20 mA signal): ±0.3% for a 14. ±20% power variation maximum; ±0.15% typical
- 15. Controls: multiturn input bias, output bias, and gain potentiometers
- 16. Connection: barrier terminal strip
- 17. Mounting: surface
- 18. Electrical Classification: general purpose, CSA approved
- Ε. Potentiometer-to-Current Converters: Potentiometer-to-current converters shall be provided where indicated and shall convert a potentiometer setting to a linear 4 20 mA signal by detecting the relative resistance in each leg of a potentiometer. Total potentiometer resistance may be from 1,000 to 5,000 ohms. The converters shall be either control panel or field mounted as required.

F. Volt-to-Current Converters: Volt-to-current converters shall be provided where indicated to receive a 1 to 5 Vdc input and convert this signal to a 4-20 mAdc current output, proportional to the sensed variable. Zero and span adjustment shall be provided. Unit shall be back-of-panel mounted.

#### 2.05 **CONTROL PANEL ACCESSORIES**

- Α. Relays, timers and other internally mounted equipment shall be of the types specified in other sections of these Specifications.
- B. Panel face mounted equipment shall be of the types specified in other sections of these Specifications.
- Standards: All control devices shall conform to applicable provisions of NEMA C. Standards ICS 1 and ICS 2.
- Pushbuttons, selector switches and pilot lights shall be heavy-duty oiltight units. D. Pushbuttons and selector switches shall have contacts rated 10 amperes continuous, Rating Designation A600 in conformance with NEMA ICS 2.
  - 1. Pushbuttons used as emergency stop devices shall have a padlockable means for maintaining an open circuit. Indicating lights shall be push-to-test transformer type with lenses of the colors shown on the Drawings.
  - 2. Multiposition control switches shall have rotary action, round knurled handle and the number of positions and stages shown on the Drawings. They shall be suitable for panel mounting. Each position shall have a positive detent. Contacts shall have a continuous current rating of 10 amperes at 300 Vac. Switches shall have integral indicator.
  - 3. For 4-20 mAdc and 1 to 5 Vdc signal selector switches, provide oiltight selector switches with electronic duty gold contact blocks. Provide sliding contacts for reliable operation without benefit of thermal cleaning action.
  - 4. Manufacturer: Provide Microswitch heavy duty oiltight manual controls, Type PT, with electronic duty gold contact blocks; Allen-Bradley Bulletin 800T oiltight selector switch with stackable "Logic-Reed" contact blocks; or equal.
- Ε. Colors and Descriptions:
  - Indicating Lamps: Unless otherwise noted in the individual Loop 1. Specifications, the following color code and inscriptions shall be followed for the lenses of all indicating lights and annunciators.

Indicating Lamp Inscription	Color	Annunciator Lamp Inscription
ON/START	Red	Refer to Instrument Schedule and Panel Elevation Drawings and Elementary Drawings
OFF/STOP	Green	
CLOSED	Green	
LOW	Amber	
FAIL	Red	
HIGH	Amber	
OPEN	Red	
POWER ON	White	

RESET	Red	
AUTO	Blue	

- 2. Lettering shall be black on white and amber lenses. Lettering shall be white on red and green lenses.
- 3. Pushbuttons: Follow color coding for indicating lamp above. All unused or noninscribed buttons shall be black. Lettering shall be black on white and yellow buttons. Lettering shall be white on black, red and green buttons.
- F. Nameplates: Unless specified otherwise in the Drawings, nameplates shall be black lamacoid with minimum 3/16-inch-high white letters for major area titles, 5/32-inch for component titles, and 1/8-inch for subtitles, and shall be fastened with a permanent but dissolvable adhesive or by screws.
- G. Pneumatic Tubing: Pneumatic tubing may be copper, stainless steel, or polyethylene as preferred by the panel vendor, except that the air header, valves, and fittings shall not be polyethylene. Tubing shall be 1/4-inch O.D. with a working pressure rating of at least 150 psi. Threaded fittings which hold air shall be assembled with bias cut teflon tape lubricant. Polyethylene tubing shall be supported in plastic duct to within 1-foot of each termination and shall be color coded in accordance with ISA Recommended Practice RP7.2. Provide individual combination air filter regulators with gauge for each air consuming device.
- H. Pneumatic Piping: Pneumatic piping shall be PVC and shall incorporate sufficient unions for assembly and disassembly. The Contractor shall supply 100 psig dried and refrigerated plant air to the panels requiring air. The control panels shall incorporate all the necessary pressure reducing valves and adapters for the instrumentation air piping. Piping shall be installed in accordance with the standards of ISA.

# 2.06 INSTRUMENT LOOP POWER SUPPLIES

- A. General:
  - For each two-wire transmitter, provide a 24 Vdc regulated 50 mA power supply with 120 Vac input. Output voltage may be 24 Vdc ±5% manufacturing tolerance at no load, but shall hold within 1% from no load to full load at 120 Vac ±10% input.
  - 2. Line-to-load regulation shall be within 0.1% from no-load to full load. Ripple shall be less than 15 mV peak-to-peak.
- B. Manufacturer: Provide Model AP9046 instrument loop power supply as manufactured by Action Instruments with plug-in mounting base; equivalent capacity Lambda power supply with terminal blocks for external connections; or equal.

# PART 3 - EXECUTION

### 3.01 INSTALLATION

A. Installation, testing, calibration, verification, startup and instruction shall be in accordance with Section 40 60 00.

- B. Wiring: Refer to Section 40 60 00, Part 3.
- C. Switching Circuit Schematics: Schematics shown are illustrative of the desired function only, the Contractor may elect to perform the required functions by other standard logic techniques. Components and circuits used shall be subject to review and approval. All switching circuits shall be checked and verified by testing before shipment.
- D. Control Voltage:
  - 1. When the control voltage is not specified in the schematics, the Contractor may elect to use the 120 Vac power, as supplied from the power panels supplies under Division 16; however, he shall provide a separate low voltage circuit for the indicating lamps or provide individual transformers with lamps. In any event the lamp voltage shall not exceed 30 Vac or dc.
  - 2. Manual disconnect switches (and relays if necessary) shall be provided internal to the panel to isolate process related groups of circuit elements from panel power and foreign voltages to permit troubleshooting without disabling controls for other processes. Safety interlock switches shall be provided on access doors to disconnect local and foreign voltages if required by safety codes of applicable regulating authorities.

# THIS PAGE INTENTIONALLY BLANK

Hoodland Chemical Improvements Job No. 2376011*00 © 2024 Kennedy/Jenks Consultants C:bmskjce-pwd0301478/40 78 00-Panel Mounted and Miscellaneous Field Instruments.docx

# SECTION 40 91 10

# GAS DETECTION DEVICES

#### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. General: The Contractor shall furnish and install all gas detection devices, complete and operable, in accordance with the Contract Documents.
- B. The requirements of Section 40 91 00 Process Control and Instrumentation

#### 1.02 CONTRACTOR SUBMITTALS

A. General: The Shop Drawings and Technical Manual, shall be submitted in conformance with Section 01 33 00.

#### 1.03 QUALITY ASSURANCE

- A. General: The accuracy of each instrumentation system or loop shall include the following.
  - 1. Verify proper power and signal wire terminations.
  - 2. Ensure proper power voltage is applied to the device.
  - 3. Check for correct output signal.

#### 1.04 MANUFACTURER'S REPRESENTATIVE SERVICES

A. General: None required for this section.

#### 1.05 PRODUCT HANDLING

A. General: Product shall be properly crated/protected to prevent damage and moisture intrusion during shipping and handling.

### PART 2 - PRODUCTS

#### 2.01 GENERAL

A. All devices specified herein shall conform to the requirements of the Contract Documents.

### 2.02 SODIUM DIOXIDE GAS DETECTOR

- A. Electrochemical Gas Detection Cell Specific for Sodium Dioxide Gas Detection.
- B. Hot swappable, replaceable gas sensor.
- C. Temperature and humidity compensated gas sensor.
- D. Automatic sensor detection.
- E. 3 Wire, 24VDC, powered gas monitor.
- F. Isolated 4-20 mA output.
- G. Three (3) alarm contacts, configurable.

- H. Integrated Backlit LCD graphic display with process value, engineering units.
- I. -40 Degrees C to 60 Degree C rated electronics.
- J. Polycarbonate corrosion resistant housing, IP66.
- K. Remote mount sensor and mounting module.
- L. Manufacturer:
  - 1. MSA Ultima XA Series
  - 2. Or Engineer-approved equal.
- M. Scope of Supply:
  - 1. AIT-101, Sodium Bisulfite storage room, sodium dioxide gas detector

### PART 3 - EXECUTION

- 3.01 GENERAL
  - A. Installation, wiring, testing, calibration, validation, startup and instruction shall be in accordance with Section 40 91 00 and shall be per manufacturer's requirements.

### SECTION 43 41 43

#### POLYETHYLENE CHEMICAL STORAGE TANKS

#### PART 1 - GENERAL

- 1.01 SUMMARY
  - A. This Section describes indoor, double-walled polyethylene tanks for chemical storage (Sodium Bisulfite). Provide complete, tested, and operating tanks as shown on the Drawings and as specified herein, including shipping any "oversized" loads to the project site.

#### 1.02 REFERENCES

- A. ASTM International (ASTM).
  - A. C177 Test Method for Steady State Heat Flux Measurements and Thermal Transmission Properties
  - B. C273 Test Method for Shear Properties in Flatwise Plane of Flat Sandwich Constructions or Sandwich Cores
  - C. D638 Tensile Properties of Plastics
  - D. D618 Conditioning Plastics and Electrical Insulating Materials for Testing
  - E. D746 Impact Brittleness Temperature
  - F. D790 Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
  - G. D883 Standard Definitions of Terms Relating to Plastics
  - H. D1505 Density of Plastics by the Density-Gradient Technique
  - I. D1525 Test Method for Vicat Softening Temperature of Plastics
  - J. D1621 Test Method for Compressive Properties of Rigid Cellular Plastics
  - K. D1622 Test Method for Apparent Density of Rigid Cellular Plastics
  - L. D1623 Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
  - M. D1693 ESCR Specification Thickness 0.125" F50-10% Igepal
  - N. D1998 Standard Specification for Polyethylene Upright Storage Tanks
  - O. D3892 Practice for Packaging/Packing of Plastics
  - P. E84 Test Method for Surface Burning Characteristics of Building Materials
  - Q. F412 Definitions of Terms Relating to Plastic Piping Systems
- B. ANSI Standards: B-16.5, Pipe Flanges and Flanged Fittings
- C. Occupational Safety and Health Administration (OSHA) Standards: 29 CFR 1910.106, Occupational Safety and Health Administration, Flammable and Combustible Liquids
- D. Oregon Structural Specialty Code (OSSC).
- E. ARM (Association of Rotational Molders) Standards: Low-Temperature Impact Resistance (Falling Dart Test Procedure)

#### 1.03 SUBMITTALS

A. Shop Drawings: Submit the following as a single complete initial submittal in accordance with Section 01 33 00 in the Product Review category. Sufficient data

43 41 43 - Polyethylene Chemical Storage Tanks

shall be included to show that the products conform to Specification requirements. Provide the following additional information:

- A. Shop drawings showing tank dimensions, orientation of tank fittings, nozzles, vents, manways, and other appurtenances.
- B. Details of tank construction and fittings. Indicate wall thicknesses.
- C. Anchorage and lateral restraint details and calculations prepared by and stamped by a structural engineer, registered in the State of Oregon, in accordance with Section 01190.
- D. Tank design calculations as specified, including material properties used in design and loading conditions (handling, vertical loading, discontinuity, and seismic loading).
- E. Resin brand and type complete with the manufacturer's published chemical resistance charts or a letter from the resin manufacturer indicating the suitability of the resin for the specified chemicals of the chemical concentrations indicated below, in percentage by weight of solution:

Chemical	Concentration	Approximate Specific Gravity
Sodium Bisulfite	25%	1.2

- F. Form of warranty.
- G. Form of warranty.
- B. Submit results of shop testing for review. Do not ship tanks until a favorable review of tests is received.
- C. Submit results of field testing.
- D. Manuals and Parts List: Furnish manufacturer's installation, operation and maintenance manuals, bulletins, and spare parts lists in conformance with Section 01 33 00. Installation manual shall include written instructions and recommended methods for unloading, storing, and installing tanks and recommended lifting and handling procedures, including bolt torques. Furnish a local 24-hour emergency number for repairs in case of tank damage.
- E. Affidavits: Furnish affidavits from the manufacturer stating that the tanks have been installed to the manufacturer's requirements and are ready for full-time storage of the specified chemicals in accordance with Section 01 33 00.
- F. Submit chain-of-custody certification.

### 1.04 QUALITY ASSURANCE

- A. Products of the same material furnished under this Section shall be supplied by a single manufacturer who has been regularly engaged in the design and manufacture of the polyethylene tanks for a minimum of 10 years. Demonstrate to the satisfaction of the Engineer that the quality is equal to tanks made by the manufacturers named herein.
- B. Products shall be manufactured at a manufacturing facility that meets or exceeds ISO 9000 quality standards.
- C. Comply with the following Reference Standard: Standard Specification for Polyethylene Upright Storage Tanks, ASTM D 1998 except as modified herein.
- D. Comply with the following Regulatory Standards:

Hoodland Chemical Improvements 43 41 43 - Polyethylene Chemical Storage Tanks Job No. 2376011.00 2 © 2023 Kennedy/Jenks Consultant

- A. International Fire Code, Chapter 50, Hazardous Materials-General Provisions, with local amendments, if any.
- B. Oregon Structural Specialty Code (OSSC)
- E. Tank shall be manufactured from new materials and shall not be stored for more than 3 months prior to delivery.
- F. Impact test results must meet the requirements of ASTM D 1998, Section 11 Test Methods.

# 1.05 WARRANTY

A. The tank shall be warranted for three (3) years for 100% replacement against defects in materials, workmanship and chemical attack and an additional three (3) years prorated warranty for a total warranty of six (6) years. Copy of warranty must be present on tank or on invoice with instruction sheets accompanying fittings.

# PART 2 - PRODUCTS

# 2.01 MANUFACTURER

A. Tanks shall be as manufactured by Poly Processing; Snyder Industries, Inc; or equal.

# 2.02 POLYETHYLENE STORAGE TANKS

- A. Tanks shall comply with ASTM D 1998 Polyethylene Upright Storage Tanks, except where modified in this specification.
- B. Tanks shall be designed in accordance with Section 01 11 90 Seismic Requirements, and other superimposed mechanical conditions as described.

Tank Name	Bulk Tank		
Tank Tag No.	T-101, T-102		
Service			
Location	Indoors		
QTY	2		
Nominal Volume (gals)	150 Each		
Usable Volume (gals)	150 Each		
Diameter (max.)	31'		
Side Wall Height (min.)	52.2'		
Overall Height (max.)	61.5'		
Туре	Vertical top		

- C. In addition to the minimum design requirements as specified, the tanks shall be designed for the stated specific gravity conditions, maximum ambient temperature of 90°F, and maximum operating temperature of 110°F. All components shall be compatible with the chemicals specified in Paragraph 1.03-A.5.
- D. Double-contained chemical storage tanks shall consist of a primary storage tank and a secondary containment tank designed to contain a minimum of **110%** of the normal fill capacity of the primary tank.
- E. Resin used in the tank manufacture shall be high-density linear polyethylene (HDLPE) Grade 8600 as manufactured by ExxonMobile Chemical; or crosslinkable polyethylene (XLPE) PAXON 7000 Series as manufactured by

43 41 43 - Polyethylene Chemical Storage Tanks

ExxonMobile Chemical; or equal. The tank material shall be rotationally molded and meet or exceed the following properties:

Property	High Density Linear Polyethylene Value	Cross-linked Polyethylene Value	ASTM Test
Density, gm/cc	0.942-0.944	0.938-0.944	D1505
Environmental Stress Cracking Resistance, F50, hours	400-1000	>1,000	D1693
Tensile Strength, Ultimate psi, 2-inch/minimum	2,620	2,600	D638 Type IV Specimen
Elongation at Break, % 2-inch minimum	350	400	D638 Type IV Specimen
Vicat Softening Point	235°F	~248°F	D1525
Impact Brittleness temperature	-175°F	<-180°F	D746
Flexural Modulus, psi	97,000-103,000	100,000	D790

- F. Each tank shall have weatherability equal to PAXON 7000 Series for cross-linked or Exxon 8660 for high-density linear polyethylene resin with UV-8 stabilizer. If requested by the Engineer, manufacturer shall provide a history of tanks made of specified resin with three or more year's exposure to sunlight.
- G. Wall thickness for a given hoop stress is to be calculated in accordance with ASTM D 1998. Tanks shall be designed using a hoop stress no greater than 600 psi. Wall thickness calculations shall assume that all tank contents have a specific gravity of not less than 1.9
- H. Manufacturer shall have the capability of issuing gel test results using the method described in ASTM D 1998. The percentage gel level for Cross-link Polyethylene Tanks on the inside 1/8-inch of the wall shall be a minimum of 60%.
- I. Tank colors shall be natural (unpigmented) .When pigments are added they shall not exceed 0.25% (dry blended) of the total weight.
- J. Manways shall be 24-in. diameter or greater and equipped with an emergency pressure relief device.
- K. Fittings shall be of the following type as suitable for the service:
  - A. Fittings shall be compression type, tank adapters with standard National Pipe Thread to be compatible with associated plumbing. Fittings shall be made vertical on sloping tank tops. Compression type fittings are not permitted for submerged service or below the top head of the tank.
  - B. Bolted Fittings shall be double flange fittings with two 150-lb flanges. Use bolts with internal polyethylene injection molded encapsulated heads compatible with the chemical stored. Provide gaskets for bolts sealing surface on inner flange.
  - C. Integrally molded outlets (molded as part of the tank) shall be used as a drain to provide complete drainage through the sidewall. Coordinate any concrete tank pad blockout requirements with installer.
  - D. Provide integrally molded flanged outlets (IMFO) or unitized molded outlets as a drain for the primary chemical storage tank.

Polyethylene Chemical Storage Tanks

- E. Gaskets shall be a minimum of ¼-inch thickness and constructed of 40-50 durometer EPDM and 60-70 durometer Viton.
- F. Fitting, gasket and bolt materials shall be as follows:

Chemical	Fitting Material	Gasket Material	Bolt Material
Sodium Bisulfite	PVC	EPDM	316 SS

G. All tank fitting attachments on the lower sidewalls shall be equipped with flexible couplers designed to deflect based upon tank loading, chemical temperature, and storage time duration. Tank piping flexible couplers shall be designed to allow 4% design movement.

### 2.03 TANK ACCESSORIES

- A. Vents: Each tank must be properly vented for the type of material and flow rates expected. Vents must comply with OSHA 1910.106 (f) (2) (iii) or other accepted standard. All tanks must be vented for atmospheric pressure as well as any pressure created by filling and emptying the tank. Venting equipment should be sized to limit pressure or vacuum in the tank to a maximum of 1/2" of water column (0.02 psi).
  - A. All u-vents shall be constructed of PVC or other specified materials.
  - B. When a tank is being filled from a pressurized tanker truck steps need to be taken to avoid pressurizing the tank. The tank may require a secondary surge protection lid to avoid any pressure build up. The surge protection lid is to be a 14" or 18" hinged and be design that it is self-closing.

#### 2.04 TANK STAND

- A. Provide each tank with a tank stand constructed of polyethylene. Stand shall elevate the tank approximately 16 inches above the floor and provide stability legs that extent approximately 28" along each stand corner.
- 2.05 SHOP TESTING
  - A. Perform gel and impact tests in accordance with ASTM D1998 on samples cut from each polyethylene chemical storage tank.
  - B. Submit certified shop test results to the Engineer, whether or not tests were witnessed by the Engineer. Do not ship tanks until favorable review of shop testing submittal is received.

### PART 3 - EXECUTION

- 3.01 DELIVERY, STORAGE, AND HANDLING
  - A. Provide all shipping and other arrangements required to transport tanks to the project site and ship tanks per manufacturer's recommendations.
  - B. The tanks shall be marked with adhesive-backed laminated tags or engraved stainless steel tank ID plate to identify the product, date (month and year) of manufacture, capacity, and serial number.
  - C. All packing, packaging and marking provisions of ASTM D3892 shall apply.

Hoodland Chemical Improvements	43 41 43 -	Polyethylene Chemical Storage Tanks
Job No. 2376011.00	5	
© 2023 Kennedy/Jenks Consultant		

- D. All fittings shall be installed and, if necessary, removed for shipping and shipped separately.
- E. Upon arrival at the destination, inspect for damage in transit. If damage has occurred, the manufacturer shall be notified prior to tank installation.
- 3.02 INSTALLATION
  - A. Install tanks and fittings in strict accordance with the manufacturer's instructions and with favorably reviewed shop drawings.
- 3.03 IDENTIFICATION
  - A. Identification of the health, flammability, and reactivity of hazardous materials is required for each tank. See Specification Section 10400.
- 3.04 FIELD TESTING
  - A. Notification: Provide the Engineer two (2) working days' notice prior to field tests so that the Engineer may elect to witness the testing.
  - B. Field Testing: Provide a 48-hour static leak test for each tank. The tanks shall be leak tested with water to the overfill level. A passing test result shall be no leakage from the tank. If a leak is detected, the tank shall be repaired or replaced in a manner satisfactory to the Engineer. Such repairs shall be performed only by the tank manufacturer, at no additional cost to the Owner. After repairs, retest the tank until a passing result is achieved. Demonstrate that all tank accessories are working properly.
- 3.05 CLEANING
  - A. After satisfactory completion of field testing, drain the testing water. Rinse the inside of the tanks with clean, potable water. Clean the tank exterior and accessories and leave in good condition.

# SECTION 46 30 00

# CHEMICAL FEED EQUIPMENT

# PART 1 - GENERAL

## 1.01 SUMMARY

- A. Provide complete, tested and operating sodium bisulfite feed equipment as shown on the Drawings and as specified herein.
- B. The Contractor shall maintain all existing chemical systems in operation throughout the project's duration.

# 1.02 REFERENCES

- A. Oregon Fire Code base on the International Fire Code (IFC).
- B. Oregon Structural Specialty Code based on the International Building Code (IBC).
- C. National Electrical Manufacturers Association (NEMA).

### 1.03 SUBMITTALS

- A. Shop Drawings and Product Data: Submit the following Product Review requirements as a complete submittal.
  - 1. Product data to demonstrate that equipment conforms to the specifications.
  - 2. Pump layouts and dimensions.
  - 3. Pump performance data.
  - 4. Materials of construction.
- B. Manuals: Furnish manufacturer's installation, lubrication, operation and maintenance manuals, bulletins, and spare parts lists for each system specified.
- C. Affidavits: Furnish affidavits from the manufacturers stating that each system has been properly installed, adjusted, and tested and is ready for full-time operation.
- D. Safety Data Sheets (SDS) for each chemical to be used during testing of each chemical feed system.

# 1.04 QUALITY ASSURANCE

- A. All products furnished under this section shall be from a single manufacturer who has been regularly engaged in the manufacture of the pumps specified for at least 5 years. Demonstrate to the satisfaction of the Engineer that the quality is equal to equipment made by the manufacturers specifically named herein.
- B. All components and equipment shall be suitable for bulk (as delivered) chemicals specified as follows in percentage by weight of solution (approximate):

Chemical	Concentration	Approximate Specific Gravity
Sodium Bisulfite	25%	1.2

- C. Comply with the Following Regulatory Standards:
  - 1. Oregon Fire Code, especially Chapter 50, Hazardous Materials-General Provisions with local amendments, if any.
  - 2. Oregon Structural Specialty Code, especially Chapter 9, with local amendments, if any.

# PART 2 - PRODUCTS

# 2.01 GENERAL

- A. The equipment covered by these Specifications shall be standard units of proven ability as manufactured by reputable concerns having long-term experience in the production of such equipment. The equipment furnished shall be designed, constructed, and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed as shown on the Drawings.
- B. Stainless steel nameplates giving the name of the Manufacturer, the rated capacity, head, speed and all other pertinent data shall be attached to each pump, motor, and control panel.
- C. The nameplate ratings of the motors shall not be exceeded, nor shall the design service factor be reduced when the pump is operating at any point on its characteristic curve at maximum speed.
- D. Mechanical equipment, including drives and electric motors shall be supplied and installed in accordance with applicable OSHA regulations. Stainless steel guards shall be installed on all rotation assemblies. The noise level of motors, unless otherwise noted, shall not exceed 85 dBA measured 3 meters from the unit under free field conditions while operating on utility power.

	Sodium Bisulfite System
ltem	
Service	Sodium Bisulfite
Quantity of Pumps	2
Pump Number(s)	P-101, P-102
Pump Type	ProMinent DulcoFlex DFXz Peristaltic
Minimum Demand	2.5 gal/day
Maximum Demand	20 gal/day
Maximum Discharge Pressure	100 psi
Metering Reproducibility	+/- 2%
Motor Horsepower	3/4 hp
Voltage/Phase/Hertz	115-230/1/60

E. Pump Schedule:

# 2.02 PERISTALTIC PUMPS

- A. Peristaltic Pumps: Provide seal-less peristaltic type hose pump. Pump shall be ProMinent DulcoFlex DFXa, no equal.
- B. Accessories:
  - 1. Hose Failure Switch (Tube Monitor): Provide a factory-mounted conductivity leak sensor for each pump.
  - 2. Spare Hose: Provide one spare hose.
- C. Motors: Drive motors shall be 115/230 VAC, 1-phase, TEFC severe duty.
- D. On-board Controls: Each pump shall include an on-board HMI with programmable settings. HMI shall display flow rate, totalized flow. Provide the following input and output signals for monitoring and control of the pump operation:
  - 1. Input signal: Dry contact start/stop (pause) signal.
  - 2. Output signal: Pump fault, running.
- E. Local Control Panel: Provide a custom fabricated local control panel to provide the following for each pump. Provide one panel serving both pumps on the pump skid.
  - 1. HAND/OFF/REMOTE switch
  - 2. SPEED controller
  - 3. Pump Alarm

# 2.03 CHEMICAL FEED SYSTEM ACCESSORIES FOR VENDOR SUPPLIED PACKAGE

- A. General: Materials of construction shall be satisfactory for continuous exposure to the hereinbefore-listed chemicals.
- B. Calibration Cylinders: Provide clear PVC graduated calibration cylinders. The calibration cylinders shall be sized to provide approximately 1 to 2-minutes of drawdown at the pumps maximum capacity, or sized to meet manufacturer's calibration requirements, whichever is larger. Provide anti-splash caps for each calibration cylinder. Install calibration cylinder assemblies on suction side of all metering pumps.
- C. Piping Specialties:
  - 1. Provide properly sized pulsation dampeners on the discharge lines of each metering pump as shown on the Drawings.
  - 2. Provide pressure relief and backpressure valves where shown on the Drawings. Valves shall be of PVC. Valves shall be field adjustable and installed where shown on the Drawings and/or as recommended by manufacturer. Valves shall be by JESCO America Corporation; Wallace & Tiernan; or equal.
- D. Pulsation Dampeners:
  - 1. Materials: CPVC wetted parts, PTFE diaphragms, and polypropylene nonwetted housing.
  - 2. Connection type: 1-inch socket or flanged-inlet connection, ANSI Class 150.
  - 3. Gas volume: 10 cubic inches or 175 cubic inches, as required.
  - 4. Pressure gauge: Glycerin filled with a PVDF housing and 2¹/₂-inch dial.
  - 5. Pressure rating: 150 psig minimum.
  - 6. Manufacturer: Blacoh Fluid Control; or approved substitute.

- E. Pressure Gauges
  - 1. Gauges shall be of the bourdon tube, bellows type, or compound type with 270 degrees clockwise pointer travel. Compound gages shall have clockwise travel on gage pressure and counterclockwise travel on vacuum.
  - 2. Gauges shall be 4-1/2 inch diameter. Smaller gages may be accepted on a case-by-case bases in packaged systems.
  - 3. Case shall be stainless steel.
  - 4. Process gages supported by the process connection shall be filled with an inert fill liquid. Panel-mounted gauges shall have round bezels for flush mounting and rear connection.
  - 5. Dial face shall be white background with black numerals and polycarbonate shatterproof glass.
  - 6. Gauge shall have safety blow out through the back or top of the unit.
  - 7. Pointer shall be externally adjustable.
  - 8. Accuracy shall be Grade 2A, 0.5% of full-scale maximum and readable to 1%.
  - 9. Connection for all gauges shall be male 1/2-inch NPT with square wrench flats. Provide diaphragm or annular seals.
  - 10. Manufacturers: Gauges shall be Ashcroft; Ametek/U.S. Gauge; or equal.
- F. Pressure Switches
  - 1. Pressure switches shall incorporate bourdon tubes, diaphragms, or bellows as the sensing and actuating element. The actuating element shall be Type 316 stainless steel or phosphorous bronze, depending on compatibility with the process fluid. The actuating point shall be readily field-adjustable in the range specified with adjustable dead band. Switches shall be SPDT, rated at 5 ampere minimum at 120 VAC. Enclosures shall be NEMA 4X unless specified explosion-proof as shown on the Drawings. Process connection shall be 1/2-inch NPT.
  - 2. There shall be calibrated external adjustments for set point and differential. Element shall be rated for at least 50% over range pressure. Switches used for alarm shall have manual reset. Provide diaphragm or annular seals
  - 3. Manufacturers: Ashcroft B Series Type 400; Ashcroft L Series; United Electric Controls Series 400; or equal.
- G. Pressure Relief Valves:
  - 1. Type: Angle pattern.
  - 2. Body, seat, diaphragm materials: CPVC with Viton/PTFE diaphragm.
  - 3. Pressure range: 0 150 psi.
  - 4. Connection type: 1-inch socket or flanged, ANSI Class 150.
  - 5. Valves shall be field adjustable and installed where shown on the Drawings and/or as recommended by the manufacturer.
  - 6. Manufacturer: Sigmamotor; or approved substitute.
- H. Back Pressure Valves:
  - 1. Materials: CPVC with Viton/PTFE diaphragm
  - 2. Connection Type: 1-inch socket or flanged, ANSI Class 150.
  - 3. Pressure Range: 5-150 psi.
  - 4. Valves shall be field adjustable and installed where shown on the Drawings and/or as recommended by the manufacturer.
  - 5. Manufacturer: Sigmamotor; or approved substitute.

- I. Coriolis Flowmeter
  - General: Coriolis flowmeters are used to measure virtually all fluids, gases, or liquified gases. These meters utilize oscillations techniques for direct measurement of the mass flow. The flow is determined by comparing the shift of a tube sonically excited by a known frequency. The flow element shall be constructed of materials per manufacturer's recommendations for the intended service and application. The flow instrument shall be rated NEMA 4X or NEMA 7 in classified areas. Accuracy shall be within 0.15% of range with 0.05% repeatability. Ambient operating temperature limits of -20 to 140 degrees Fahrenheit.
  - 2. An integral or remote electronic indicating transmitter (per Drawings and Instrument Schedule) with totalizer and display shall produce a 4-20 mAdc signal. The transmitter shall be supplied by 24 VDC.
  - 3. Manufacturer: Emerson Micro Motion Transmitter and Sensor, Endress+Hauser Transmitter and Sensor, or equal.
- J. Pump Skids: Pumps shall be mounted on chemical feed skid systems complete with pump, base, and accessories as described in this Section and as shown in the Drawings.
  - 1. Pump skids shall be polypropylene/polyethylene construction.
  - 2. Piping on the skids shall be SCH 80 PVC per Section 40 20 00. Piping shall use solvent welded joints with solvent cement specifically rated for sodium bisulfite service as specified in 40 20 00. Piping and components shall be rated for 150 psi.
  - 3. Parts coming into contact with the liquid shall be selected to ensure optimum corrosion resistance to the liquid being pumped.
  - 4. Skids shall allow anchorage into existing concrete and be designed for seismic loading per Section 01 19 00.
  - 5. Skids shall include the following accessories mounted on the skid.
    - a. Wye strainer
    - b. Calibration column
    - c. Pressure gauge with isolator
    - d. Pulsation dampener
    - e. Back pressure valve (one per pump)
    - f. Pressure relief valve (one per pump)
    - g. Pressure switch high (one per pump)
    - h. Pressure guage (one per pump)
    - i. Carrier water flow meter
    - j. Sodium Bisulfite with Carrier water flow meter
    - k. And all other components as detailed on the Process and Instrumentation Diagram Drawings.

# 2.04 AIR TRANSFER PUMP

- 1. Air transfer drum pump capable of using compressed air to transfer sodium bisulfte from drum containers to storage tanks.
- 2. Tube and Shaft material: CPVC, 40" long dip stick with bung adapter
- 3. Internal materials: compatible with sodium bisulfite; PTFE, or equal.
- 4. Discharge size: 1-inch
- 5. Discharge Type: Hose barb
- 6. Capacity: max 15 gpm at 17 feet lift

### 2.05 SPARE PARTS

A. Furnish spare parts that are necessary for continued operation of the equipment and any special tools required for replacement of parts and adjustment of equipment. For each peristaltic pump furnish one spare hose, length as recommended by the manufacturer.

# PART 3 - EXECUTION

#### 3.01 INSTALLATION

A. General: The chemical feed system equipment shall be installed in strict conformance with the manufacturer's installation instructions and with favorably reviewed shop drawings. Check out of the final installation, startup, calibration, and instruction of operating personnel shall be performed by an authorized representative of the manufacturer.

#### 3.02 IDENTIFICATION

A. Identification of the health, flammability, and reactivity of each chemical shall be affixed above each chemical feed area. See Specification Section *10 40 00*.

#### 3.03 FIELD TESTING

- After successfully completing leak tests of the chemical storage tanks Section 43 Α. 41 43, each chemical feed system shall be tested for 4 hours with water. Each chemical system shall be tested against a closed discharge solution line to test pressure relief valve operation. This shall be performed for each metering pump and shall be witnessed by the Engineer. Only after satisfactory testing with water and complete draining and removal of water from the chemical system, and thorough drying, which may require blowing dry air through the pipelines, may the final test with chemical be allowed to proceed. After draining the test water, hand wipe, dry and blow dry air through chemical feed pipelines to leave the chemical pipelines clean, dry and ready for conveyance of the chemical; then test each chemical feed system in all operational and alarm modes to show conformance with these Specifications. Provide sufficient chemical (approximately 55 gallons each), for the test. The chemicals used shall be favorably reviewed by the Engineer prior to the test. Each chemical metering pump shall be (chemical solution) calibrated and tested throughout its pumping range. The MSDS for each chemical shall be on hand during the testing of the chemical feed system.
- B. The Contractor shall be responsible for the disposal of the test material(s).

#### 3.04 FIELD SERVICES

- A. Provide an engineer or technician from the chemical feed equipment supplier(s) to make all adjustments and monitor the testing specified above.
- B. After successful completion of field testing, provide 1 day (8 hours) of additional service by an engineer or technician from each equipment supplier to train plant personnel in system operation, maintenance, and safety procedures.